SAP S/4HANA®

An Introduction

▶ Learn how SAP S/4HANA enables digital transformation

▶ Explore innovative financials and logistics functionality

▶ Understand the technical foundation underlying SAP S/4HANA advances

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Lahiri · Meijerink · Worsley-Tonks

Rheinwerk Publishing

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SAP S/4HANA®

An Introduction

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Dear Reader,

Here's a little secret about the publishing world: The old adage about more hands doing less work doesn't always hold true for us. Get the wrong mix of people, and you'll publish two years late with an uninspired manuscript. But when you get the right team together? When you have people with differing viewpoints but a shared vision? When everyone is dedicated to the project and their writing? That's where the magic happens!

It almost goes without saying (though I'll say it loudly just this once!) that the author team we've gathered together for *SAP S/4HANA: An Introduction* falls into the latter category. It has been my privilege to work with Axel, Dmitry, Nga-Sze, Mark, Asidhara, Bert, Andrew, and Devraj over the last ten months, and we're all excited to send this book out into the world! The unique perspective that a team from IBM Global Business Services adds to the conversation is invaluable—as you'll see in the following pages.

As always, your comments and suggestions are the most useful tools to help us make our books the best they can be. Let us know what you thought about *SAP S/4HANA: An Introduction*! Please feel free to contact me and share any praise or criticism you may have.

Thank you for purchasing a book from SAP PRESS!

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Foreword from Nancy Thomas

Since the 1980s, we've seen the world transform into a digitized one. This digital enablement began with products such as DVDs and cameras and has since evolved into larger changes such as the Internet revolution, which brought us online marketplaces and e-commerce. These changes have already brought a huge disruption to traditional business and have laid the foundation for some incredibly successful companies, such as Amazon with its e-commerce platform.

With the rise of the social network and the introduction of mobile devices and smartphones, digitalization walked into private households and changed the way people get in contact with each other and exchange information (e.g., Facebook). Digitalization has had huge implications on the social life and behavior of the current generation, which expects to have information at their fingertips and whose buying behavior demonstrates the need for instant fulfillment. They use all types of information before buying a product and mix online shopping with physical visits to the store, and they discuss their experience with the product with online social communities. These changes have already had a huge impact on traditional companies and the way they develop, produce, and sell their products.

Market leaders in the digital industry—Google, Facebook, and Apple—are growing and extending their core market to fulfill the digital demand of the new generation. They are also developing new business models to try to conquer markets and industries outside their core business. This move of digital companies into new markets puts a large amount of pressure on traditional companies to change their way of doing business and to face the digital challengers.

In short, it is essential for all companies, traditional and nontraditional, to build a digital platform that possesses the capabilities to enable their digital transformation.

SAP started to evolve its core product SAP R/3 toward online capabilities with *mySAP.com* solutions that reflected the changing economy and customer behavior in the 2000s. More recently, SAP has developed SAP S/4HANA, a product that addresses digital transformation trends such as social media, big data, cloud solutions, mobile accessibility, and the Internet of Things (IoT).

This book fully introduces how SAP S/4HANA can address and support the digital transformation of your company. It covers all relevant aspects, from value scenarios to a full digital transformation roadmap. The authors use their experience from different industries and concrete examples of when and how to use SAP S/4HANA, in combination with line of business solutions from SAP to show you how to support your digital journey. In these pages, the authors provide you with practical information and project examples of how to approach the changes to your ERP landscape.

I hope that all readers of this book will deepen their understanding of the digital transformation and its implications on their ERP environment, as well as how SAP S/4HANA brings value to and supports this transformation journey. I also hope that every reader enjoys reading this book and that it opens new perspectives to the digital transformation and SAP S/4HANA.

Nancy Thomas
Managing Partner, Global Enterprise Applications, IBM Global Business Services

Foreword from Markus Schwarz

There can be no doubt that today's marketplace and the broader economy are driven by massive digital trends. Whether its big data, in-memory, mobility, cloud computing, or others, business leaders must develop strategies for succeeding in a digital world. Digital transformation is happening across all industries, in companies of all sizes, in every geography. New market entrants and new business models proliferate, offering incredible opportunities for all participants. Market leaders—and those who hope to become market leaders—must adapt.

Companies that look to digital transformation as an enabler instead of a disruption to normal business stand to gain market share, profit share, and mind share. Even the largest enterprises can benefit. After all, they frequently have the resources that start-ups can only dream of. Companies that are nimble, that have the ability to execute quickly, will win in the digital economy.

With SAP S/4HANA, we have delivered a truly next-generation ERP suite, built specifically for in-memory computing, that goes beyond simple transaction management to become a digital core. It allows you to operate your business in real time, with intelligence, interconnected throughout your company and broader ecosystem. You can now easily deploy new business models or explore interesting ventures, knowing that you have the flexibility of a simplified IT landscape.

No longer bound by legacy database constraints, you can deliver greater customer value faster than ever. Designed to operate in a world full of data, including IOT streams, SAP S/4HANA simplifies and contextualizes data, allowing you go from insight to action in a single step. As you can see, gathering data and understanding it are only half the battle. Taking smart action in real time, supported by prediction and simulation on complete data, will set your company apart.

Let me close with two customer examples. For one European mill products company, SAP S/4HANA enabled a transformation from legacy processes into new, flexible, high-speed, customer insight-driven processes. Another customer—this one a large Indian manufacturer—now has real-time visibility across its entire value chain, from planning to inventory, which allows the firm to optimize sales performance and customer service. Furthermore, this manufacturer plans to incorporate IOT data streams to support entirely new business models.

What does the digital future hold for you? I encourage you to explore the power of a digital core and run live today.

Markus Schwarz
Senior Vice President and General Manager of SAP S/4HANA SAP SE

Preface

Beginning with the introduction of PCs and the rise of the Internet, the digitalization of private households and companies continues to grow every day. The possibilities for companies to enhance their products or to build new business models are rising exponentially. Alongside those possibilities, we find customer expectations for better levels of customer service and customer centricity. This change needs to be reflected in your IT environment to support the flexibility and scalability required in this increasingly digital world.

As the leading global packaged application provider, SAP supports the changing demand of its customer base to provide a solution that can support the digitalization trends. With the introduction of the SAP HANA database in 2010, SAP provided the capability to use in-memory capabilities to accelerate its business application and to integrate transaction and reporting capabilities into a single database. With this first step, SAP provided the baseline technology for future architecture and decided in 2013 to use SAP HANA as the platform for all of its business applications. In addition to the changes on the platform level, there was a significant move toward the consumption of "as-a-service" models. This allowed companies to reduce their implementation and maintenance cost and increase productivity with cloud-based deployment options.

SAP's acquisition of other companies, for example, SuccessFactors and Hybris, has added the needed capabilities to build an end-to-end digital platform. To simplify the processes and to address the demand of a more user-centric solution, SAP introduced SAP Fiori as part of the overall platform. The combination of those changes and capabilities led to a renovation of SAP ERP toward a new product line called SAP S/4HANA Enterprise Management in 2015 and a new way of implementing SAP products: SAP Activate.

Why Read This Book?

With all the changes introduced in the past years and the innovations that are coming alongside those changes, there is a need for more detailed information on and experience with SAP S/4HANA. We know that there is detailed information available on certain aspects of SAP S/4HANA, but we believe that it only covers a subset of the overall information and that it only addresses a specific audience. With this book, we provide a comprehensive overview of the different aspects of SAP S/4HANA from industry, business, and technical perspectives.

We also share the experiences we've gathered in different client situations as well as the challenges and how to solve those with concrete examples. In addition, we've identified a need to prepare customers for the digital transformation and to provide them with the right setup from the strategic, organizational level down to the technical and operational level. With that, we aim to close the gap at the strategic level by discussing concrete best practices and how to apply them.

This overview should help new SAP clients as well as experienced SAP customers understand the different aspects and changes to their environment.

Audience

This book is geared toward CxOs, business owners, enterprise architects, and project managers who want to get a consolidated overview of the value from SAP S/4HANA and the related products supporting the digital transformation. We cover the industry perspective and the implications as well as the strategic imperative results of the industry transformation. Because of this scope, we believe the book is relevant for all SAP interested readers across all industries.

We also address all aspects and possibilities to help business teams understand the SAP S/4HANA functional capabilities (e.g., finance and

logistics) as well as how the value scenarios improve day-to-day work.

On the other side, we look at the technical platform, and the migration, upgrading, and deployment options that are useful for enterprise architects and project managers.

We want to encourage the readers of the book to take a closer look at the concepts we introduce and consider them in your future transformation and implementation projects.

Structure of the Book

This reference book on SAP S/4HANA provides you with both a complete overview and important details on each topic. The structure guides you from a strategical level to a practical level and covers all relevant aspects in each topic. This book also serves as a compendium so that you can pick up at a specific chapter and read through this chapter to get detailed information on a selected topic, as each chapter is complete in itself. However, we recommend that you start from the beginning and work through the book as some chapters refer to a previous chapter and build on each other.

In **Chapter 1** provides an overview of the digital transformation and introduces its main drivers from business and technical perspectives. Based on this, we set this information into the context of selected industries to provide you concrete examples on the impact and the changes that need to happen. We also provide an overview of the technical megatrends and a pace layer model for your application architecture.

Chapter 2 guides you through the history and evolution of SAP software. It also provides you with the fundamentals of SAP S/4HANA, including the different editions and deployment options. We provide you with an overview of business value scenarios and how they support the digital transformation. Within the value scenarios, you'll see concrete

optimization and savings potential. Everything is rounded up with a high-level overview of the SAP S/4HANA architecture and the principles behind SAP S/4HANA.

In **Chapter 3**, we introduce you to the pain points of a chief financial officer (CFO) based on IBM's CFO study. We introduce the key functionalities of SAP S/4HANA Finance and how they address the pain points identified previously. We provide a maturity assessment of the finance capabilities and a business case that is underpinned by best practices. Finally, this chapter provides you with an outlook on future capabilities that will be available with further releases.

We continue on the functional capabilities of SAP S/4HANA in **Chapter 4** and extend it toward the logistics (Materials Management and Operations) functions. Similar to Chapter 3, we provide you with an overview of the major pain points of the chief supply chain/operations officer (CSCO) study and how SAP S/4HANA addresses those pain points. We also discuss the key capabilities for logistics and the business case for when and where to use SAP S/4HANA. In addition, we cover a future outlook and upcoming innovations for Material Management and Operations functionality in SAP S/4HANA.

After we introduce you to SAP S/4HANA and its functional capabilities, we broaden your view in **Chapter 5** by introducing the extended functionality provided by the line of business (LoB) solutions outside the digital core (e.g., SAP SuccessFactors, SAP Ariba, and SAP Hybris) and how they integrate with SAP S/4HANA. Therefore, we provide you with a high-level overview of their functional capabilities and how these products complement each other.

In **Chapter 6**, we explain the details and the concept behind the SAP HANA platform and how it addresses the typical issues of an IT department and serves as the database for SAP S/4HANA. We get into the principles of the SAP HANA database concepts, scalability,

virtualization, and operations. These features are being extended by security and user experience (UX) to complete the architecture.

Based on fundamentals of the SAP HANA architecture, **Chapter 7** describes the extension possibilities of future SAP solutions and how SAP S/4HANA can be extended via in-app and side-by-side extensions. We also introduce you to the SAP HANA Cloud Platform and possibilities for Internet of Things (IoT) and cognitive computing as fundamental pieces of the digital value chain.

To complete the picture, **Chapter 8** presents the different deployment options from on-premise to cloud and possible hybrid scenarios. As the requirements for hybrid scenarios are increasing, we provide you with an overview of possible integration scenarios and capabilities.

Next, **Chapter 9** helps you get prepared from a technical perspective for a move to SAP S/4HANA and provides you with the relevant prerequisites. We discuss the different implementation options and approaches as well as the recommended housekeeping activities and relevant tools.

An essential part of a successful SAP S/4HANA implementation project is having the right approach and method. In **Chapter 10**, we explain the principles of the SAP Activate framework on the context of SAP S/4HANA and provide an overview of the available tools.

After we explain SAP S/4HANA and its benefits, architecture, principles, method, and tools, we leverage **Chapter 11** to demonstrate how you can build your own transformation roadmap. We also discuss what method and tools should be used to make the right decision.

In **Chapter 12**, we finally illustrate and prove the value of SAP S/4HANA with concrete cases that show what benefits can be achieved.

The conclusion in **Chapter 13** summarizes the lessons learned in this book and provides you with ideas on how to start your roadmap to SAP

S/4HANA.

Acknowledgments

As this book was a lot of work, you can imagine that it could not be accomplished by a small group. We the authors want to say "thank you" to all of the supporters who helped us complete this book successfully.

First, we want to thank our families for helping us find the time and the peace to write this book. However, we also want to thank our friends and colleagues who helped us get this done. Therefore, we want to express our gratitude to Carsten Steck, who kept everything together and provided significant support to the author team, and to Devraj Bardhan, who made significant contributions to this book. We also want to thank Frank Mebus, Thomas Weinhardt, and Dr. Anup K. Ghosh for reviewing this book and providing valuable feedback. In addition, we want to say thank you to the following contributors, who brought their valuable expertise to discussions and the completion of some chapters: Mike Beer, Bijoy Bhattacharya, Dr. Anup K. Ghosh, Jayanta Ghosh, Alfonso Martinez Gonzalez, Janusz Jarzemski, Tomas Krojzl, Nitsa Kukreja, Anton Kusters, Frank Mebus, K. J. Min, Shah Abdul Odud, Soumen Saha, Pradeep Santara, Andreas Scholl, Shivesh Sharma, and Dipanshu Roy.

We also want to say thank you to all of those who aren't mentioned by name but supported us in the book project.

And, last but not least, we really want to say thank you to Meagan White and Emily Nicholls from SAP PRESS, who had patience with our team and provided encouraging support.

Axel Baumgartl, **Dmitry Chaadaev**, **Nga-Sze Choi**, **Mark Dudgeon**, **Asidhara Lahiri**, **Bert Meijerink**, and **Andrew Worsley-Tonks**

The digital economy is here, and businesses will flourish or wither in this new battleground. Organizations must understand the economic and technical implications of this digital transformation. This chapter describes what digital transformation really means and how it's driving changes to current ERP solutions.

1   The Digital Transformation: An Introduction

Within the past 30 years, digitalization of the world has massively increased. Starting with the Internet and the ability to access all information digitally at our fingertips, digitalization continued to grow via the use of smartphones and social media, which connects us all on a global level and enables us to exchange information, interact, and stay connected. By 2020, an estimated 2.5 billion people will be connected on personal and business social networks worldwide. At the same time, an estimated 200 billion devices will be linked to each other on the Internet of Things (IoT).

For example, what started with smart watches to measure and track the success of your personal sporting activities has developed into a community where all data around your life are being measured, quantified, and digitally documented to build your personal health record. Another example is the smart home, where you can bring in different devices (e.g., smart thermometer, smart plugs, etc.) to control and monitor your home. These devices can be combined with data provided by weather data suppliers and enhancing services to control your home. This brings along a lot of data that can be used to extend or enhance current services to the consumer or even build new business models.

On the other side, huge growth has occurred in the automatization of the manufacturing industry. According to the International Federation of Robotics (IFR), the demand for industrial robots increased by 48% from 2010 to 2014 and has increased exponentially over the past two years. In short, digitalization is everywhere, from the personal to the global economy.

In this chapter, we'll discuss exactly what the digital transformation is and what it means for you or your industry. We'll then take a closer look at digital transformation from both a business and technical perspective.

1.1   Defining the Digital Transformation

First, let's begin with some recent history of how the digital transformation started and how it's now maturing and influencing different business areas. Figure 1.1 shows an evolution of the digitalization that started with the digitalization of single products in the 1980s and has now matured toward building completely new business models.
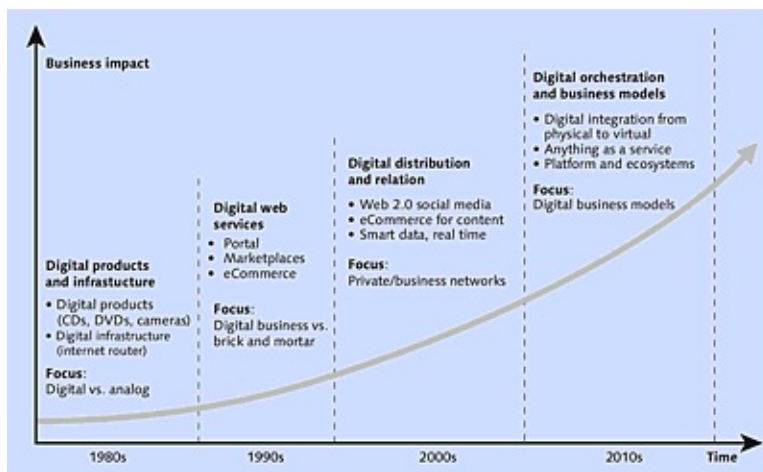

Figure 1.1   Phases of the Digitalization from Products to Business Models

Those new business models include companies such as Amazon for commerce, Facebook for social media, and Uber/BlaBlaCar connecting different services and building collaborative networks.

Does this mean that traditional companies will no longer exist or are being taken over by the new challengers? For example, Google is aggressively going into the mobility space and engaging with autonomous cars. At the same time, German automotive producers BMW, Daimler, and Audi jointly acquired Nokia HERE to extend their capabilities toward supported and autonomous driving. We see that, while there is the potential for traditional companies to lose market shares to new challengers, there is also a huge potential for them to extend their current market or market segments.

This shows one way in which traditional business models are being challenged. The digital transformation is driving existing businesses to accelerate their speed and leverage the digital potential. While many of the traditional chief experience officers (CxOs) see the digital transformation as a short-term topic that needs to realize benefits on a quarterly basis, we believe it's a continuous adoption process that goes beyond the here and now.

Equally, if it's a short- or long-term adoption process, all these changes have an implication on the way companies will run their businesses in the future and how they need to adapt. This subsequently has implications to their enterprise resource planning (ERP) capabilities that will support companies in building their digital platform core as a foundation to gain value out of the digital transformation journey.

Returning to the question of what we mean by the phrase "digital transformation," we can see that it has different implications for different people, such as the following:

- For some, it's about technology as an enabler.

- For others, digital is a new way of engaging with customers.

- For still others, it represents an entirely new way of doing business and defining new business models.

The digital transformation could actually be all of these and more. As we have different stakeholders within organizations, we have different interests and views on the same topic. In terms of how the digital transformation is influencing industries, companies, and consumers, we can define the term digital transformation as follows:

> *The digital transformation is the way in which businesses are being impacted by leveraging new technologies (e.g., cloud computing or process automation via robots) and how this affects the overall organization of a business. It's about hyperconnectivity and the utilization and interpration of new data that are available to provide better insight and generate predictable results to reimagine business models from procurement to sales and services and to improve the entire value chain.*

Based on that definition, what are the fundamental pieces of the digital transformation? To answer this question, we'll spend the rest of this chapter looking at it from two perspectives: a business point of view and a technology point of view. We should note that both views are tightly integrated, and the importance of technology is increasing in the age of the digital innovation. In his book, *Business @ the Speed of Thought: Succeeding in the Digital Economy* (Warner Books, 1999), Bill Gates said the following:

> *Information technology and business are becoming inextricably interwoven. I don't think anybody can talk meaningfully about one without talking about the other.*

While digital transformation has different meanings to different people, we still see a common agreement that technology is seen as an enabler and a game changer for chief executive officers (CEOs) based on the latest IBM Institute for Business Value study in 2016, as illustrated in Figure 1.2. This is a significant shift from even five years ago, as CEOs put technology as the top priority of the external forces driving their enterprise starting in 2012.
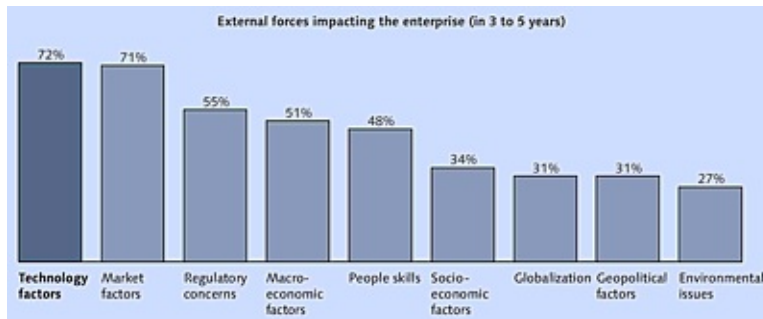
Figure 1.2 External Forces Impacting the Enterprise

> **Note**
>
> The results of the IBM Institute study will be discussed in detail at the start of Chapter 3 and Chapter 4.

It's clear that, due to the digital transformation, the business model is influenced by technology and has implications to the business strategy. This also made a change in the influence of the chief information officer (CIO) and the CIO organization, as they have to transform from a pure service provider to the innovation driver of a company.

This requires transformation from a reactive mode into a more proactive mode to support an organizational, platform, and skills shift. As the new role of the CIO organization is to envision possible business for the company to lead and extend their current business model by harvesting existing data and providing better customer insights, building the right platform to transform into a customer-centric organization is essential.

1.2 Digital Transformation: A Business Perspective

Based on the studies "Customer Activated Enterprise" and "Redefining Boundaries" by the IBM Institute for Business Value, the following are the key challenges that drive the CxO agenda:

- **Technology**
  Technology is used as an enabler across the different industries and domains to extend and enhance existing businesses or to build up new business models.

- **Market factors**
  Globalization strategies and expansion into new markets are the key market factors. Cross-industry collaboration building new business models or even changing buyer behavior comes alongside the digital transformation.

- **Digitally enabled supply chain**
  The IoT is used to get more transparency alongside the full supply chain. Manufacturers need a tighter integration into the sales and commerce solutions to optimize more frequently and to produce customized products at a higher velocity.

- **Organizational openness**
  End-to-end integration of suppliers and buyers extends existing business networks toward collaborative networks.

- **Customer centricity**
  Digital behavior and footprint are used to meet increasing customer demand for personalized offerings, products, and services based on the customer experience and the customer profile.

- **People skills**
  Within a digital world, the retention of talent is getting more and more important as the business is changing. People need relations, communication, flexible worktime, and education; lack of these will lead

to intense emotional and economical costs and ultimately loss of the digital specialists to other companies.

- **Integration of touchpoints**
  The aggregation of information alongside a more and more customer-centric world needs better customer insights, which require an integration of different channels and data.

- **Business model innovation**
  The drive toward acquisitions and divestures is getting stronger to leverage cross-industry capabilities and extend or enhance core products capabilities.

All of the CxO challenges are influenced by technology megatrends that have an impact on future business models and the way companies need to transform. A *megatrend* has a significant impact on how people live their lives or conduct business (e.g., social media changed the behavior of a generation). Figure 1.3 shows a list of the current megatrends. Following are the top priorities of those megatrends for the next three to five years:

- Cloud computing and services

- Mobile solutions and user experience

- IoT and big data

- Data insights and cognitive computing

We'll provide you with a more detailed overview on the technology megatrends in Section 1.3, which should allow you to get a better understanding of the individual megatrends and why they lead to a digital disruption.
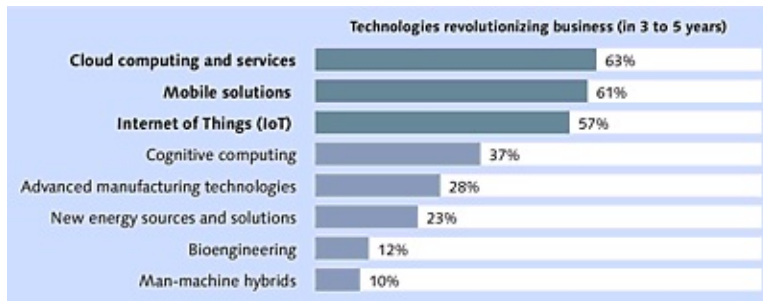
Figure 1.3 Technologies That CxOs Expect to Revolutionize Business of Tomorrow

While each of these technology megatrends has a huge impact on the digital transformation, the combination of an integrated solution will have the biggest impact to the business.

Now that we've looked at the challenges and drivers of the digital transformation, let's take a closer look on the adoption of the digital transformation for the different industries.

As you can see in Figure 1.4, based on the studies available, the high-tech industry, unsurprisingly, is leading in the adoption of digital business, based on their origin and the tight connectivity of their business and digitalization. This is followed by banking and retail, which, while not as close to the leading edge as the high-tech industry, is still part of the group deriving real value out of the digital transformation.

On the bottom right of Figure 1.4 are industries that are unsure of the value of digital and innovations and are more conservative in their investments. They understand the need for a unified vision and governance but are more skeptical. Insurance companies are leading this quadrant.

On the top-left corner are the companies that already gained certain digital experience but don't have a clear governance and strategy in place; they are lacking a unified vision on how to gain value out of it. This quadrant is led by the telecommunication industry.

At the very end of the digital adoption, on the lower left corner, you find the beginners of the digital transformation. They are traditionally very

strong in their existing ERP or IT strategy. Unaware of the digital benefits and opportunities, they have started some smaller investments without a clear vision or transformation governance.
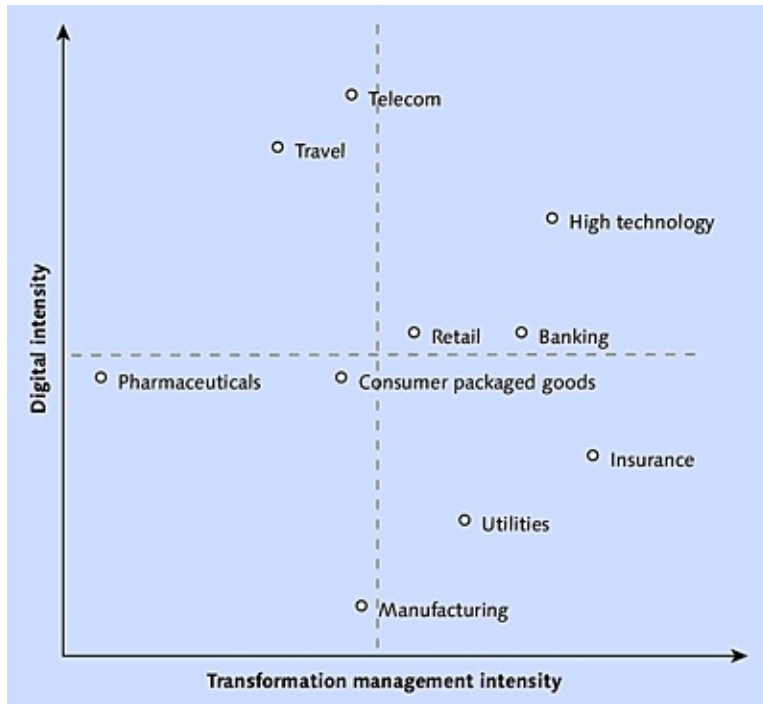
Figure 1.4   Digital Maturity of the Different Industries

Next, let's take a closer look at selected industries to get a better understanding of the context and the challenges described earlier. As we've already pointed out, banking is deriving real value out of the digital adoption, but why is banking one of the top digital adopters?

As you can see in Figure 1.5, as millennials are now of an age to become banking customers, two thirds of banking customers are connected to the digital world and are looking to take advantage of all the digital offerings available on the market. They aren't willing to wait for a change of their existing banks. This puts pressure on banks and creates a demand and expectation for a customer-tailored experience.

Figure 1.5 Percentage of Customers Who Switched Their Financial Service Provider within the Past 12 Months

With the rise of so-called *FinTech* (financial technology) companies, the slow and inefficient process of existing banks is being unmasked and leading to new business models. Right now, only 20–40% of retail banking processes are digitized. For example, taking out a 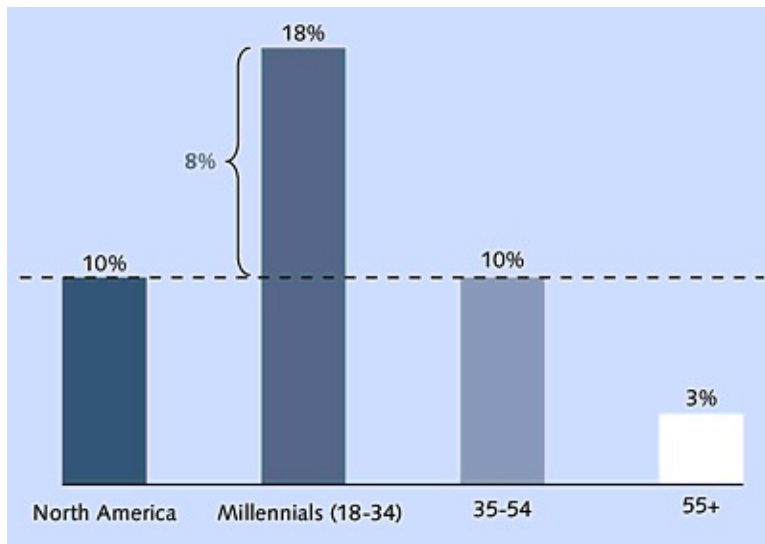loan has been a long and cumbersome process in traditional retail banking. Now it's possible to get a credit approval within minutes via your smartphone or your computer.

Another major challenge facing banking companies is the emergence of cross-industry businesses. Every retailer offers financing options to their clients that can be approved while they are shopping in real time. It's possible to withdraw money from the local supermarket or the gas station without any additional fee. In the future, retail banking will be forced to provide complementary financial services alongside the value chain of retailers or manufacturing companies.

As a result, banks are accelerating the adoption of new technologies as they realize the need to reinvent their business to increase the ease of service consumption and improve services to their customers.

Thus, there is not only a risk connected to the digitalization but also an opportunity that many banks have recognized. As soon as they provide a digital offering that helps customers and enhances their buying or service experience, clients will adopt those very quickly.

The potential value that banks can achieve from the digitalization of their business is twofold:

- Cost optimization comes from streamlining the current processes and cutting down on sales costs via digital channels and improving time to market for selected products (e.g., loans, payments, credit cards) in addition to service automatization of the fulfillment processes via workflow and self-services. A concrete example for this was Bank of America, which saved between 40% and 90% of internal costs via service optimization.

- Revenue increase and demand generation can be achieved with a better target segmentation with digital marketing and mobile or online sales offerings, leveraging technology as an enabler to extend the sales channels. For example, cashless payments or digital wallets enable banks to address new customer segments.

In summary, retail banks can access many opportunities and generate much value by digitalizing their business.

To compare the maturity of the different industries with regards to digitalization, let's now take a look at the insurance industry. First, keep in mind that insurance companies falls in the same category as retail banks. Traditionally, the insurer had very limited contact with its customer, and, as with banks, the products were very difficult to understand.

This is changing with the digitalization of the insurance industry, as now the insurer has a direct connection with the customer because they are using new direct sales channels instead of going through an agent or broker. In addition, as with banking, the customers have high expectations for the availability of digital interaction with the insurer.

Based on the market research of Bain & Company, 79% would use digital channels to interact with their insurer within the next five years if available. However, as shown in Figure 1.6, customer satisfaction lags behind.
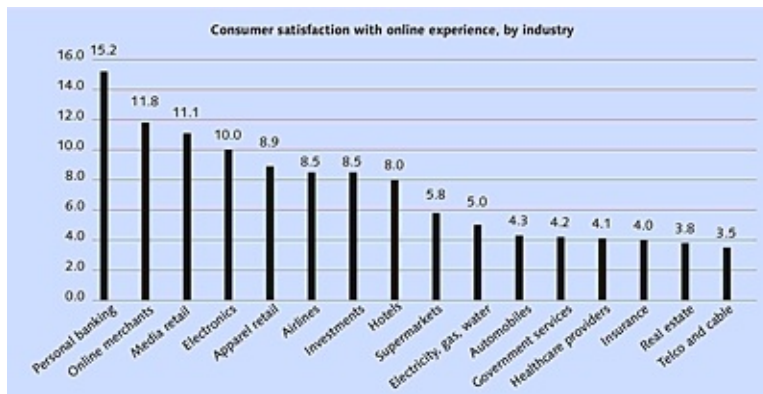

Figure 1.6 Consumer Satisfaction with Online Experience by Industry

Like banking, insurance companies are being attacked by digital natives, the so-called *InsurTech* companies, which were born on the back of digitalization and are fully leveraging the possibilities of existing technologies to disrupt the traditional insurance business. For example, Esurance, founded in 1999, specializes in direct sales and had revenue of more than 1 billion USD in 2011 when they were bought by Allstate, and a revenue of 1.5 billion USD in 2015.

Following are the values insurers can gain from moving toward digitalization:

- Optimize cost with automated back office process such as claims management.
- Improve speed and time to market for underwriting.
- Predict and prevent damages and costs by leveraging connected and geo-location data.
- Include advanced analytics in the decision-making processes, and improve risk evaluation based on sensors, devices, and social media.
- Increase revenue with extension of the value chain to supplier

networks.

- Leverage social and digital marketing for demand generation, and extend sales channels with a 24x7 digital experience.

- Increase customer experience and insight to leverage aggregated data and enhance the omni-channel experience.

Looking at these two industries, companies need to ask what they need to do, from a business perspective, to drive forward the digital transformation and ensure that there is a real benefit from their investments. In short, companies have to ask themselves the following:

- Do we have a clear digital strategy?

- What capabilities are needed based on our digital strategy?

- Where can we boost our existing business model with digital?

- From which industries can we be disrupted? Are there other industries that break into our current business?

- What can we forecast? Are there any trends that could have an implication on our current business?

- Can we adopt from the industry as a fast follower and adopt the first mover strategy from others?

These are the initial questions businesses need to answer to drive forward their digital transformation with the following objectives:

- Creating value with better customer insight and customer experience based on aggregating different sources of information and tailoring personalized offerings

- Extending the business and getting into new markets by leveraging all channels that are digitally enabled by the newest technologies

- Enhancing current products with digital services or information

- Improving time to market with new products by digitalization and

automatization to increase efficiency and effectiveness

- Building up core capabilities on the business and technology level to support the digital transformation

Now that we've looked at the business drivers and challenges for a few different industries and what needs to be done to come up with the right strategy around the digital transformation, let's now connect the challenge, business drivers, applications, and technology to see how everything fits together.

1.3 Digital Transformation: A Technical Perspective

As highlighted in the previous section, technology is an enabler for new business models and has a significant influence on the way companies can adjust or need to adjust their strategy. In the upcoming sections, we'll discuss the details behind the following technical megatrends that will have the biggest impact on business: cloud computing and services, mobile solutions and user experience (UX), Internet of Things (IoT) and big data, and data insights and cognitive computing.

1.3.1 Cloud Computing and Services

Cloud computing accelerates time to value, drives higher adoption of new technologies, and connects value chains in real time. While this has relevance to all CxOs, it's especially relevant to chief marketing officers (CMOs) who rely on accelerated time to value in this digital age. Per IBM in *The Power of Cloud*, "Cloud has the power to fundamentally shift competitive landscapes by providing a new platform for creating and delivering business value."

Organizations need to evaluate exactly which delivery models will help them innovate faster in today's digital economy. Most organizations already operate in a hybrid world where cloud technologies interact with on-premise apps. Most innovations are delivered as cloud apps, and the value is proven. With faster time to value, capabilities available in the network, and the rise in adoption, analysts such as Gartner have embraced this view and have used the expression "postmodern ERP" to define an alternative approach and the adoption of hybrid-ERP application architectures. Four key cloud models (see Figure 1.7) are relevant for customers:

- **Infrastructure-as-a-service (IaaS)**
  IaaS is an enterprise class optimized infrastructure built using opens standards. Businesses are leveraging IaaS (e.g., IBM SoftLayer) to get

up and running in a matter of hours without spending significant capital expense.

- **Platform-as-a-service (PaaS)**
PaaS provides an entire computing platform in the cloud, including hardware, software, and open application programming interfaces (APIs) to build new businesses and create new solutions. Examples include Apple, SAP HANA Cloud Platform, and IBM BlueMix, with their range of APIs and services that will also be a disruptive platform for business. Another model of PaaS is managed PaaS for enterprise applications, where customers move their on-premise platform to a public or private cloud (e.g., SAP HANA Enterprise Cloud, IBM C4SAP).

- **Software-as-a-service (SaaS)**
SaaS is a mature trend, with offerings such as SAP Ariba providing solutions via the cloud. SAP is currently the leader in this area, with 80 million+ users leveraging SaaS. With SaaS growing more than 20%, we see more apps moving into the cloud. While this is dominated by customer relationship management, procurement, and human resources solutions (think SAP SuccessFactors), other solutions such as SAP ERP are also moving into the cloud.

- **Business-process-as-a-service (BPaaS)**
BPaaS enables business transformation. An example is outsourcing commodity business processes (e.g., payroll, expense payments) to a commercial "as a service" pricing model.
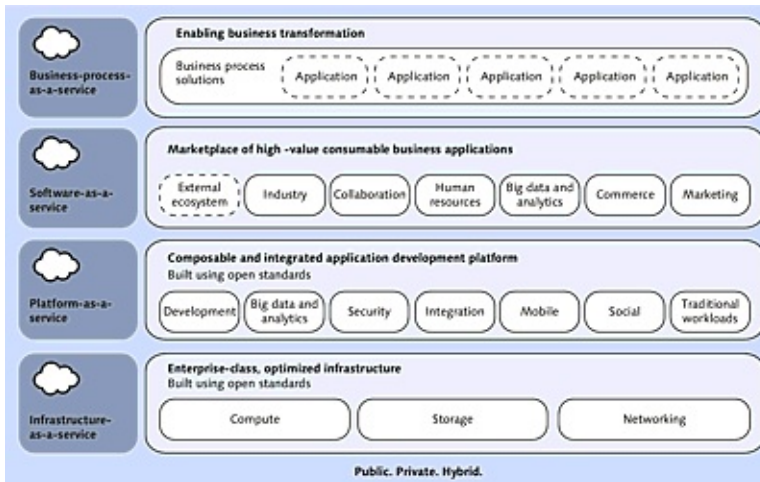
Figure 1.7 Overview of the Four Cloud Models

1.3.2 Mobile Solutions and User Experience

In the digital era, being mobile first and providing a first-class user experience are essential technology components. The chief value of mobility for the CMO is having a readily available, personal channel available for customers. However, they also need to provide a consistent user experience across all channels their customers use (e.g., in store, browser, mobile).

When consumers check out a vendor's offerings, they expect to search for products, read reviews, and experience standard pricing, whether they are shopping from their smartphone or laptop, by telephone, or in a brick-and-mortar store. Their purchase decisions and brand loyalty are heavily dependent on a positive buying experience. Businesses must now deliver an omni-channel experience through the customer journey.

As already mentioned in Section 1.2, in the context of banking and insurance clients, a first-class user experience, including design, individualization, and availability, is of paramount importance and has become the minimum expectation today. The latest IBM CIO survey found that good mobile apps are a driver for the digital transformation because they can improve user productivity from 10 – 45%. This is why

design thinking is an essential part of today's digital transformation strategies. Design thinking is an effective way to structure complex tasks into an integrated method that takes both people and the collaboration between teams into account to generate extraordinary results. It also uses a six-phase iterative innovation process that considers the place as a factor to increase collaboration and effectiveness. The interaction with the end user and the usability and effectiveness play especially important roles in the adoption of a mobile solution.

1.3.3   Internet of Things and Big Data

While big data, including extended sources of data beyond traditional systems of record (e.g., social media, IoT), is emerging as a key technology trend, it is analytics and cognitive capabilities to enable data insights that add the business value, that is, innovative insight directly answering business and industry pain points.

One of the major blocks of big data is the mining and interpretation of social business data to understand the individual, deepen relationships and connect, communicate and share information across structured and nonstructured data from a variety of resources. In today's digital age, feedback (positive or negative) on a customer's product is essential information to provide the business with more insight.

With the use of collaborative networks and the increasing amount of private data such as that from smartphones or industrial implements (e.g., sensors and robots), we're on the threshold of a massive explosion of connected devices. As identified by IBM research, 88% of the IoT data produced in 2015 was unused. If you consider the potential that remains uncovered and the possibilities for new business, there is huge demand for change.

IoT digitizes our world, providing us with prolific amounts of data and new delivery models that allow business to engage in new value creation. For

example, it gives companies the possibility to extend the current business model by doing the following:

- Unlocking new revenue from existing products/services

- Inspiring new working practices or processes

- Changing or creating new business models or strategies

Studies from the research company Economist Group (Economist Intelligence Unit) indicate that 62% of CxOs believe that companies which are too slow to integrate IoT as part of their digital transformation will fall behind the competition.

For organizations across industries, IoT will become one of the biggest, richest sources of data. The IoT is also the vehicle for delivering cognitive capabilities in products, services, and processes. Due to security, regulations, cost, or simply speed, a large portion of IoT data processing needs to happen at the edge, where data are created and where human interaction occurs.

However, IoT presents a data processing challenge. If we want to accomplish transformational outcomes, we can't continue to ignore IoT data at the network's edge. There is massive opportunity to be had, but the IoT also presents a significant data challenge as the scale, complexity, and diversity of IoT data threatens to overwhelm traditional computing systems.

Traditional programmable systems are designed to handle specific scenarios and data sets. Nevertheless, IoT data doesn't play by traditional rules. Images, videos, sounds, and machine-to-machine data all come together through the IoT. These data are then combined with data sources such as social media, weather reports, and enterprise data, which provide additional context and relevancy that sharpens the value of insights.

To the earlier point, it's not the individual technologies that make the difference, it's the confluence of these different technologies that holds the greatest promise and delivers the biggest value. This is especially the case with IoT and cognitive computing, discussed in the next section.

1.3.4   Data Insights and Cognitive Computing

While big data, and particularly the insights into data it can provide, is one aspect of technology enablers on the CMO agenda, cognitive computing is another emerging technology. Cognitive computing is enabling companies to rethink the role of nonhuman channels by allowing all channels to be "human-like" and even tailored to individual customers' desires. For example, cognitive computing can guide people through complex decisions, such as choosing tax-efficient investments, using natural language to learn about and advise the customer, all while considering an exhaustive set of options. For large companies, this can drive significant cost benefits while actually improving customer satisfaction. Following are possible scenarios and capabilities provided by cognitive computing:

- Understand unstructured data through sensing and interaction
- Reason about data by generating hypotheses, considering arguments, and reviewing recommendations
- Learn from training by experts, from every interaction, and from continually ingesting data
- Understand, learn from, and reason through data to reshape an organization's industry

Cognitive computing-enabled processes are key to unlocking the value of big data and provide additional information that helps to automate processes or make informed decisions. In the area of analytics, we also see the move from traditional descriptive and diagnostic analytics (describes what happened and why it happened) to predictive (describes

what will happen) and cognitive analytics (describes what should be done and how you can make it happen). Cognitive computing can help make sense from the explosion of data created by the Internet of Everything (IoE), meaning that all different information sources, such as devices, sensors, smartphones, and so on, are being considered and used to extract valuable insights.

The most exciting thing about cognitive technology is that it may forever shift the conversation from asking what the answer is to asking what the possibilities are. In the digital era, this is where the true competitive advantage first takes root.

Figure 1.8 illustrates the CxO challenges, the digital transformation drivers, and the changing SAP ERP landscape, with SAP S/4HANA at the core. What are the dependencies these elements and how is the digital transformation influencing the core ERP solutions?
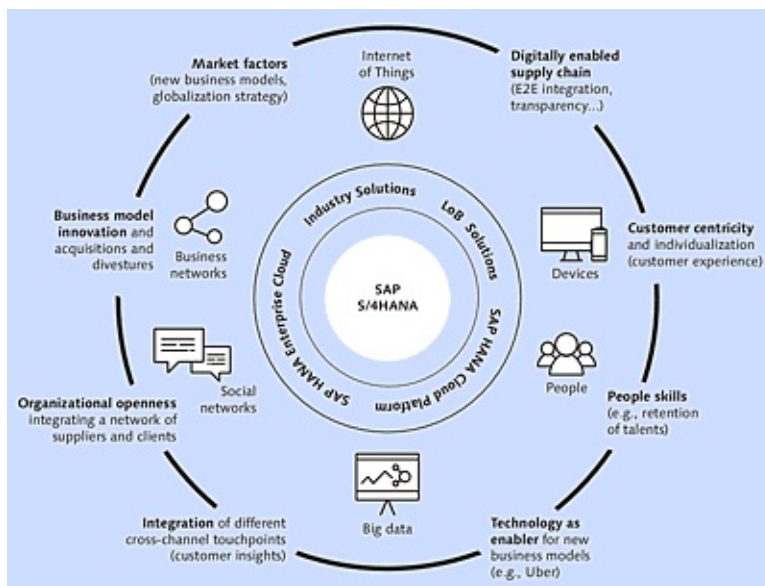

Figure 1.8   Digital Transformation: Challengers, Drivers, and Enablers

A digital transformation program from a technical perspective shouldn't be a one-time or "Big Bang" approach. It should be focused on selected areas and provide companies with the right capabilities to gain the biggest value out of their investment. As you saw in Section 1.2, the

insurance industry wants to cut down the operations costs while improving customer interactions and customer insights.

Before we get into the details, you must first understand the pace layered model. The pace layered model classifies applications into different layers based on their demand for change, ranging from the more stable system of records to the system of innovation that needs much more change and flexibility to meet today's demand.

Table 1.1 shows the main building blocks of an insurance business based on the classification from Gartner in 2011 and the pace layered model. The pace layered model should reflect the classification of applications and their need to change or adapt over time. There are layers that could be useful for a longer period with no adjustments, but you also have layers that require frequent change to adopt the business demand. The applications themselves can be assigned to different layers based on the customer strategy or industry.

System of Innovation (Front Office)	System of Differentiation (Middle Office)	System of Record (Back Office)
- Sales - Service - Marketing - Underwriting - Commissions - Planning and forecasting - Treasury	- Policy management - Billing - Reinsurance - Claims and fraud - Payments - Financial reporting	- Finance - Planning - Procurement - People - Investment - Real estate

Table 1.1 Overview of the Building Blocks of an Insurance Company

The first layer is the *system of record*, which is mainly being driven by the industry-independent processes or shared services functionality ranging from financial accounting, collection and disbursement via human resource management, or legal. It reflects the core building processes for an organization and leverages existing system functionality with very limited customization because it also reflects cross-industry processes that don't need special adjustments.

The second layer is the *system of differentiation*, which is aimed toward customer- or industry-specific processes or capabilities. Here, it's important that the processes can be different and bring added value or a differentiation advantage. For an insurance company, the differentiation is around product development, policy management, or claims and payments, which require a very high level of configuration capabilities.

The third building block is the *system of innovation*, which aims to support frequent changes and flexibility required to adjust and to change to new business models. In the insurance industry, these are the more customer-centric solutions for sales, services, and marketing, as well as simplification/automation of the underwriting process to keep pace with the digital transformation demand. This block is the most important because it supports companies in their efforts to keep up the pace in the digital age.

If you're looking at the drivers and challenges of the digital transformation and the pace layered model, you can assign the applications to the different layers based on their requirements and need to change. As stated earlier, we recommend a two-phased or three-phased approach for an insurance company to support critical business functions that don't need to adjust and maintain the current operation model, while focusing on the applications that need to support faster change and adoption, especially toward the customer. This approach minimizes the risk but still helps insurers prepare themselves for new business.

1.4   Summary

In this chapter, we gave you a brief overview of digital transformation and its implications on selected industries. We also described the technology megatrends and the different application layers.

After covering the pace layered model, we can build the baseline to understand the different implications and changes the digital transformation has on an application architecture strategy and the dependencies on ERP systems. As outlined in Section 1.2, it's important to understand *where to act*, but it's also important to understand *how fast you need to act*, which is reflected within the pace layered model. Based on that, in the next chapter, we'll outline a possible SAP ERP technology road map that fulfills the business requirements, and we'll underpin the road map with possible scenarios for the previously selected industries. So now that you understand the role of the digital transformation, let's take a closer look at how SAP S/4HANA fulfills the digital transformation agenda.

The digital transformation is influencing business and is demanding a pace layer model. This chapter focuses on how to keep pace with changing requirements and what value SAP S/4HANA brings.

2 SAP S/4HANA and the Digital Enterprise

As you learned in Chapter 1, the digital transformation is influencing the way business is conducted and causing companies either to build new business models based on existing products or to create completely new business models. In this chapter, we'll give you an overview of the history of SAP and why the SAP S/4HANA product line is being developed. We'll also describe the SAP S/4HANA editions to give you a better understanding of their capabilities. In addition, we'll discuss some business scenarios that help you understand the value of SAP S/4HANA and how it's different from your current enterprise resource planning (ERP) solution. We'll end the chapter by briefly discussing the architecture of SAP S/4HANA (for a more in-depth look at the architecture, see Chapter 6).

2.1 Evolution of Enterprise Resource Planning Solutions

SAP has a long history in providing ERP solutions to fulfill customer requirements. With the changing requirements and the new technical capabilities of the digital transformation, SAP decided to build SAP S/4HANA to fulfill current and future customer requirements. Although the current version is well established and is being used by most of the multinational companies around the world, the previous technological limitations no longer exist, which enabled SAP to redesign/optimize SAP

ERP by building a product that fulfills the twenty-first century requirements and serves as a platform for a company's digital transformation. Figure 2.1 shows the evolution of the SAP ERP solutions over the years.

Based on Figure 2.1, let's drill a little bit deeper to get a more detailed view of the evolution toward SAP S/4HANA Enterprise Management and the current product lines before we discuss the business value scenarios.
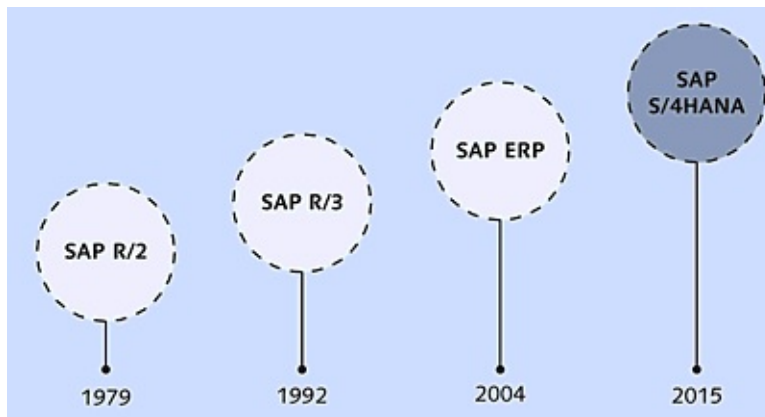

Figure 2.1 The Evolution of SAP Products from SAP R/2 to SAP S/4HANA

In Figure 2.2, we start with SAP R/3 Enterprise 4.7 Extension Set 2.0, which was available on any database and ran on SAP NetWeaver. This led to the development of mySAP ERP 2004 with SAP ECC 5.0 to reflect the Internet boom and extend further capabilities for business-to-business and business-to-marketplace opportunities. Up to SAP ERP 6.0 EHP 8, SAP's software was available for any database, but if you want to use its new functional capabilities such as SAP S/4HANA Finance 1.0, you must run your solution on the SAP HANA database. The digital platform that is available with SAP S/4HANA Enterprise Management is built as a completely new product and provides the core for the digital transformation requirements from different industries.
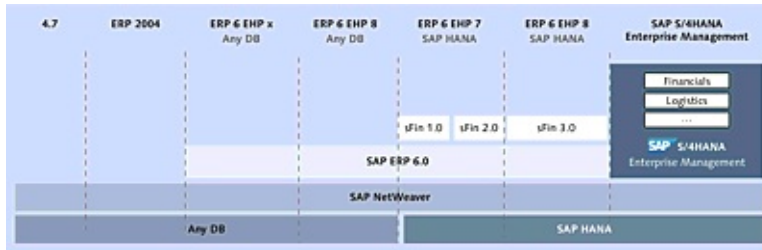
Figure 2.2   Detailed View of the Evolution to SAP S/4HANA Enterprise Management

Because SAP S/4HANA is a separate new product line that is being developed aside from the traditional SAP Business Suite and SAP ERP product line. However, the SAP Business Suite product lines will be available to the customer until 2025, when SAP Business Suite's standard maintenance will end. SAP S/4HANA has additional editions with different functionalities.

As you can see in , there are two different developments with separate code lines that supply the different product lines. Currently, classic SAP ERP can run on any database, including SAP HANA, and that supports the current functionality with some smaller functional enhancements and stabilization. As a second option, you can have classic SAP ERP as an on-premise solution that is enhanced with new financials functionality based on the newly developed SAP S/4HANA core solution. In addition, SAP S/4HANA Enterprise Management (often referred to as the "on-premise edition" for clarity) is a major part of the SAP S/4HANA product line and includes all the new functions. As the last piece of the product line, you can see SAP S/4HANA Cloud, which is 100% based on the new product and code line.
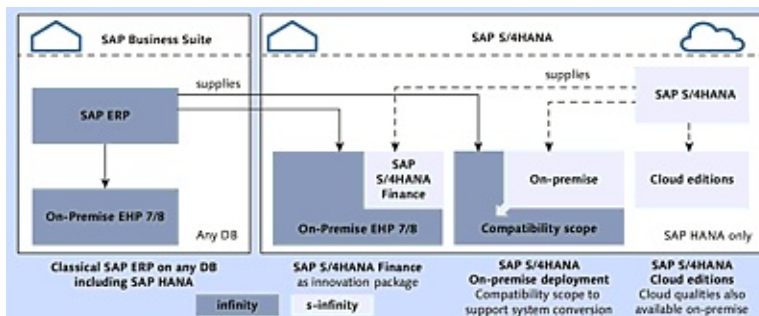
Figure 2.3   Overview of SAP Product Lines and Editions

SAP currently has a "cloud first" strategy; because cloud solutions can be innovated and delivered faster, new functionality is usually available first in the cloud and then for the on-premise deployment options. To get a sneak peek at the next available functionality for your on-premise implementation, you can rely on the functionality provided with the cloud edition. As shown in Figure 2.4, SAP S/4HANA, on-premise edition, is built and provided on a yearly cycle with new functionality, whereas SAP S/4HANA Cloud is being built on a quarterly cycle with the latest functionality and content. Let's take a closer look on the functionality that is included based and the available deployment options.
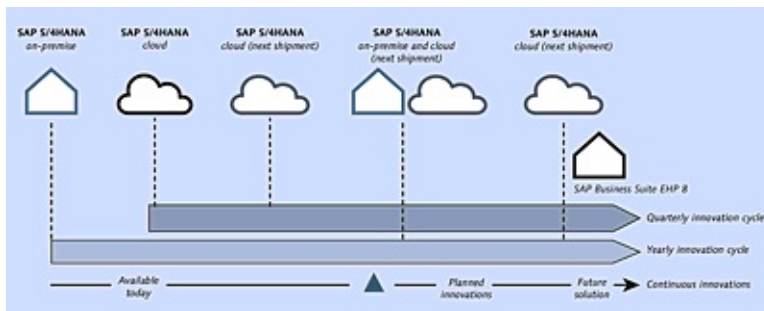
Figure 2.4   Release Cycle of the Different Editions

As shown in Figure 2.5, the different editions serve different purposes and have variations in their functional scope. Deployed on-premise, SAP S/4HANA covers the same functionality as the SAP Business Suite with additional simplifications in the areas of financials and logistics, as well as integration into existing line of business solutions (LoB) such as SAP SuccessFactors.

Figure 2.5 Overview of the Functionality Provided with the Different Editions

SAP S/4HANA Cloud covers different business scenarios; for example, with the professional services edition, it covers the requirements of a services organization such as baseline functionality for finance, controlling, procurement, sales, production, maintenance, and project management. Similar to this, SAP S/4HANA Marketing Cloud is aimed at serving marketers with core baseline functionality. SAP S/4HANA Enterprise Management Cloud, on the other hand, covers the full SAP ERP functionality.

All the key innovations to enable the digital transformation are shown in and described in the following list:

- **Procure to pay**
  This process is simplified and standardized to reduce purchase order errors and the related costs via an integrated process flow and simplified user interfaces (UIs). For example, in the sourcing and procurement area, the supplier information and master data with classification and segmentation logically groups expenditures to organize spending, responsibilities, and organizations. In addition, the supplier evaluation has been enhanced with SAP Fiori to classify suppliers using attributes and mater data.

- **Sourcing and contract management**
  Operational contract management has been simplified by consolidating all activities and tasks into a single SAP Fiori app and providing additional information to monitor contracts and improve efficiency with insights to action capabilities (e.g., the renewal of a contract).

- **Operational procurement**
  Several simplifications have occurred by consolidating information into a single SAP Fiori app for requirement processing and purchase order processing via enhancements for purchase order requisition, simplification and enhancements for self-service requisitioning, and procurement analytics. While the simplification leads to a reduction in

processing and provides further SAP Fiori capabilities (e.g., grouping and filtering), the enhancements in the purchase order collaboration include a standard integration into the SAP Ariba Network (e.g., sending purchaser orders, order confirmations, etc.) to reduce invoicing costs and double work efforts within procurement and the supply chain. In the procurements analytics area, efficiency has been highly increased with role-based access to the procurement information to analyze purchasing spend and contracts in real time via an SAP Fiori app that decreases reporting efforts and provides transparency.

- **Invoice and payables management**
  Simplified invoice processing is now available via an SAP Fiori app to accelerate processing of supplier invoices and integrating into SAP Ariba networks for invoice collaboration.

- **Inventory management**
  A new data model and role-based SAP Fiori apps for the inventory manager and warehouse clerk enable real-time processing of inventory postings and visibility of inventory values. This will reduce the overall inventory costs with a single source of truth, increase inventory turnover, and improve on-time delivery.

- **Material valuation**
  Material valuation addresses the challenges around locking bottlenecks, lack of standard price postings, limited insights to actual cost, and multiple material valuation tables. With the visibility into actual inventory costs due to a simplified table structure (2 document tables and 26 aggregate tables are replaced with a single document table), it becomes easier to control and change inventory settings. Inventory postings are processed in real time, and there is visibility into inventory values (instead of batch processing). Due to a single material valuation table, you also have better visibility into actual inventory costs, and you can run on-the-fly analytics on the primary data.

- **Material requirements planning (MRP)**

  MRP is based only on the actual stock requirement list with integrated decision support. It executes the impact analysis of the entire material flow in real time and identifies disruptions in the material flow to support proactive decision making. The performance is faster and reduces the MRP run time to minutes, which allows swifter assembly/production process adjustments.

- **Available-to-promise (ATP)**

  With real-time product availability check and use case-driven product allocation check, ATP reduces manual effort and increases the amount of orders per employee.

- **Order management and billing**

  This process is now being enhanced with the continuously monitoring capability of end-to-end order-to-cash processes and a personalized sales order cockpit to provide transparency on planned and unplanned logistic events.

- **Universal Journal and Central Finance**

  The Universal Journal combines FI and Controlling (CO) data to provide consistency and on-the-fly aggregation of data and real-time insights into the financial results.
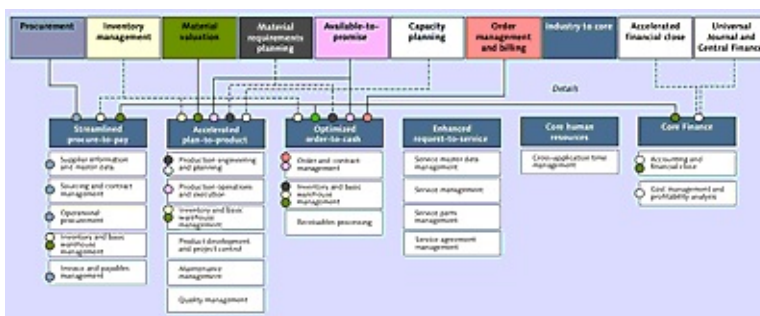

Figure 2.6   Key Innovations to Enable the Digital Transformation

Now that you've seen a high-level overview of the key innovations provided with SAP S/4HANA, let's look at SAP S/4HANA Enterprise

Management and see how it supports companies with their digital transformation.

As shown in Figure 2.7, SAP S/4HANA provides a digital platform to support the demands of a digital transformation. This is mainly based on the redesign of the solution that leverages the capabilities of SAP HANA to build a central information platform that makes it easy to consolidate and use the data for real-time analytics enriched with a role-based user frontend that optimizes the process. All of this is enhanced by prepackaged content via SAP Activate that helps to accelerate the adoption of new functionality and supports a continuous innovation process. All this functionality is extended with the LoB solutions that are available today and that support nonindustry-specific processes (e.g., HR with SAP SuccessFactors). An overview of SAP S/4HANA Enterprise Management is shown in Figure 2.8.
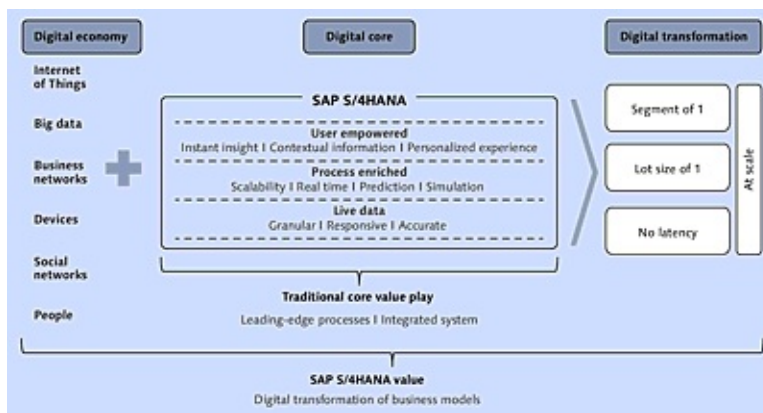

Figure 2.7   Value of SAP S/4HANA for the Digital Transformation

Figure 2.8   Overview of SAP S/4HANA Enterprise Management

You now have an understanding of the context around SAP S/4HANA and its different editions, as well as the baseline understanding of how it supports the digital transformation. In the next section, we'll take a closer look at how SAP S/4HANA provides business value and what innovations are behind it.

2.2 Business Value Scenarios

Most of you likely have an existing SAP solution in place and have invested a lot of money to ensure that it fulfills your current requirements. Some of you may be uncertain about the business value and the migration costs that come along with moving to SAP S/4HANA, but there is a huge opportunity to reconsider the current processes with a focus on the digital transformation and the ability to support the future creation of business models. Therefore, it's essential to understand the value SAP S/4HANA brings from a functional perspective, as well as the technical capabilities that must be embedded in your strategy to tailor an individual road map that fits your future business.

Looking at the impact of the digital transformation (see Figure 2.9), you'll see five different layers that need to be supported to achieve the highest transformation toward creating new business models.
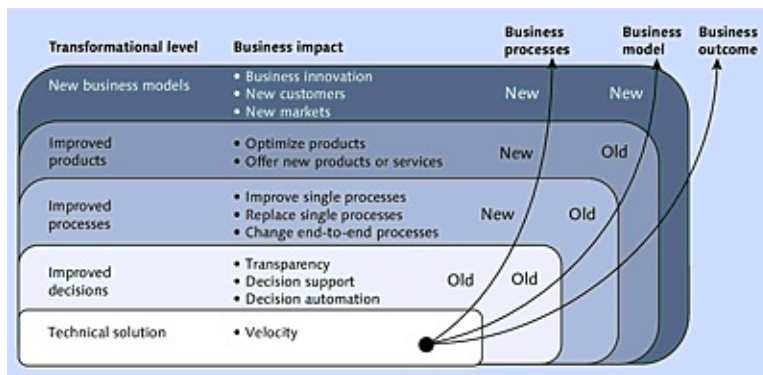

Figure 2.9   Digital Transformation Adoption Model

How does SAP S/4HANA address those challenges? Platform speed is increased with the migration to SAP HANA as an in-memory database. Speed is also increased by simplifying the data model and reducing the redundant application data. Creating a single data source for end-to-end processes (described in Section 2.2.2) aids in decision making, and simplified and improved processes are enriched by role-based, user-specific user experience (UX) (discussed in Section 2.2.1).

Additionally, having a single data source and the ability to aggregate data on the fly, in combination with the storage of customer behavior from different sources, provides better insight into customer behavior. You can understand what they may do, what they are doing right now, and what they have done in the past. All this information is available in real time and is part of the future digital platform with SAP Hybris (discussed in Section 2.2.2). All of these capabilities are provided as part of SAP S/4HANA and the supporting LoB solutions that are tightly integrated to support the digital value chain.

For each of the layers shown in Figure 2.9, we'll outline potential use cases to help you understand the value of SAP S/4HANA.

Let's begin with Figure 2.10, which contains a summary of the key innovations that are available in the current release. As you can see, it's in line with the digital transformation model and is based on the following three main changes:

- **Rearchitecting the in-memory platform**
  This supports the first four layers of the digital transformation model from the technical solution up to improved products (see Section 2.2.2). This is part of the SAP S/4HANA core solution and leverages the simplification of the technical architecture by combining Online Transaction Processing (OLTP) and Online Analytical Processing (OLAP) to drive analytics as part of the transactional processes. As an example, you can look at the decision support cockpit for MRP.

- **Responsive UX design**
  This supports the improved decisions, processes, and products because this will be a single entry point for all customers and users (see Section 2.2.1). It provides the capability to work from any device (e.g., smartphone, smart watch, etc.) and improves the effectiveness of the users significantly with the redesign of the transaction into user-centric SAP Fiori apps.

- **Unifying functionality in the core**
  This simplifies SAP S/4HANA and follows the *principle of ONE* as a key driver for simplification. It's the elimination of functional, technical, and data redundancies to optimize SAP S/4HANA and avoid complexity (see Section 2.3).

All of these changes have implications on the innovation capability of SAP S/4HANA Enterprise Managements and are the foundation for the different scenarios and simplifications in FI and logistics.
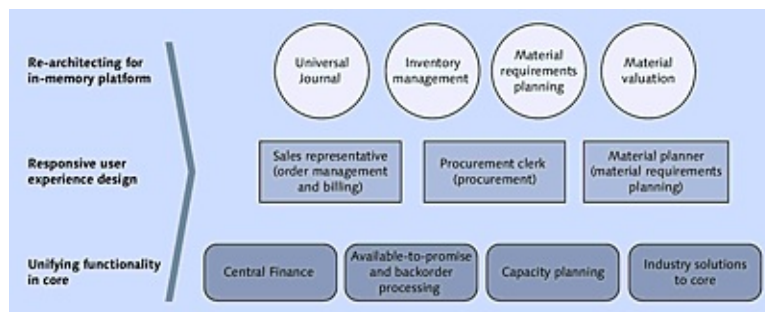

Figure 2.10   Key Innovations for SAP S/4HANA Enterprise Management

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Note

You can create your own business scenario recommendations report based on your transaction usage. You can get a guide on how to do this at *https://www.s4hana.com/how-to-guide*. The report provides you with a detailed overview of the recommended business scenario, the relevance for your company based on the analyzed transactions, and the improved or relevant transactions that are affected. For illustrative purposes, a sample of an executive summary is shown in Figure 2.11.
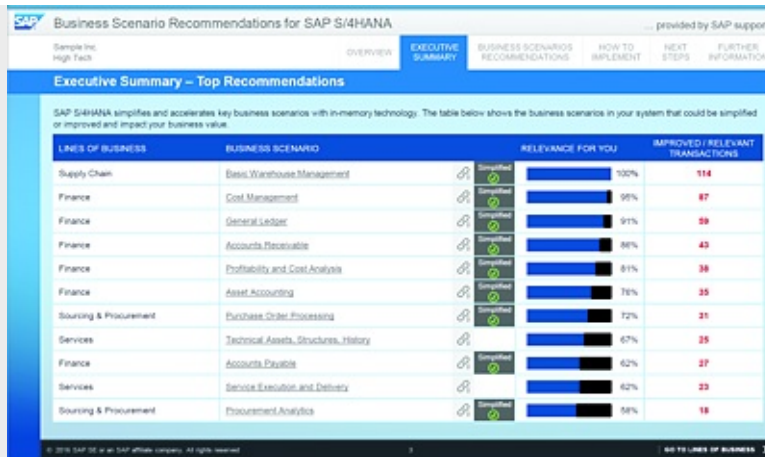
Figure 2.11 Business Scenario Report Executive Summary

Let's now look at the three main areas where SAP S/4HANA can add value to your business: through improved customer centricity and experience, increased customer insight and a better decision-making process, and a new digitally enabled supply chain.

2.2.1 Customer Centricity and Experience

As part of the digital transformation, the way users are going to access ERP solutions is different from the past. Users want access via different devices (e.g., mobile) in a simplified, user-friendly experience. As stated in Chapter 1, there is a massive change in the behavior based on the target group, such as Generation Y or Millennials; they are looking for a customized and focused user experience that is simple to handle. Based on changing requirements and the future of digitally enabled enterprises, SAP decided to provide customers with a new UX called SAP Fiori. SAP Fiori applies the following new design principles to reimagine the UX:

- **Role-based**
  This design principle focuses on fulfilling individual working requirements.

- **Responsive**
  This design principle focuses on supporting every possible way of

working—from the desktop to mobile—to be responsive to customer needs.

- **Simple**
  This design principle focuses on only providing the user with what is essential and important.

- **Coherent**
  This design principle focuses on providing a fluid and seamless experience.

- **Delightful**
  This design principle focuses on satisfying users' needs and making an emotional connection.

With the usage of SAP Fiori, there is a significant shift from the pure functional view that was available in the old SAP ERP to a role-based UX with one single entry point and a common design in SAP S/4HANA (see [Figure 2.12](#)) across the business applications, whether cloud or on-premise. From a strategy perspective, all new or existing SAP solutions will use SAP Fiori to harmonize the unified UX for SAP Ariba, SAP SuccessFactors, SAP Hybris Cloud for Customer, SAP Fieldglass, and all SAP S/4HANA editions.
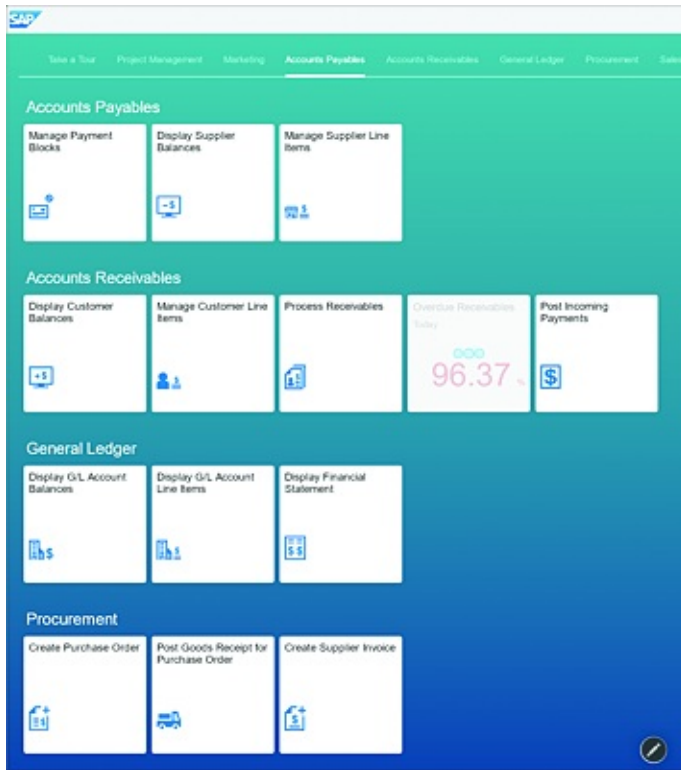
Figure 2.12   Role-Based View with SAP Fiori as Part of SAP S/4HANA Cloud

So what is the real business value? Aside from the creation of a nice UI, it also affects the way people work. This is evident in nonmonetary benefits such as the following:

- **Increased user satisfaction**
  The efficiency and effectiveness of work is increased because all applications can be accessed via a single entry point with the same look and feel.

- **Increased customer loyalty**
  Using the unified UX (e.g., recruiting or procurement) increases both internal and customer loyalty.

- **Increased solution adoption**
  Reduced maintenance costs and user errors result from increased solution adoption.

Those nonmonetary benefits will lead to significant business results such as the following:

- Gain productivity through the avoidance of errors, which will help free up additional team members for more productive work
- Save training costs through easier solution adoption, which will reduce the overall change management costs for implementation of new functionality

To give an example from an existing client, one food delivery business improved its productivity by 60% after adopting the new processes based on SAP Fiori. Another customer eliminated training effort due to the intuitive SAP Fiori design and the user-specific UI.

> **Note**
>
> SAP provides a tool to calculate the business value for selected scenarios at *http://www.sapcampaigns.de/us/UX_Calculator/*.

Based on the design principles described earlier, the changing of the UX strategy has the goal to support the simplification of the SAP S/4HANA solution, which is why SAP S/4HANA and SAP Fiori are tightly integrated. At present, not all SAP solutions are enabled fully with SAP Fiori, but solution development will continue. More SAP Fiori apps will be available in later releases that will simplify the overall solution. In addition, not all transactions are being replaced with SAP Fiori apps because there will be a move to a more role-based UX, and the processes will be streamlined and condensed to the necessary core functionality.

You may wonder why SAP S/4HANA Cloud is fully based on SAP Fiori, and the on-premise version isn't. This is due to the limited functionality provided with SAP S/4HANA Cloud and the fact that it's based on a completely new product line. As the product evolves, more and more processes will be supported by SAP Fiori Apps while the simplification process is going forward. All this effort is based on the desire to reduce the redundancy on any level, ranging from the SAP HANA database up to the SAP Fiori UX.

The simplification process from SAP ERP to SAP S/4HANA doesn't just consist of the new UX design. Based on the simplification of the data model, redesign of the business logic, code pushdown, and role-based tailoring of the solution, there is also a process redesign coming along with the move to SAP S/4HANA.

How many processes are supported by SAP Fiori? Within SAP S/4HANA Finance 1503, more than 140 SAP Fiori apps were supported; with SAP S/4HANA 1511, more than 260 SAP Fiori apps are supported.

If you want to realize the benefits of SAP S/4HANA, you should first look at the roles and the usage of the transactions to get a better understanding where the best case for simplification or value realization resides. Second, you should look at the currently available SAP Fiori apps and review how they fit into your role requirements and where the gaps are. This will give you a good overview of the functionality your end users need and an understanding of what the current release covers.

Note

Not all users will be SAP Fiori users at the beginning, so you have to plan for the traditional SAP GUI users or a combination of those as well.

To identify the currently available SAP Fiori apps, you can browse through the SAP Fiori apps reference library (see Figure 2.13) at *https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/#*.

In the SAP Fiori apps reference library, you can select the area of interest to review the available apps. All apps are assigned to different roles; for example, under the ACCOUNTS PAYABLE ACCOUNTANT, there are apps available for CREATE MANUAL PAYMENT/CREATE SINGLE PAYMENT (see Figure 2.14). You can see the details regarding app availability, the required backend product, and any additional documentation. You can

also take a detailed look via the list view and select the different product suites to get a quick glimpse.
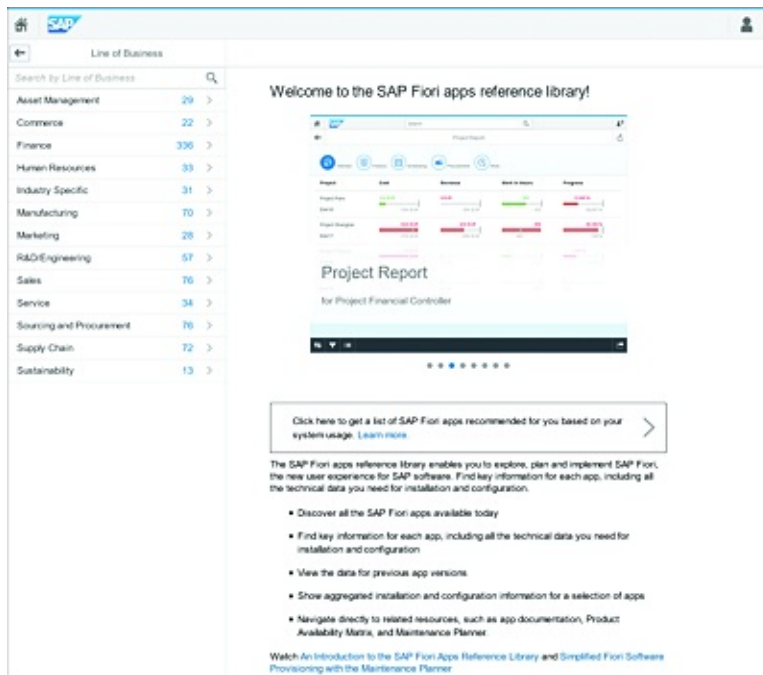

Figure 2.13   Overview of the SAP Fiori Apps Reference Library

If you want to get a recommendation based on your system usage, you can select this as an option within the library. A detailed guide on running an SAP Fiori relevance and readiness analysis is available at *https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/docu/R*

The results of the analysis provide a list of possible relevant SAP Fiori apps based on your transaction usage, as well as the relevant prerequisites.
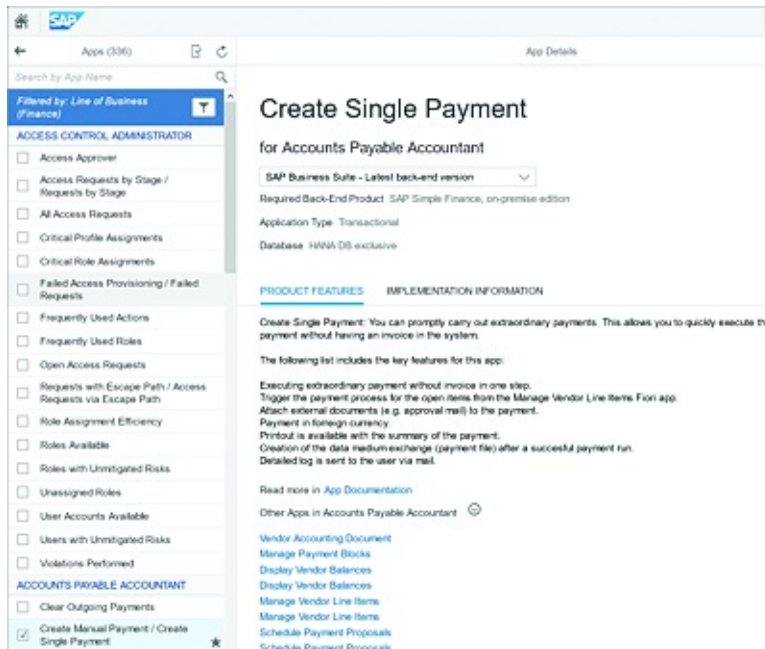
Figure 2.14   Sample for Identifying an SAP Fiori App in the Finance Area

As a sample for the improved process time via SAP Fiori within SAP S/4HANA, let's look at the FI area to see how SAP S/4HANA Finance (formerly SAP Simple Finance) has been improved and simplified, in this case, for an account receivables accountant processing incoming payments (see Figure 2.15). Table 2.1 summarizes the differences between SAP GUI and the new SAP Fiori app that is available via SAP S/4HANA for posting received customer payments and cleared customer invoices. This process was traditionally handled by Transactions F-04, F-28, and FB05.
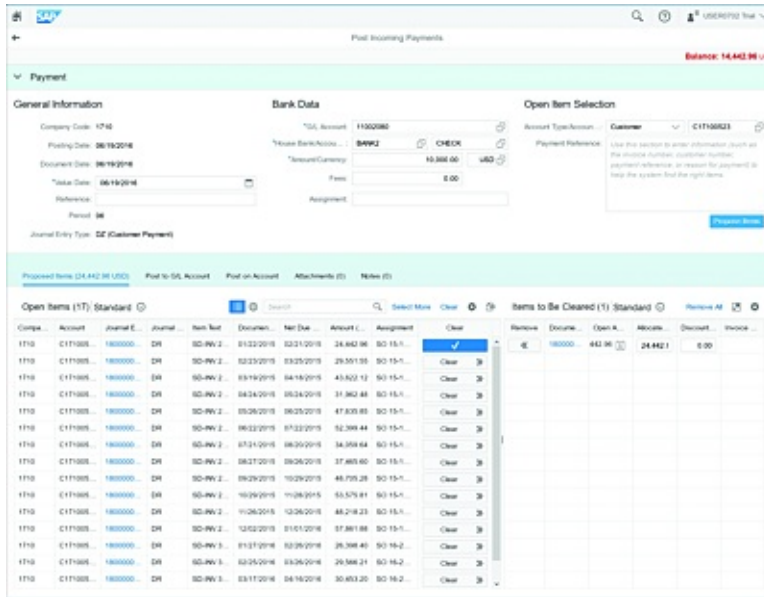
Figure 2.15 Clearing Invoices from Incoming Payments

SAP GUI (Traditional)	SAP Fiori (Simplified)	Improvement
Duration: 1:26 min	Duration: 0:59	31% reduction
Clicks: 27	Clicks: 17	37% reduction
Screen changes: 14	Screen changes: 2	86% reduction
Fields filled: 14	Fields filled: 7	50% reduction

Table 2.1 Comparison of Activities and Savings between SAP GUI and SAP Fiori

As you can see, there is a significant improvement running the clearing process via the SAP Fiori app not only in the total duration but also in the change of screens and the information that needs to be entered manually. This is a simplification example that really demonstrates the value that SAP S/4HANA brings with its unified UX.

In short, SAP Fiori isn't just about a nice UI; it's more about redesigning processes from an end-user perspective to be more efficient and to reduce costs. SAP Fiori can provide business value for your organization from a UX perspective, and there are tools available to identify the relevant business scenarios for your organization.

2.2.2 Customer Insight and Improved Decision Making

As part of the digital transformation, it's not only important to improve the UX, as outlined in the previous section, but it has also become increasingly critical to better understand client behavior so that you can offer a tailored service or product. Therefore, it's essential to collect all necessary data, make the data available in real time, and create actionable results based on the analysis and prediction of data. With the transition to SAP S/4HANA, several changes enable you to provide better customer information and support the decision-making process. Due to the use of an in-memory database, the redesign of the data model, and the data footprint reduction that comes with SAP HANA, it's now possible to provide a single platform across the different solutions with one copy of the data and less integration effort.

SAP S/4HANA is designed to fulfill the end-to-end requirements of a digital value chain (see Figure 2.16). It contains optimized, end-to-end processes that reside on a single data source, with SAP HANA as the digital backbone. It also contains Internet of Things (IoT) integration via the SAP HANA Cloud Platform, which allows companies to get insights and automatically initiate business processes from social media tools, as well as analyze structured and unstructured big data in real time.

This value chain is only possible because SAP S/4HANA also integrates SAP's existing portfolio of LoB cloud solutions, as follows:

- **SAP Hybris**
  This is the industry-leading omnicommerce platform for customer engagement that delivers exceptional and consistent customer experience across every channel of interaction.

- **SAP SuccessFactors**
  This is the leading solution for human resource management.

- **SAP Fieldglass**
  This solution helps manage contingent labor.

- **SAP Ariba**

  This is the indirect material procurement network where companies trade between each other in a fully digitized way.

- **Concur**

  This business travel and expense management solution provides the best possible experience for the business traveler at the lowest possible cost for the company, all fully integrated to the transactional system.
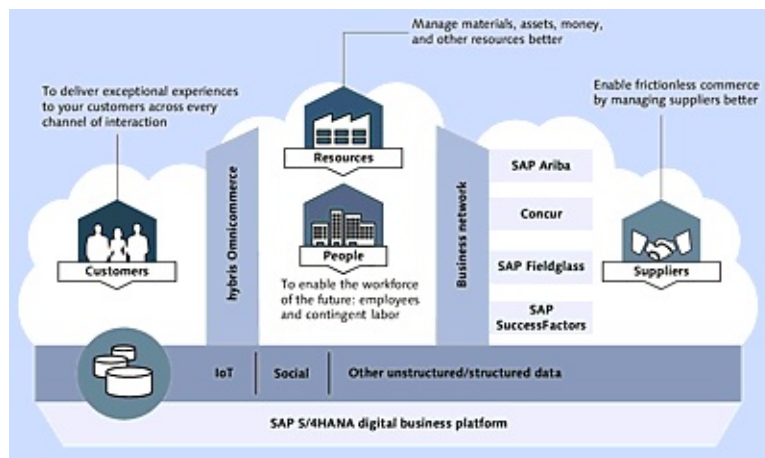

Figure 2.16   SAP HANA as the Foundation for the Digital Value Chain

This enables customers to run their entire company digitally, in a fully integrated manner. More information on the extended portfolio is provided in Chapter 5, which explains how those solutions fit into the overall strategy of SAP S/4HANA.

The step toward SAP S/4HANA and the plan to integrate all LoB solutions into a single data source combined with the capabilities of an in-memory database enables customers to move from a traditional separated transactional and analytic data approach toward a unified one (see Figure 2.17). This significantly reduces the delay between the different data sources and enables customers to drive real-time analysis and make decisions on live data. You also can embed analytics as part of the transactions to improve the process and provide better information

based on real-time data instead of aggregating the data manually and spending additional time and manpower to produce outdated data.
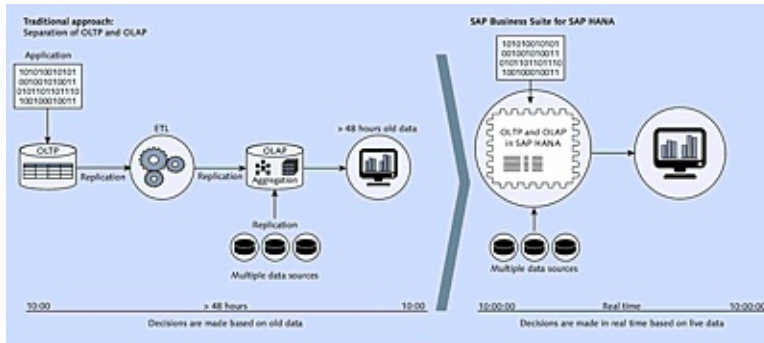
Figure 2.17   Integrating Real-Time Data Access for Improved Decision Making

As shown in Figure 2.17, SAP S/4HANA provides all capabilities that are required from a digital platform. The redundant data limitation and the complex data models overview are gone, which enables you to conduct ad hoc and real-time analysis without data extraction and data loading.

As a concrete example, let's take a closer look at the work of an accounts receivable manager. If the accounts receivable manager wants to get an overview of the 90 days' receivables he is expecting sorted by the top 10 customers outstanding, he can easily access this information via an SAP Fiori app that provides detailed information for his entire customer base (see Figure 2.18). The reports available via SAP Fiori allow different user groups to get a detailed understanding of the finance data (e.g., auditors can drill down into the details of the overdue receivables and sort them by customer, company code, accounting clerk, etc.).
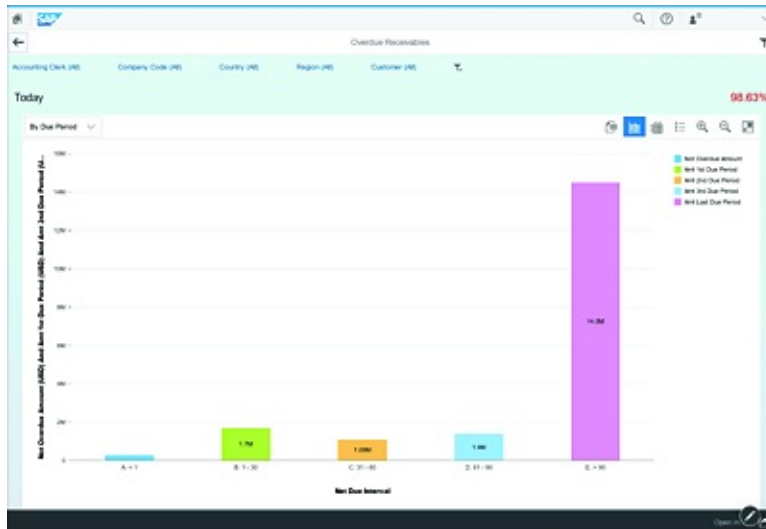
Figure 2.18   Overdue Accounts Receivables

Using this report, the accounts receivable manager can get a better overview of the top 10 customers and their behavior and then drill down into further details (see Figure 2.19). All this information provides transparency and helps companies improve their decision-making based on real-time financial data combined with on-the-fly reporting capabilities.

This example provides an overview of the key benefits of SAP S/4HANA based on the simplified data model. These benefits are listed here:

- **Real-time processing**
  Eliminate batch processing and data reconciliation through a single data pool.

- **Predictions**
  Discover and respond to future opportunities and challenges based on available/historical data.

- **Simulation**
  Simulate possible scenarios and explore the impact of business decisions on outcomes.

- **Responsive**
  Improve user satisfaction by reducing wait time through real-time access to data.

- **Drilldowns**
  Drill down into easy-to-use reports and analyze data at any level without exporting data.

- **Recommendations**
  Rule-based and instantaneous decision support guides the user and text mining, and the ability to embed structured and unstructured data in one business process ensures innovative business processes and business decisions.
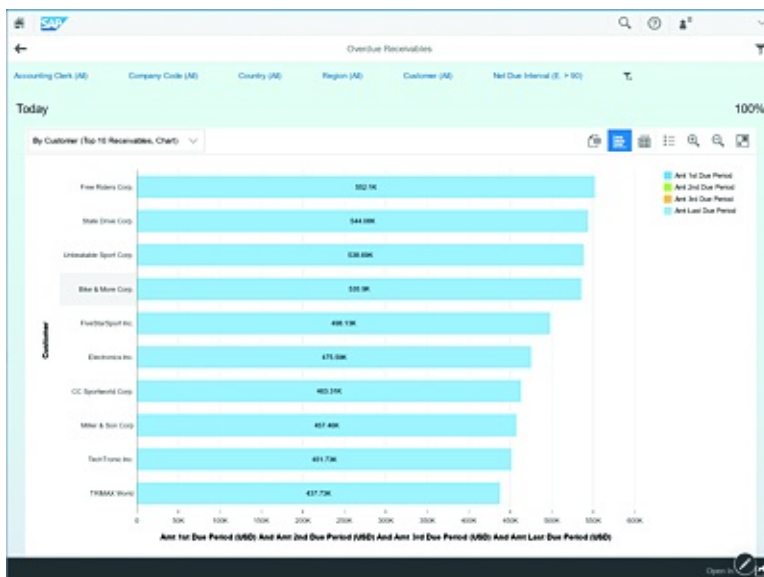
Figure 2.19   Overdue Receivables by Top 10 Customers

2.2.3   Digitally Enabled Supply Chain

Section 2.2.1 showed how users are being empowered with people-centric UIs, while Section 2.2.2 showed how the simplification of a single data model with no redundant data is supported by SAP S/4HANA. Let's now look at the third piece of the puzzle: how logistics is changing due to the market trends that are driven through the digital transformation and how SAP S/4HANA addresses those topics. Although there are no changes to the processes themselves, there is a significant change in the way processes are executed more efficiently, as was shown earlier in Table 2.1. In the area of logistics, the digital transformation has brought

about significant changes; for example, consumers expect their orders to be fulfilled and shipped on the same day, so they can receive their product on the next day.

Another example is the IoT and the collection of big data via sensors or other devices, which has huge implications on the way companies monitor their supply chains. The rapid growth of collaborative networks is removing borders between suppliers and consumers, which has a big impact on the way processes can be executed and improved.

The current SAP ERP system serves as a classical *system of record* storing your transactional data. The business user goes through different transactions to get transparency on demand shortages, analyzes various reports, adds intelligence to the information, and then either prioritizes production or transfers goods from one plant to another to avoid shortages. With SAP S/4HANA, the business user gets away from the traditional system of record and leverages the core capabilities of the platform, such as IoT or business network connectivity, to obtain more detailed information and advanced analytical options that help him do his work more effectively.

To give a concrete example of the business value SAP S/4HANA provides in the logistics area, let's look at inventory management. The challenge of inventory management is to provide customers with the right products at the right time while reducing storage and saving costs at the same time. In the past, to achieve transparency, you had to execute the backflush process (the process of determining the number of parts that must be subtracted from the inventory) once a day, which led to inaccurate inventory in the system. With customers now expecting individualized and on-demand products and services, it's not feasible to work with outdated data that gives limited transparency on the available inventory, as this will lead to supply shortages and unsatisfied customers.

Most businesses are requiring real-time data in the entire supply chain in an effort to minimize the stock in warehouses to reduce the total costs.

With older ERP solutions, separate data are loaded from several sources, which takes too much time. Therefore, a simplified data model is needed to avoid redundant data and enable on-the-fly analysis to provide a detailed look inside the inventory and minimize the risk of deviations between physical inventory and virtual inventory. This is where SAP S/4HANA comes in.

In Figure 2.20, you see the classic inventory management process flow:

1. At 6:00 a.m., the stock is automatically entered via barcodes.

2. During the day, the inventory manager checks the virtual inventory that is available in his system. In this example, he checks the inventory in two hour cycles at 8:00 a.m., 10:00 a.m., and 12:00 p.m.

3. At 2:00 p.m., the stock is automatically entered via barcodes.

4. At the same time (2:00 p.m.), the inventory manager checks the virtual inventory again and gets a first view of the real values after the actualization of the information. This leads to a large deviation between the virtual and the real stock through, for example, production quality issues.
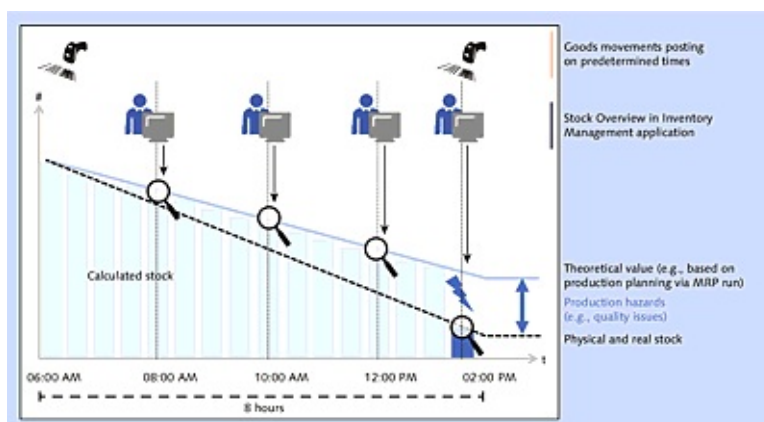
Figure 2.20 Classical Inventory Tracking

In our example, we have a high deviation between virtual and actual stock. To compensate for this difference and to prevent the production chain from stopping due to lack of parts, you must have safety stocks

(see Figure 2.21). Safety stock is expensive because it requires additional costs (e.g., handling costs, space costs, etc.) on top of the stock itself. Therefore, it's essential to have minimized safety stock.
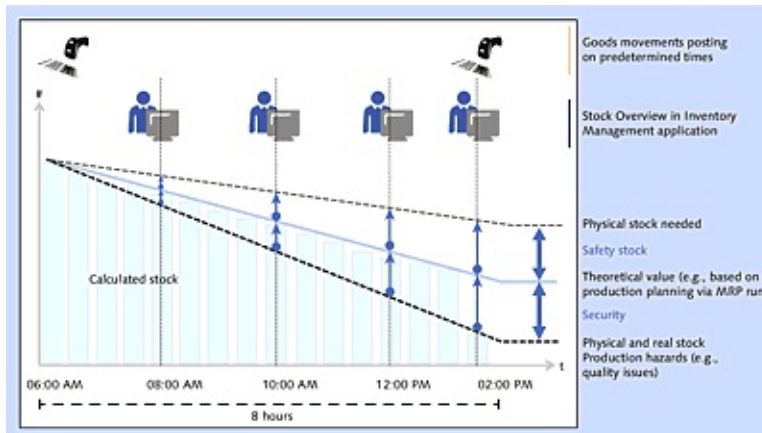
Figure 2.21   Inventory Tracking Including Cost-Intense Safety Stocks

To avoid these deviations and to reduce the amount of safety stock, SAP S/4HANA enables you to reduce the difference between the theoretical and the real stock value. As shown in Figure 2.22, real-time inventory tracking allows you to enter values of the stock in real time, which allows you to anticipate actions to compensate for the risks of production and reduce your safety stock.

The foundation of this SAP S/4HANA simplification is the elimination of aggregates. In SAP ERP, the Materials Management (MM) inventory functionality is stored in table MKPF (header table) and table MSEG (line item table) with an additional 18 tables for quantities and values. Out of those tables, 11 aggregate tables have additional shadow tables for historical data (see Figure 2.23). All these tables are required to support reports such as report MB5B or report MMBE, among others. This all results in a great deal of redundant data, which was necessary before the possibilities of in-memory technology. With SAP S/4HANA, a new data model has been built that leverages the advantages of the in-memory columnar storage.
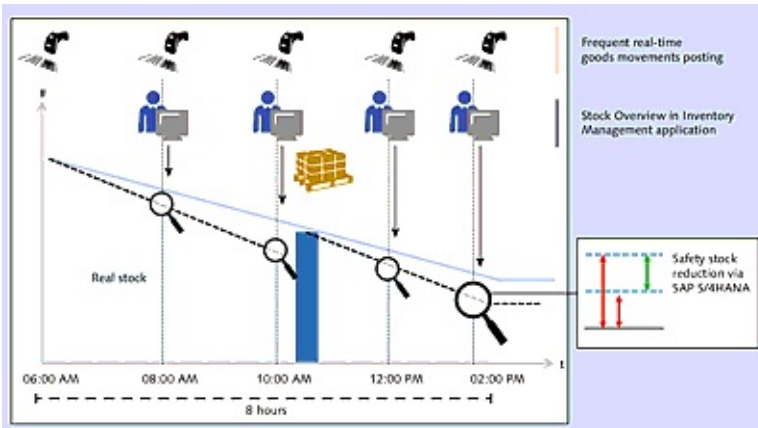
Figure 2.22 Real-Time Inventory Tracking

With SAP S/4HANA, the single table MATDOC contains all the information formerly stored in all those various tables, which eliminates redundancy and provides you with better performance. Now that the aggregate tables have been replaced with Core Data Services (CDS) views, both on-the-fly calculations and compatibility with custom developments are supported. With these changes, SAP S/4HANA provides you with real-time processing of inventory postings and visibility of inventory values so you can reduce your safety stock and manage smaller lot sizes moving through logistics operations. All of this leads to an overall cost reduction in your inventory.
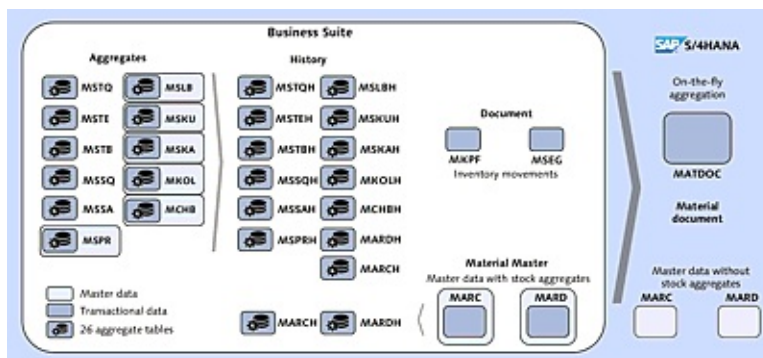
Figure 2.23 Inventory Management Changes from SAP ERP to SAP S/4HANA

Another example of the optimization is the accelerated material requirements planning (MRP) that is available with SAP S/4HANA. As you can see in Figure 2.24, there is a huge simplification between the SAP ERP system and SAP S/4HANA. With SAP S/4HANA you now have

the ability to access your key KPIs in real-time. Due to increased transparency, there is a significant decrease to the amount of inventory you must keep on hand, which then in return results in cost savings.

Traditional SAP ERP	SAP S/4HANA
No real-time planning due to elapsed time	Real-time system with key performance indicators (KPIs) instantly refreshed
Decisions based on "old" data, resulting in lower quality	Segment of one that reduces lot sizes down to single items
Lower forecast accuracy and attainment of promise date, and increase in inventory	Focus on exception handling rather than standard processes
	Inventory decrease with reliable ATP check

Table 2.2   Accelerated MRP Comparsion between SAP ERP and SAP S/4HANA

Note

For more details about logistics in SAP S/4HANA, see Chapter 4.
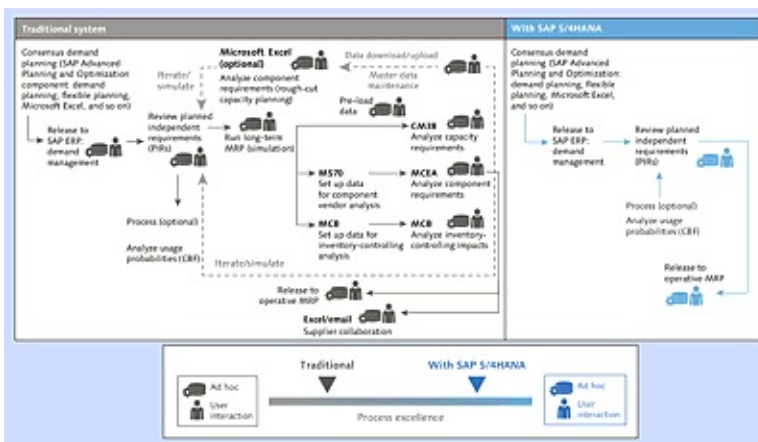
Figure 2.24   Accelerated Material Requirements Planning

2.3   Architecture at a Glance

In this section, we want to give you a first glance on the architecture concept of SAP S/4HANA to provide you with a basic understanding. As already mentioned, the goal of SAP S/4HANA is the principle of ONE, which means the removal of redundant frameworks, technologies, data models, and application data. The guideline for a digital transformation platform is to focus on the essential and to reduce all overhead while leveraging the best technical possibilities to achieve a highly flexible solution for the digital era. To achieve this, we have to take a closer look at the SAP architecture.

Within SAP, processes and features belong to a software component. All of the relevant software components that are required for an SAP ERP 6.0 EHP 8 on-premise system are shown in Figure 2.25. As you can see, there are a lot of separate software components that reflect the functionality available in the current release. The idea of components is to have the smallest possible unit that can be maintained separately to reduce maintenance and increase the possibility to update smaller pieces of the overall solution separately.

As you can imagine, there are interdependencies between the different components that need to be considered; this adds additional complexity to the overall solution and the development of the solution. One of the goals of SAP S/4HANA is to remove these dependencies to come to *one* component with *one* deployment option.
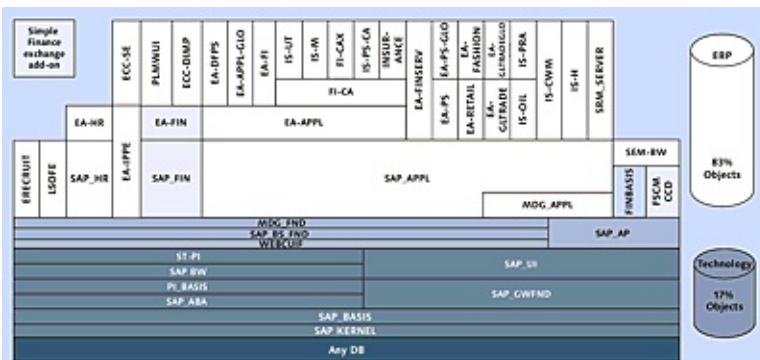
Figure 2.25 Overview of the Software Components for SAP ERP EHP 7 On-Premise

To follow the principle of simplification with SAP S/4HANA, the components that aren't essential need to be removed or be merged, as shown in Figure 2.26.
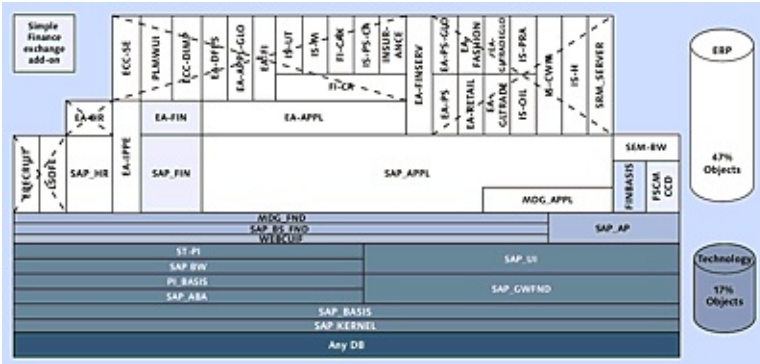

Figure 2.26 Reduced Objects That Aren't Relevant for an SAP S/4HANA Core Solution

SAP S/4HANA focuses on providing a baseline functionality around the areas of MM, Sales and Distribution (SD), customer services, FI, and CO. This leads to the new merged software component called SAP S/4HANA core solution, which includes the baseline functionality. All other software components are removed to simplify the solution, as shown in Figure 2.27.
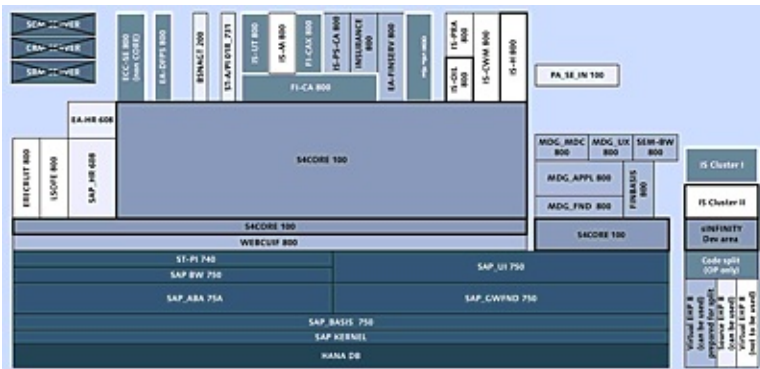
Figure 2.27 Software Components of SAP S/4HANA

As you can see, SAP S/4HANA is built similarly to SAP ERP 6.0 EHP 7, but is on a different code base. Both the original and the new code lines are now providing for the different editions illustrated in Figure 2.3. This

leads to the previously mentioned differences in the available functionality in the different editions.

Now that you understand the differences of the functionality and the connection between the different editions and the relation between SAP ERP and SAP S/4HANA, we want to illustrate the high-level runtime architecture of SAP S/4HANA in Figure 2.28.

On the highest level, technology stacks are illustrated with the incorporated technologies. At the top, the SAP Fiori shell layer represents all available technologies for users to work with ranging from the web GUI for SAP to SAP Fiori apps.

Below that, you see the SAP Gateway as an embedded component for the SAP S/4HANA ABAP stack for the cloud. The SAP S/4HANA, on premise edition, deployment recommends a separate UI frontend server.
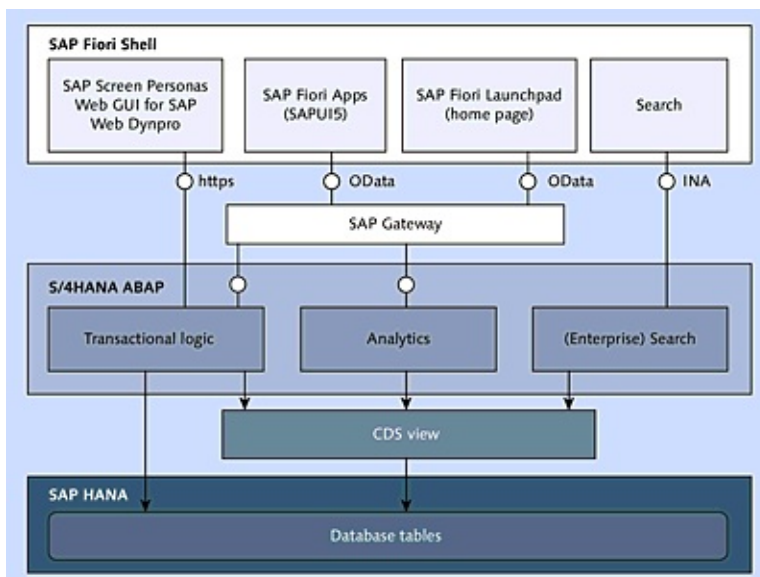
Figure 2.28   High-Level SAP S/4HANA Runtime Architecture

In the second layer, the SAP S/4HANA layer, you can see that there are two different possibilities to consume SAP S/4HANA tables:

- Direct consumption via business logic inside transactional logic
- ABAP CDS views

CDS views are used to reduce the application logic and push down the code from ABAP into SAP HANA.

Based on the principle of ONE, several simplifications have been achieved, as follows:

- Simplifications of the data model for FI and Inventory Management

- Unification with Discrete Industry Mill Products (DIMP) back to the SAP S/4HANA core application layer

- Simplification of long material number (LAMA) extending from 18 to 40 fields

- General deprecation process ~70,000 main repository objects, for example:

  - Deprecation of Foreign Trade (SD-FT)

  - Remaining Beverage Solution (SD-SLS-PLL)

- One business partner via the customer vendor integration (CVI) as a single point of entry to create, edit, and display master data for business partners, customers, and vendors

- One single valuation via the SAP Material Ledger (no moving average price on `MBEW`)

- One analytics approach:

  - Avoid embedded SAP Business Warehouse (SAP BW) based on redundant data

  - Avoid Logistic Information System (LIS)

Note

Further information on the top simplifications can be found on the SAP Community Network (*http://scn.sap.com/docs/DOC-70833*) and will be updated frequently.

2.4 Summary

In this chapter, we explored the history of SAP S/4HANA and provided you with an overview of the different editions as well as the different deployment options and their functions. We explained the key principles around customer centricity and experience with SAP Fiori as the leading UX for SAP S/4HANA, as well as the possible benefits. We gave you a brief overview of why SAP S/4HANA helps you get better customer insight and provides you with improved decision-making capabilities based on the SAP HANA platform. Along with the previous information, we discussed business value scenarios and the digitally enabled supply chain as part of SAP S/4HANA.

Finally, we illustrated a high-level overview of the SAP S/4HANA architecture and the principles behind SAP S/4HANA, as well as the simplifications that have been achieved from a technical and functional perspective to build a solid foundation for the following chapters.

The key features of SAP S/4HANA Finance perfectly address the pain points identified by the various IBM CFO surveys held over the years, which is helpful input to fuel the business case for SAP S/4HANA Finance.

3   SAP S/4HANA Finance

SAP S/4HANA Finance, formerly SAP Simple Finance, follows SAP's simplification strategy. The introduction of the SAP HANA database enabling real-time data made it possible to rethink how to run financial processes. SAP S/4HANA Finance was the first area where SAP offered these new functionalities, which we'll describe in this chapter in more detail.

The following sections explain the intent, assumptions, and trends of IBM's chief financial officer (CFO) study, with a focus on the results from 2013 and 2015. The best performing companies from the study (in terms of growth over the past three years and shareholder value) serve as a model for the way ahead. Next, we'll provide insight into the seven key pain points the CFOs are experiencing and will show how SAP S/4HANA Finance addresses these pain points; this should help build the business case for implementing SAP S/4HANA Finance.

Furthermore, we talk in more detail about the new SAP S/4HANA Finance functionalities such as Universal Journal, SAP BPC for S/4HANA Finance (formerly SAP Integrated Business Planning for Finance), SAP Cash and Liquidity Management, Central Finance, and some improved functionalities in Asset Accounting (FI-AA), SAP Material Ledger (ML), and the month-end close process. We conclude this chapter by

assessing the maturity of SAP S/4HANA Finance, its business case, and its future outlook.

3.1　IBM Chief Financial Officer Surveys

Since 1999, IBM has carried out a series of studies focused on what topics chief experience officers (CxOs) are interested in and how these topics affect their agenda. In this section, we'll look at the CFO part of this study (*https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=SPM12350USEN*) because it provides insight into the factors that contribute to increasing the effectiveness of the finance function and the possible contribution it makes to revenue growth and value creation. We've seen that important factors for this are the reduction of complexity through standardization and process optimization, so that integration of information within the organization and across organizational units is possible. Integrated information enables the company to optimally manage the company and to better control risks.

Over the years, we see a trend of growing involvement of finance in areas to help mitigate risk and reduce structural complexity to get a better, more accurate picture of the drivers influencing the overall business performance of an organization. The CFO study of 2010 clearly showed that finance needs to develop strong capabilities in two areas:

- **Finance efficiency**
  Finance efficiency is the degree of process and data commonality across finance. Finance needs standards for organizational structures, data and metric definitions, and processes to ensure transparency of financial information across an organization globally. Internal finance operations should be running well, with strong adherence to process and data standards. By having that in place, finance will reduce the time spent on operational tasks of paying the bills, closing the books, and producing financial results, which allows time to produce business insights on a daily basis.

- **Business insight**

  Business insight is the ability to drive operational efficiency, spot market opportunities, react faster, and ultimately predict changes in the business environment. It requires mature business analytical skills from the very basic (e.g., operational planning and reporting capabilities needed to prepare, execute, and adjust the financial performance goals of the company) to the more sophisticated (e.g., multidimensional Profitability Analysis [CO-PA], scenario planning, and even event, behavioral, and risk-based predictive analytics).

Based on these capabilities, IBM scored finance organizations on their financial efficiency and their ability to provide business insights. From this information, IBM identified four finance profiles, of which *value integrators* outperformed the rest (see Figure 3.1).
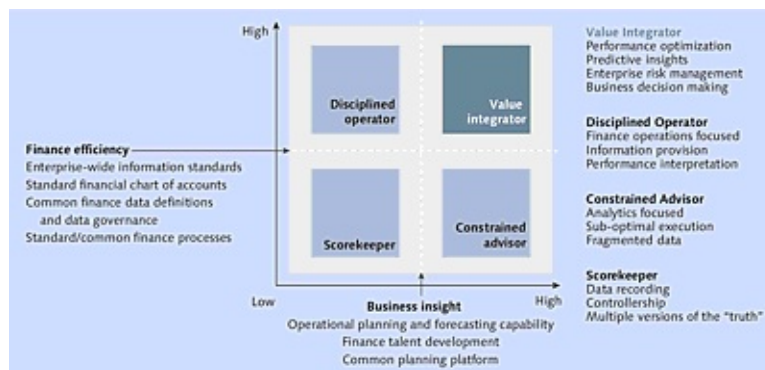
Figure 3.1　Finance Organizations Classified into Four Profiles

The four organization profiles are as follows:

- **Value integrator**

  These organizations score high on both dimensions—top right of the quadrant—with strong business insight coupled with finance operations that are efficient, running well, and optimized.

- **Scorekeeper**

  Opposite the value integrator, the scorekeeper organization is the least mature of the four profiles and is low on both dimensions. This profile is more the traditional controllership-oriented finance organization that is

primarily focused on performing accounting operations, using controls, closing the books, managing the audit, and supporting regulatory and statutory compliance. There is either no mandate or a lack of capability for finance to do much more than that.

- **Disciplined operator**

  The disciplined operator organization has built a strong foundation of financial controls, standard processes, and data, but it has yet to deploy more mature analytical capabilities and partner with the business. The disciplined operator organization is driving more out of finance with less.

- **Constrained advisor**

  The constrained advisor organization is the opposite of the disciplined operator. Having done more to deploy greater planning and analytical capabilities, these finance organizations have the best intentions in mind but are constrained in terms of their execution capabilities. This is largely because they still have issues with process and data standards and commonality, leading to fragmented data and having to drive their analytics through brute force. They are constrained because they continue to be challenged by problems with the accuracy of their analysis and their inability to produce these results quickly.

A very important finding of this survey over the years is that those organizations which excel in both efficiency and business insight (the value integrators) contribute to even better financial outperformance.

Becoming a value integrator organization requires driving data integrity and the delivery of information through automation and self-services. You must implement enabling tools, such as workflow, for distribution and supporting finance processes from operations to planning systems and dashboards. In addition, you must employ electronic data capture at the source and systematize the cleansing and standardization of the data layer.

Clearly, across the board, value integrators have historically gone through transformation efforts and continuous improvement to drive both finance efficiency and business insight.

In the IBM CFO survey published in early 2013 (*Pushing the Frontiers – CFO Insight from the Global C-Suite Study*), the CFOs indicated that almost everything they do has become more important over the past three years. Their most critical task was measuring and monitoring their company's performance. However, providing strategic input comes as a close second, and developing people with the right skills remained a top-of-mind issue.

Finance organizations who are value integrators still stand out from the crowd. Value integrators are better than their peers at integrating information from numerous internal sources. They're also better at planning, budgeting and forecasting, and continuously fine-tuning everyday financial processes. In fact, they're better at everything except transaction processing, where disciplined operators likewise excel, and the difference between the two groups is marginal (see Figure 3.2).

However, in 2013, it was found that a small subset of value integrators do even better than the other members of their group. They've mastered their core duties so thoroughly that they're far ahead of every other kind of finance organization, including their fellow value integrators. These finance organizations were named *performance accelerators*.
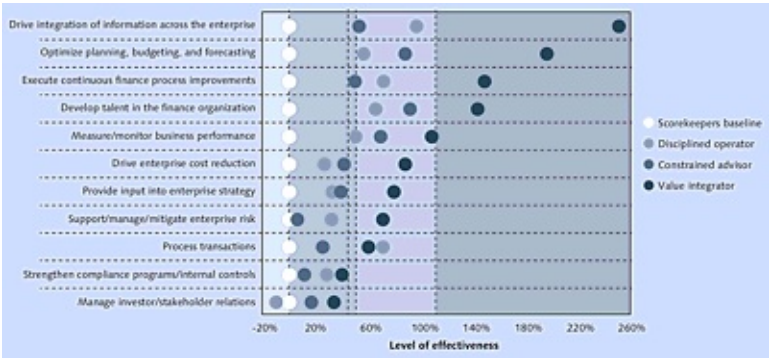
Figure 3.2 Value Integrators: Better Performance in Almost Every Finance Functionality

Another interesting discovery was that performance accelerators have been 70% more successful than their fellow value integrators, measured in terms of revenues and profits generated over the past three years. Apparently, it pays off to become a performance accelerator.

In the 2015 survey, IBM interviewed 643 CFOs from 18 different industries globally (per *https://ibm.biz/IBMCSuite*). The year-on-year results clearly demonstrate how expectations have changed. Providing strategic input, managing enterprise risk, and integrating different sources of information have soared to the top of the CFO agenda, which has helped organizations generate meaningful business insights.

CFOs note that the traditional barriers between previously distinct industries are collapsing, as companies in one industry provide their services to other industries as well. This gives your organization a great opportunity for growth but is also a threat because competition can come from everywhere.

Next, it was clear that CFOs expect technologies such as cloud computing, mobile solutions, and the Internet of Things (IoT) to have the biggest impact on their organizations over the next three to five years, but they aren't ignoring the potential disruptive impact of cognitive computing, advanced manufacturing technologies, and new energy sources (see Figure 3.3).
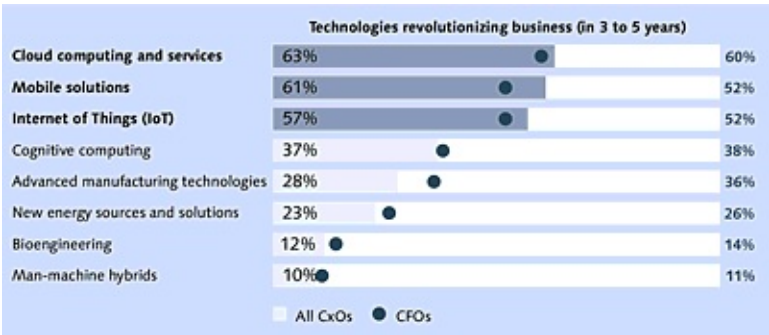
Technologies revolutionizing business (in 3 to 5 years)

	All CxOs	CFOs
Cloud computing and services	63%	60%
Mobile solutions	61%	52%
Internet of Things (IoT)	57%	52%
Cognitive computing	37%	38%
Advanced manufacturing technologies	28%	36%
New energy sources and solutions	23%	26%
Bioengineering	12%	14%
Man-machine hybrids	10%	11%

Figure 3.3   CFO Expectations for Three Key Technologies to Have a Major Impact on Their Organizations

With that said, many CFOs don't yet exploit the power of existing technologies as fully as they could. They still use the older versions of enterprise resource planning (ERP) systems such as SAP R/3 and analytical tools for about a third of their work. The rest of the time, they rely on spreadsheets or old-fashioned intuition.

In the next section, we show what performance accelerators are doing better compared to the other profiles and how SAP S/4HANA Finance technology can help your organization become a performance accelerator.

3.2 SAP S/4HANA Finance Benefits

We learned from the 2013 IBM CFO survey that performance accelerators are far more effective in the following areas, as depicted in Figure 3.4:

- Managing investor/stakeholder relations

- Processing transactions

- Strengthening compliance/internal controls

- Providing inputs to enterprise strategy

- Developing talent in the finance organization
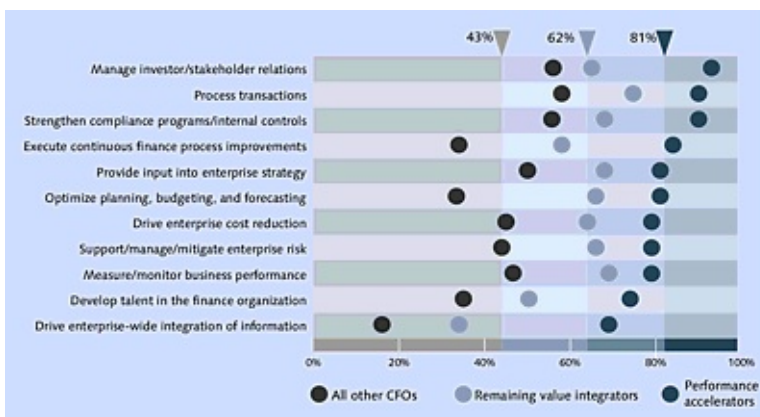
Figure 3.4   Performance Accelerators Outshining Their Fellow Value Integrators

As you can see in Figure 3.4, performance accelerators are better in all areas. In this section, we'll look at those areas where SAP S/4HANA Finance can contribute to your organization becoming a performance accelerator. So far, we've identified seven areas in which SAP S/4HANA Finance can play that role:

- Drive integration of information across the enterprise effectively.

- Drive enterprise cost reductions.

- Measure/monitor business performance.

- Optimize planning, budgeting, and forecasting.

- Execute continuous finance process improvements.

- Provide inputs to enterprise strategy.

- Develop talent in the finance organization.

Let's now explore these seven areas in more detail.

3.2.1 Integration of Information

Driving integration of information across the enterprise means that you have the governance in place to ensure common business processes and data definitions in your enterprise. To use SAP's phrase, it means that you have all that information technically captured in one place: a *single source of truth*. This single place in your system environment can satisfy all your financial information needs and serves as the single source for all of your interfaces as well. Many organizations are struggling with that, so their finance departments can't act as performance accelerators because they can't provide required business insights. These organizations have the following characteristics:

- **Lack of timely, qualitative, good, and easily accessible information**
  Data are stored in complex table structures on various levels of aggregation that make reporting difficult and requires heavy reconciliation effort.

- **No transparency**
  The key performance indicators (KPIs) aren't comparable because processes aren't fully harmonized, and there are no common definitions for reporting dimensions.

- **No reliable forecasts (e.g., revenue)**
  Because actuals data aren't fully transparent, these organizations can't, for example, build up their monthly forecast based on their week actuals.

- **Lack of perspective**
  Because the required level of detail is missing, it's impossible to see the organization from different perspectives, such as different business models and accountability structures.

Having only the technical ability for a single version of truth isn't sufficient, but from an organizational perspective, it's very important that the right governance structure is in place as well. To get to a single version of truth, an organization must have a clear idea of its financial reporting requirements. The organization must also have the governance structures in place, such as business process ownership and business data ownership, to guarantee harmonized business process and ensure that data are defined and captured in a common and consistent way across all your business units. When the organization has all that governance in place, it then makes sense to have the technology as well to realize a single version of truth for finance via SAP's Universal Journal in your application landscape.

SAP ERP struggles in this area, as its financial capabilities contain multiple ledgers such as the SAP General Ledger (G/L), Cost Center Ledger, Profit Center Ledger, SAP Material Ledger (ML), and the Profitability Analysis (CO-PA) Ledger (see Figure 3.5). Due to all of these different sources of financial information, reconciliation activities are required to make sure all these ledgers are synchronized.
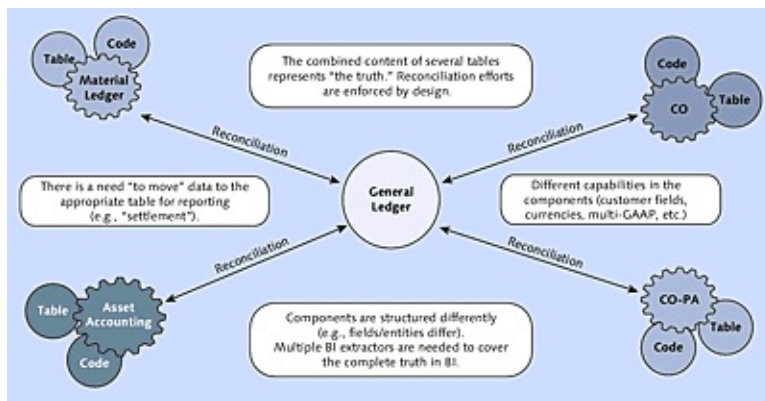
Figure 3.5 Challenge of the SAP ERP Architecture: Various Ledgers

With the introduction of SAP S/4HANA Finance, there is now just one ledger called the Universal Journal (captured in table ACDOCA) where all details can be found. As a consequence, you no longer have to consider where to report or interface your financial data from. The Universal Journal contains all this disparate data, as shown in Figure 3.6.
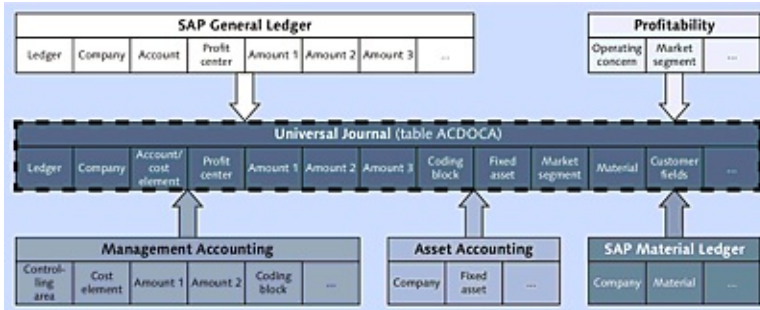
Figure 3.6   The Universal Journal Combining Information from Multiple Ledgers into One Source Table

From a technical perspective, SAP S/4HANA drives the integration of information due to its in-memory capabilities, and its columnar table structure redefines data aggregation and indexing (see Figure 3.7).
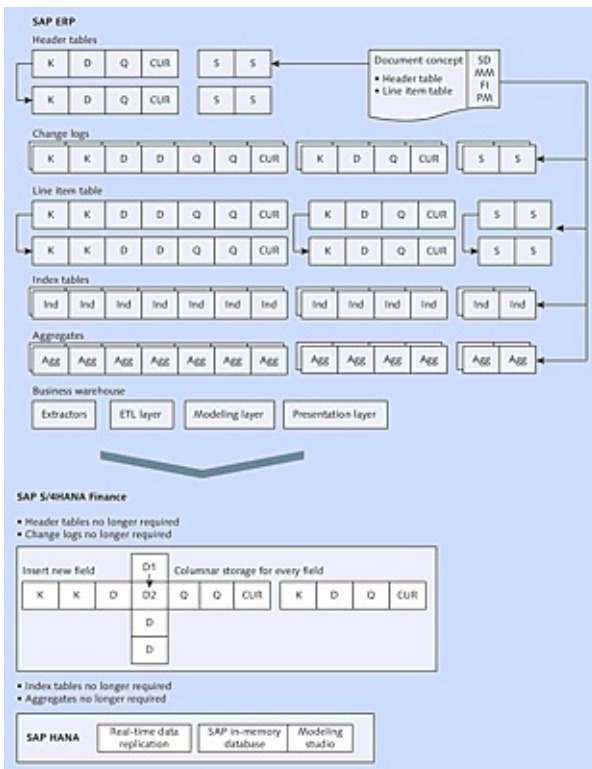
Figure 3.7   SAP S/4HANA Finance vs. SAP ERP

As shown in Figure 3.7, index tables, aggregate tables, and totals tables are no longer needed to guarantee an application's good performance. The Universal Journal is the much-desired single version of truth mentioned at the start of this section. This is a key enabler for driving the integration of information across the enterprise and an important step on the road to becoming a performance accelerator.

3.2.2   Enterprise Cost Reductions

The SAP S/4HANA capability of in-memory processing using columnar databases shortens processing time significantly and eliminates the need for running processes in batches. Processes that you would normally run at period-end due to long running times can now be run on a daily or weekly basis. Because it contains all the actual data, the Universal Journal removes the need to reconcile SAP ERP Financials (FI) and Controlling (CO) data and provides you with visibility on, for example, work in progress (WIP) in real time. These abilities enable a *soft close*, meaning that you don't have to wait to analyze your data after month-end close activities anymore, and you can analyze the data daily to steer the business. No reconciliation efforts are required because you're reporting from one single source of truth only.

Due to the speed of SAP S/4HANA processing and the shift toward soft closes, less headcount is required in the closing process. Capacity requirements are now more equally spread over the month rather than increasing dramatically at the end of the month. SAP S/4HANA Finance gives you access to very detailed data in real time, which helps you spot

out-of-line situations immediately, minimizing costs of failure. Prompt remedial action is now possible, rather than waiting until the data are available after month-end. Reporting is simplified, fast, and multidimensional, making drilldown reports almost redundant. You no longer need to run operational reporting in a separate SAP Business Warehouse (SAP BW) environment, which has a positive impact on the speed of turning data into information and thus on the operating costs.

3.2.3   Measuring Business Performance

SAP S/4HANA provides better insight during the posting period because you'll have easy access to real-time profitability on a granular level. Because the introduction of the Universal Journal simplifies data structures, you can perform end-to-end analysis and define new responsibilities in many areas, including the following:

- **Predicting the future**
  You can simulate the impact of different business models on your profitability. With a single version of truth in place and SAP S/4HANA speed, you can connect the data with external sources to anticipate the future.

- **Managing receivables**
  Having access to real-time data allows the sales and accounts receivable departments to work more closely together. Collection tasks are moved from back-office teams to sales representatives.

A sales manager with access to real-time open item data any place, anytime on his mobile device using SAP Fiori apps can discuss out-of-line situations more efficiently with customers and can document agreed-upon actions immediately. In addition, this information is visible for the accounts receivable department. SAP Fiori delivers a role-based, consumer-grade user experience across all lines of business, tasks, and devices and will be the new way of accessing SAP S/4HANA information and executing your SAP transactions.

A good example of how SAP Fiori can be used is the Process Receivables transactional app shown in Figure 3.8. Using this app, you can access a list of receivables payable by an individual customer. You can then create promises-to-pay and dispute cases. You start the app either by entering a customer number directly or by searching for a customer.

SAP S/4HANA Finance allows you to have real-time access to your cash position. There is no data latency, meaning cash managers are able to perform their tasks on the real cash situation. SAP Cash Management provides you with the following in real time:

- Financial statements

- Actual cash flow analysis

- Liquidity forecast
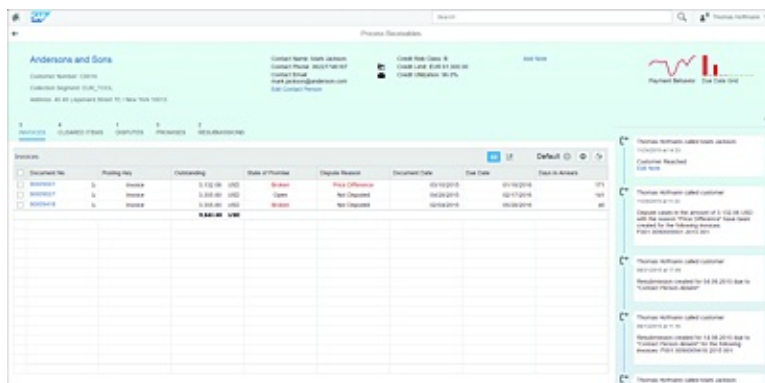
Figure 3.8 Cash Management with an SAP Fiori App

SAP S/4HANA Finance also offers a number of different SAP Fiori apps such as SAP Smart Business for Cash Management (see Figure 3.9). This app provides real-time insight into the current liquidity, forecast of 7-day cash position, 30-days liquidity, and other key figures. It also allows you to identify bank accounts with insufficient funds and to see an overview of bank risk considering the cash deposited in different banks. These features certainly make managing working capital much easier.

Figure 3.9 SAP Smart Business for Cash Management

3.2.4 Optimize Planning, Budgeting, and Forecasting

With the introduction of SAP BPC for S/4HANA Finance, a new, more user-friendly planning process is supported. In SAP ERP, you had different planning solutions for Cost Center Accounting, Profit Center Accounting, Internal Orders, and CO-PA. Reconciliation of all these solutions could cause problems and delays. SAP BPC for S/4HANA Finance provides a single tool (as depicted in Table 3.1) to plan the following elements:

- Profit and loss
- Cost of sales
- Market segments
- Profit centers
- Cost centers
- Internal orders
- Projects
- Liquidity

Profit & Loss	SAP ERP Planning Tool	SAP

Planning			S/4HANA Planning Tool
Revenue	100,000 USD	CO-PA, Profit Center Accounting, FI	SAP BPC for S/4HANA Finance
Cost of Goods Sold	60,000 USD	CO-PA, Profit Center Accounting, FI	
Gross Profit	40,000 USD	CO-PA, Profit Center Accounting, FI	
Expenses	25,000 USD	Cost Center Accounting, Internal Orders, Project Systems, CO-PA, Profit Center Accounting, FI	
Operating Profit	15,000 USD	CO-PA, Profit Center Accounting, FI	
Other Expenses	5,000 USD	Cost Center Accounting, Internal Orders, Project System, CO-PA, Profit Center Accounting, FI	
Net Income	10,000 USD	CO-PA, Profit Center Accounting, FI	

Table 3.1   Profit & Loss Planning Tool: SAP ERP vs. SAP S/4HANA

Because all this planning data will be stored in one single data structure, reconciliations are no longer needed. Another benefit is that you can apply the same validations to the planning data and that reporting will have the same look and feel. In fact, SAP created a single source of truth for financial planning as well as for finance data. Keep in mind that plan data isn't part of the Universal Journal because it contains actual data only. You still have to read two different tables if you want to run a plan/actual comparison report.

3.2.5 Continuous Finance Process Improvements

SAP S/4HANA isn't only about the speed of the database but also about the value SAP S/4HANA technology will bring to finance activities in general. SAP S/4HANA Finance allows you to run your processes faster, which enables faster planning, reactions, reporting, and analysis.

As stated earlier, SAP S/4HANA enables continuous insight into your financial figures; it allows you to shift activities from month-end to weekly or daily activities. Because FI and CO data live in one single table (ACDOCA), you can run, for example, your legal reporting and customer and market view reporting without needing to reconcile these reports. Using this single table also allows you to combine information from various areas into one report, for example, spend analysis by responsibility and P&L by market segments, along with other dimensions, such as customer and material group or WIP analysis by relevant production order and cost center. SAP S/4HANA Finance extends the reporting and analysis capabilities that were previously only possible via SAP BW reporting.

SAP S/4HANA Finance provides new functionality such as intercompany reconciliation, which is a great improvement in the financial close process as well. Intercompany reconciliation detects intercompany mismatches at an early stage, allowing you to have them corrected before the month-end close. It also does the following:

- Improves and accelerates automated matching
- Eliminates batch jobs; the real-time analysis supports the continuous intra-period process execution
- Improves user experience and enhances data drilldown to reduce the reconciliation effort
- Provides better process oversight via a new intercompany reconciliation dashboard

SAP also provides a very user-friendly goods receipt/invoice receipt (GR/IR) monitor that shows the GR for which no invoice has been posted and vice versa.

SAP S/4HANA Finance also comes with the Financial Closing Cockpit, which allows you to centrally monitor and control closing tasks; enables automation of some manual steps, transactions, programs, jobs, workflows, and remote tasks; and allows owners to collaborate effectively during the closing process. It also offers best practice closing templates to streamline the closing process and supports audits by recording the output and history of all tasks performed and who did them.

To further streamline the financial close process, SAP S/4HANA Finance also comes with the newly developed SAP Fiori app called SAP Smart Business for Financial Close (see Figure 3.10). This app provides real-time insight into the progress, quality, and financial results of the end-to-end financial close and supports respective actions.

Figure 3.10   SAP Smart Business for Financial Close

3.2.6   Provide Inputs to Enterprise Strategy

Today, companies are expected to produce more predictable financial results, eliminate surprises, and respond to market changes with more agility. To meet these expectations, finance functions have to forecast with more precision, reduce cycle times associated with budgeting and investment, and shift from a retrospective statutory reporting view to one that is more forward looking. Therefore, it's absolutely necessary to be

able to link your company's KPIs with your strategic objectives and have a system in place that can show whether you're still on the right track and provide you the information to get on track again if necessary.

SAP S/4HANA Finance offers SAP BPC for S/4HANA Finance, as well as the ability to integrate both operational/nonfinancial and financial information in a cohesive manner and to optimize the planning, budgeting, and forecasting processes. It also works with advanced analytics tools such as SAP HANA Live and SAP Crystal Reports, which are available to build real-time dashboards.

From the IBM CFO survey, we've learned that a value integrator is very successful in driving integration of information across the enterprise via a robust infrastructure with common standards, data definitions, finance processes, and planning platforms (as depicted earlier in Figure 3.2). In other words, they were able to implement a single version of truth for the financials processes.

However, finance organizations who are performance accelerators go a step further by integrating their organization's strategic, operational, and financial planning to impact the overall business performance (see Figure 3.11). SAP S/4HANA Finance can play a crucial role here because the newly introduced Universal Journal is key to that goal.
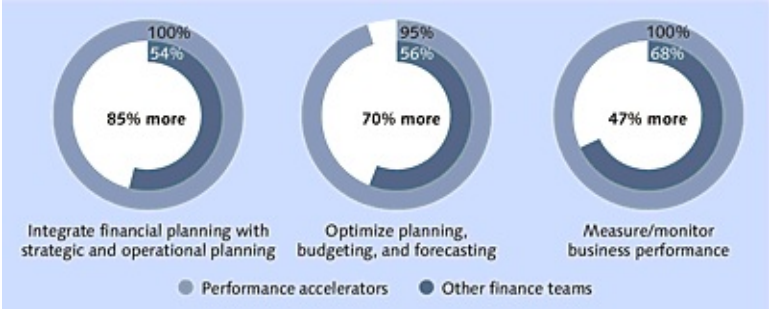
Figure 3.11   Impacts on the Overall Business Performance

Because you have easy and real-time access to your internal data via SAP S/4HANA Finance's Universal Journal, you can use this as a basis for simulating the impact on the business performance of potential new

offerings by using SAP advanced analytic tooling such as SAP Predictive Analytics. SAP Predictive Analytics allows you to evaluate opportunities for stimulating your organic growth or the potential for mergers and acquisitions as well (see Figure 3.12).
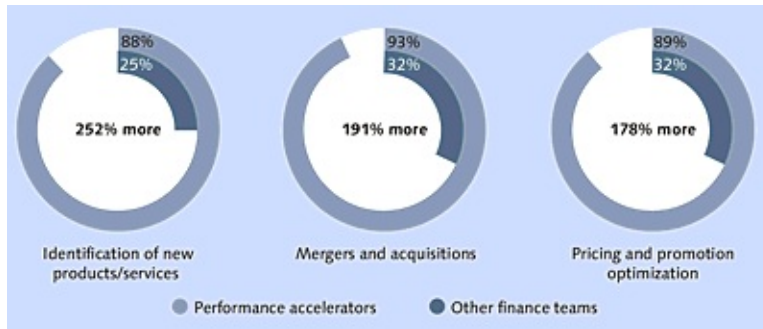
Figure 3.12   Application of SAP Predictive Analytics

SAP Predictive Analytics can provide organizations with the ability to anticipate and shape their business, their customer relationships, competitive forces, and operational aspects. It enhances organizational performance by applying advanced mathematical modeling, deep computing, simulation, data analytics, and optimization techniques by using analytical engines, data mining, and statistical models that address specific business process areas. SAP S/4HANA Finance brings greater speed and agility of decision-making, with clear links to target performance outcomes, more reliable and accurate financial reporting, and greater visibility into the levers that drive performance. By combining your own internal data organized in SAP S/4HANA Finance's Universal Journal with external data sources such as industry trends and the nature of the competition, you can better determine the most promising opportunities.

To do that, you first need to establish a data foundation and a single version of the truth for your financial processes before you can progress on your analytics journey, as shown in Figure 3.13.

Your journey starts by having the data foundation in place (e.g., a governance structure to safeguard data quality). The next step is to

establish a single version of truth that will allow you to start analyzing your data more carefully and begin applying predictive analysis more extensively to finally enter the cognitive space where systems are able to understand, reason, and learn.
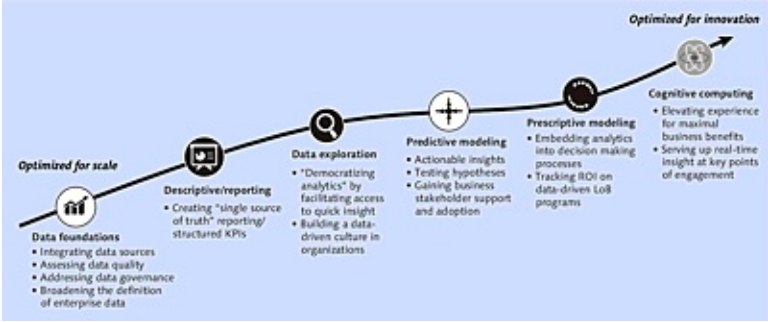
Figure 3.13   Progressing on the Analytics Journey

3.2.7   Develop Talent in the Finance Organization

Considerable skills are required to benefit from SAP S/4HANA's real-time data provision and to operate sophisticated analytical tools such as SAP Predictive Analytics. SAP S/4HANA Finance can help assess and improve business performance only with these sophisticated business analytics and the talent to interpret and use cross-functional information. However, acquiring the right technological and business know-how is only one of the issues CFOs have to deal with; many CFOs are preoccupied with more immediate challenges, such as whether their own finance teams are ready to weather the storm. Table 3.2 lists some finance workforce challenges and the opportunities available to address these challenges.

Workforce Challenge	Workforce Opportunity
Finance skills are focused on transaction processing.	Transform competencies to more value-added activities to support the evolving role of finance.
Qualified professionals are wasting effort on activities that	Refine the skill mix to focus professionals on driving business value

add less value.	and innovation.
Data analysis is performed by management.	Develop junior employees in decision support.
The finance team is globally distributed.	Enable global collaboration.
Shared services expansion or relocation eliminates local roles.	Educate and redeploy top talent into retained organization.
The implementation of SAP ERP systems eliminates roles.	Expand transformation to train and educate top talent to develop value-add capabilities.
Employee turnover is high.	Grow organically by defining new career paths.
Linear traditional career paths are eroding.	Chart multidimensional career paths to develop the leaders of tomorrow.
Employee development is informal.	Align learning and development programs to support the CFO agenda and future job roles.

Table 3.2   Finance Workforce Challenges and Opportunities

The first three workforce challenges in Table 3.2 share a common theme in terms of *high-value employees performing low value-added work*. The opportunity is to optimize talent capabilities by rebalancing who is doing what. Keep in mind that when using SAP S/4HANA Finance, many transactional activities aren't needed anymore because data are available in real time. Consequently, your workforce needs to be more focused on analyzing the data instead of preparing the data for reporting.

The next three challenges refer to how *transformation is focused on eliminating job roles and realizing full-time equivalent (FTE) benefits*. The opportunity is to invest in talent and redeploy them in the organization to make the transformation a success. When implementing an SAP

S/4HANA Finance system, you have to think about the necessary job roles for running it. As stated previously, fewer transaction processing roles will be required, but more roles will be needed in the analytical space.

The last three challenges address how *people and career paths are shifting in ways we've never seen before*. The opportunity is to define new career paths and learning programs to grow organically and prepare the workforce for the future. From the IBM CFO survey, we learned that performance accelerators are extremely focused on developing analytical talent. They understand that advancing their business insight capabilities also means keeping scarce analytical skills engaged and motivated with fresh challenges and expanding responsibilities.

In addition to sharpening their forecast accuracy, performance accelerator organizations are developing more sophisticated analytics such as complex scenario planning and predictive models. As their ability to anticipate rises, value integrators should consider embedding these predictive capabilities into operational systems to improve responsiveness at the front lines of the business. With new technology and new processes in place when using SAP S/4HANA Finance, training is typically restricted to how to use the tool to continue to perform jobs before the SAP ERP implementation—essentially focusing on efficiency versus effectiveness. You should go beyond how to use the tool or module, for example, to help develop critical thinking skills so that employees can leverage the tools to perform value-added analysis.

3.3   Key Functionalities

In this section, we'll introduce you to the most important functionalities of SAP S/4HANA Finance. Some of these, such as SAP BPC for S/4HANA Finance and the Universal Journal, have already been part of our discussion but will be fleshed out in detail. We'll also discuss the ML, the new FI-AA, SAP Cash Management, CO-PA, Central Finance, and the soft close process enabled by SAP S/4HANA Finance.

3.3.1   Universal Journal

As stated in earlier sections, one of the key features of SAP S/4HANA Finance is the availability of a single version of truth for finance in the Universal Journal represented by table ACDOCA. This table provides the following:

- One common view of financial and operational data is provided to help ensure enterprise-wide consistency and reduce reconciliation time and errors.

- Real-time data are available across all financial dimensions.

- One line item table contains full details for all applications for instant insight and extensibility.

- Data are stored only once with no reconciliation needed by design.

- Fast multidimensional reporting is available without replicating data to SAP BW.

- If SAP BW is already in place, only one extractor is needed (instead of many today) for financial data.

- From the ABAP program perspective, read access remains the same.

- SAP-provided compatibility views redirect the program to the new format in SAP HANA.

The power of the Universal Journal is that financial data that was spread over multiple tables in previous versions of SAP are now stored in just a single table. Information from FI, CO, FI-AA, ML, and account-based CO-PA is combined in one single entry in table ACDOCA to provide the benefits outlined in the preceding list. Keep in mind that costing-based CO-PA and special purpose ledger tables aren't part of the Universal Journal table. It makes a lot of sense to explore the possibilities of account-based CO-PA before activating costing-based CO-PA and to prevent the usage of special purpose ledgers because both will jeopardize the single version of truth concept.

Furthermore, as discussed in [Section 3.2.1](), you can only benefit from a Universal Journal when your organization has a clear idea of its financial reporting requirements. You must also have the governance in place to guarantee harmonized business processes and to guarantee that data are defined and captured in a common and consistent way across all business units. You can only take full advantage of SAP S/4HANA Finance when you have a single source of truth for finance, which is the single place in your system environment where all data elements required for any financial reporting are defined in a consistent way.

Having an information architecture in place can contribute greatly to realizing this single source of truth for finance because it will facilitate the discussion around all key aspects of business information by answering four key questions:

- Why should we manage information?

- What information should be managed?

- Who should manage the information?

- How should information be managed?

A concept that can help answer the question of what information needs to be managed is what we call the coding block. A coding block is what you use to document all reporting requirements of an organization. It serves

as the basis for setting up the design for the Universal Journal in SAP S/4HANA Finance. A coding block consists of business measures represented by rows and business dimensions represented by columns as shown in Figure 3.14. Measures are normally represented by the chart of accounts in your SAP system, and the dimensions are represented by posting details such as material, customer, channel, and so on. Further, it's essential to understand that not all measures need to be recorded because, for example, gross profit is a measure that gets calculated based on the elements revenue and cost of goods sold (COGS). The same applies for the measures as well. Not all dimensionality is required in the initial recording. Some of the dimensions can be derived based on the recorded elements later (e.g., by an allocation).
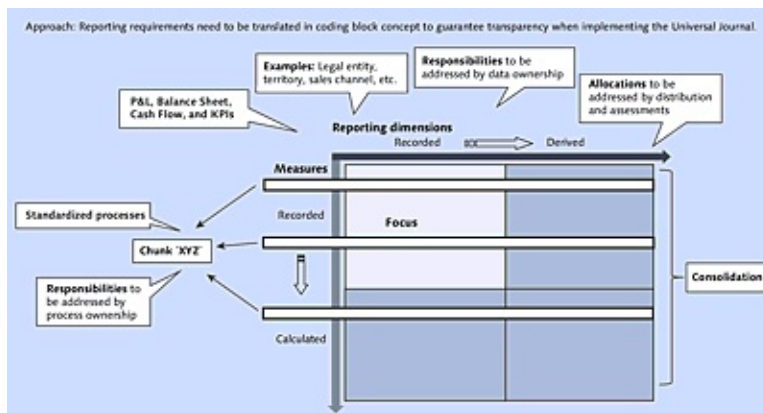
Figure 3.14   Coding Block Approach

All reporting requirements need to be broken down into this concept. All definitions should be in business terminology and not be linked to any system. For an example of a coding block, see Figure 3.15.

In Figure 3.15, you see clearly depicted the business measures and the related business dimensions. For example, the Land and Buildings account requires the following four business dimensions: LEGAL ENTITY, OPCO (operating company), REPCO (reporting company), and GENERAL LEDGER ACCOUNT.

Account	Description	Movement specifications	Chunk ID	Chunk	Glossary ID	Legal entity	OpCO	RepCO	General Ledger account	Material (master)	Material group (e.g., brand, COGS type)
									DD	DD	DD
A10100	Land and buildings	M_PPE	130	ASSETS		x	x	x	x		
A10200	Plant and equipment	M_PPE	171	ASSETS		x	x	x	x		
A10700	Other operating assets	M_PPE	163	ASSETS		x	x	x	x		
A10800	Not employed in business operations	M_PPE	151	ASSETS		x	x	x	x		
A10000	Property plant and equipment		176								
A20910	Trademarks, patents, and licenses	M_INT	211	ASSETS		x	x	x	x		
A20920	Software	M_INT	189	ASSETS		x	x	x	x		
A20930	Internal developed intangible assets	M_INT	122	ASSETS		x	x	x	x		
A20980	Intangible intercompany assets	M_IGW	119	ASSETS		x	x	x	x		
A20990	Miscellaneous intangible assets	M_INT	144	ASSETS		x	x	x	x		
A20900	Other intangible assets	M_INT	158								
A20100	Goodwill	M_INT	112	ASSETS		x	x	x	x		
A30000	Intangible assets	M_INT	118								
A30910	Non-current derivative assets		146	OTHER ASSETS		x	x	x	x		
A30920	Securities		185	OTHER ASSETS		x	x	x	x		
A30990	Miscellaneous financial assets		143	OTHER ASSETS		x	x	x	x		
A30900	Other non-current financial assets		162								
A30200	Pension assets	M_TAX	168	OTHER ASSETS		x	x	x	x		
A30100	Deferred tax assets	M_INV	95	OTHER ASSETS		x	x	x	x		
A30400	Investments in subsidiaries	M_INV	126	OTHER ASSETS		x	x	x	x		
A30600	Investments in associates	M_INV / ASS	125	OTHER ASSETS		x	x	x	x		
A30700	Loans to group companies	M_NON	134	OTHER ASSETS		x	x	x	x		
A30800	Non-current receivables		150	OTHER ASSETS		x	x	x	x		

Figure 3.15   Example of a Coding Block

Your next step is using the coding block to make a design regarding how to depict your data in SAP. As stated earlier, a coding block consists of business measures (rows) and business dimensions (columns).

Measures are split into measures to be recorded and measures to be calculated. Measures to be recorded are normally represented by the chart of accounts in SAP. Measures to be calculated are a computation of the measures that are recorded (e.g., gross profit).

Dimensions are split as well into dimensions to be recorded and dimensions to be derived. Dimensions to be recorded need to be supplied by the business transaction at recording time. For example, if we state that the revenue measure should contain customer and material as dimensions, a business transaction that triggers a revenue line should support it. If we also state that revenue should have channel as a dimension as well, and it can't be recorded at inception time, we need an allocation to get revenue at the required level of reporting via an allocation.

Dimensions can be represented by SAP's organizational structural elements (e.g., company codes, profit centers, and functional areas segments) or by master data elements in many cases as CO-PA dimensions. By plotting SAP solutions on the coding block, you can see exactly which SAP elements will be used for representing each part of

the coding block, which should clearly indicate the requirements for any business transaction feeding the coding block.

In summary, the coding block will do the following:

- Provide a "road map" for how to depict real-life organizational structures into SAP ERP organizational structural elements

- Determine what can be reported where (in which SAP module)

- Ensure consistency in mapping business requirements that relate to organizational structure elements

If you have all that preparatory work in place, it then makes sense to use technology such as the Universal Journal in SAP S/4HANA to realize a single version of truth for finance in your application landscape.

Keep in mind that the introduction of Universal Journal doesn't necessarily mean that the SAP modules needed for depicting your financial organization will change. You'll still set up FI-AA, cost centers, profit centers, ML, and CO-PA, but you'll probably switch to account-based CO-PA because under SAP S/4HANA, it's similar to costing-based CO-PA and is incorporated in the Universal Journal. The benefit of the Universal Journal is that it combines all the information stored in those various ledgers in the past into one single ledger entry. In addition, by combining FI and CO information in one table, there's no need for cost elements anymore. In SAP S/4HANA Finance, primary cost elements are replaced by G/L accounts. To support secondary cost elements as well, the G/L master record is extended by a special attribute indicating a secondary cost element

3.3.2   SAP Material Ledger

ML functionality has been present in SAP ERP for a long time as part of Product Costing (CO-PC). ML allows you to do the following in the system:

- **Parallel currencies**

  Without ML, stock values are updated in the system only in one currency. If you need to get stock reports in another currency, conversion is performed using the reporting date exchange rate. ML adds the possibility to valuate goods movements using the historical exchange rates. In SAP ERP, up to three parallel currencies can be defined in ML. Parallel currencies is a required feature for stock valuation in countries with highly fluctuated local currency or in industries with standard currency stock units.

- **Parallel valuations**

  In addition to parallel currencies, the ML can maintain several valuations. These valuations can depict stock values from different views (legal, group, profit center), and values in each valuation can differ by addition or exclusion of certain values. This feature allows you to analyze stock values simultaneously from different perspectives. It's used by global companies to have visibility on stocks from the following different perspectives:

  - Legal valuation (statutory or tax)

  - Corporate group valuation

  - Valuation for individual company segments/organizational units (profit centers)

  In total, only three combinations of parallel currencies/parallel valuations can be defined in SAP ERP.

- **Periodic actual cost**

  During the period-end, valuation of all goods movements is done with the preliminary valuation price, which is normally the standard price for produced goods and standard or moving average price for purchased materials. ML adds the feature to calculate periodic actual cost. In this case, all variances from the preliminary valuation of materials are collected in the ML. At period-end, revaluation of ending inventory and consumption can be performed with the determined actual price.

Revaluation is possible using different rules for different valuations.

ML functionality used to be an optional feature in SAP ERP and was activated in the system only if one or several of the previously mentioned features were required. In this case, one or several ML features were activated with the respective configuration and process adjustments. This led to a vast number of different approaches to ML usage.

Because ML was an optional component, it used a fully separate set of tables to store data. This led to two historical disadvantages for ML:

- Need to reconcile values between ML and other functional components (most notably FI and Materials Management [MM])

- Absence of a comprehensive reporting tool for different material valuations because data was distributed among FI tables, MM tables, and ML tables

In SAP S/4HANA Finance, on the other hand, the goal is to have a single point of truth for the data with the ability to drill down to the required level of detail when needed. To achieve this task, the table setup must be clear and simple without data duplication and distribution. Historical ML setup didn't match the new concept because it was a rather complex separate module with its own tables. Therefore, SAP S/4HAHA Finance introduced a single common solution for material valuation. This solution consists of mandatory ML functional components together with architectural changes.

With mandatory usage of ML, it's no longer necessary to store values in inventory valuation tables (e.g., `EBEW`, `EBEWH`, `MBEW`, `MBEWH`, `OBEW`, `OBEWH`, `QBEW`, `QBEWH`) in the xBEW(H) namespace. Therefore, in SAP S/4HANA Finance, these tables are no longer updated to store transactional figures and only contain material master data attributes. This leads to higher data integrity and higher throughput.

Contents of ML tables `MLIT`, `MLPP`, `MLPPF`, `MLCR`, `MLCRF`, `MLCD`, `CKMI1`, and `BSIM` are now stored in table `ACDOCA`. For materials that aren't relevant for

actual costing, ML tables MLHD, MLIT, MLPP, MLCR, and MLCD aren't updated anymore; instead, values are updated in table ACDOCA. For materials that are relevant for actual costing, tables MLHD, MLIT, MLPP, MLCR, and MLCD are updated (see). To get the full picture of material valuation for both types of materials, compatibility views are used, which read from both tables.

The main ML features are updated and work in the following way in SAP S/4HANA Finance:

- **Parallel currencies**
  In SAP S/4HANA Finance, a single currency setup must be used across all finance components: FI, CO, and ML. This single currency setup is defined once and used in the Universal Journal for all financial transactions. This provides a single view on material valuation and uses common reporting tools that are linked to the same table structures.
  As of SAP S/4HANA release 1605, up to 10 currencies per ledger can be defined. Two currencies are always defined in the system—local currency and global currency (controlling area currency)—and the other 8 can be defined based on customer requirements.
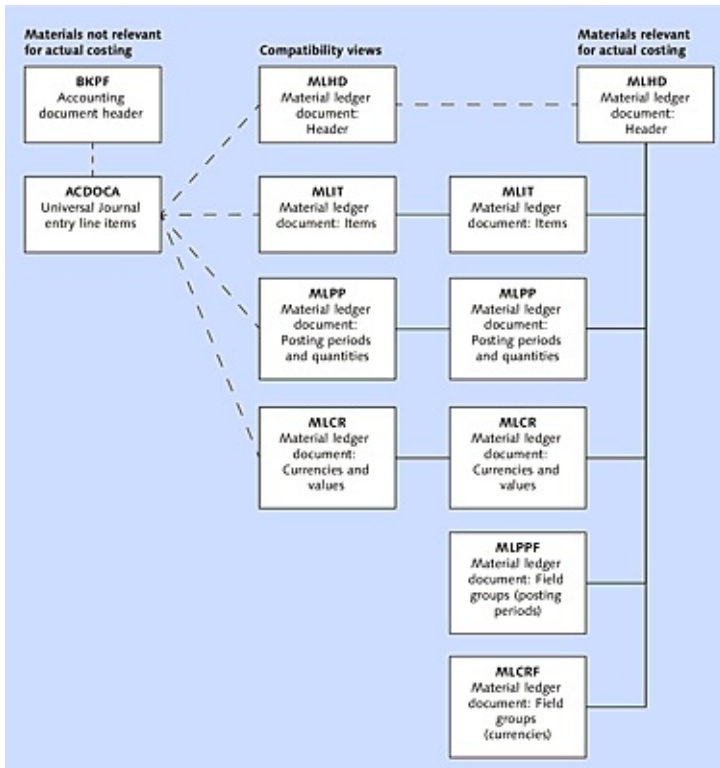
Figure 3.16 SAP Material Ledger Tables

- **Parallel valuations**
  Due to changes in finance table architecture, the parallel valuation approach was redesigned in SAP S/4HANA Finance. The first solution to cover parallel valuation is delivered as part of release 1605 together with a solution to store additional currencies. Still, up to three valuations (i.e., legal, group, profit center) can be defined in the system. They can be assigned to a single ledger (in this case, the multivaluation ledger), or a specific valuation can be defined for a single ledger (in this case, the parallel valuation using single valuation ledgers).

- **Periodic actual cost**
  Periodic actual cost is an optional feature of the ML in SAP S/4HANA Finance that can be used if the requirement to calculate periodic actual cost is in place.
  The main concern many have about using the ML is that the closing schedule will be complicated due to actual cost calculation steps. If

actual costing isn't used, then the ML has no impact on closing or operational processes. Therefore, companies not using the ML currently and that have no requirement to calculate periodic actual cost won't need to update their closing schedules and modify accounting policies.

3.3.3   New Asset Accounting

SAP released the new Asset Accounting (new FI-AA) for the first time in SAP ERP 6.0, EHP 7. However, to use the new FI-AA, you had to activate business function `FI_AA_PARALLEL_VAL` and then also activate new FI-AA.

In SAP S/4HANA Finance, new FI-AA is mandatory. There is no choice of using the classic FI-AA functionality, and migration steps are incorporated into the SAP S/4HANA Finance migration. Data from classic FI-AA tables `ANEK`, `ANEP`, `ANEA`, `ANLP`, and `ANLC` are now stored in table `ACDOCA` and can be retrieved online. There are also other technical adjustments to reduce the number of different sources of data storage and simplify reporting for FI-AA.

In classic FI-AA, periodic processing was used in the following places:

- **Periodic postings for parallel depreciation areas**
  Only one depreciation area posted values in real time, while values from parallel depreciation areas could be posted only periodically. This caused reconciliation issues and required additional steps during closing.

- **Depreciation postings**
  These postings were also made on a monthly basis.

The main shift in SAP S/4HANA Finance is to move from batch processing to online processing. The goal is to perform as many process steps as possible not during the closing but during the period-end (this is a soft close, which is discussed in more detail in Section 3.3.8). In the

new FI-AA, this is achieved to some extent with a new configuration setup for depreciation areas. In SAP S/4HANA Finance, it's not only the leading depreciation area that posts its values to the G/L online but also other depreciation areas. This feature eliminates reconciliation issues between fixed assets and the G/L and also increases transparency between depreciation areas and accounting principles. Several changes to the posting logic have been made that also improve transparency.

The depreciation posting logic has also undergone changes. There are multiple changes on the selection screen of the program, as follows:

- Multiple company codes can now be executed at the same time.

- Depreciation postings are allowed even if some assets aren't complete.

- Depreciation postings are now at the asset level.

The last bullet point should reduce the reconciliation effort significantly and provide seamless reporting capability for all accounting principles. At the same time, the number of line items increases proportionally to the number of parallel accounting principles.

There are also other minor improvements and restrictions in the new FI-AA compared to the classic FI-AA. These influence both the technical implementation and process change in SAP S/4HANA Finance and need to be analyzed prior to migration.

3.3.4   SAP Cash Management

Cash management processes were supported by SAP ERP prior to SAP S/4HANA Finance. Functionality was distributed between SAP ERP functional components such as Bank Accounting (FI-BL) and SAP Financial Supply Chain Management (SAP FSCM) and wasn't focused on supporting central cash management and distributed processes.

With a strong business direction to move to central cash management, there was a need for an integrated product that would support integrated

group and subsidiary cash management processes. SAP introduced SAP Cash Management powered by SAP HANA (hereafter, SAP Cash Management) to address this requirement. This functionality changes the way companies can manage cash using SAP functionality and provides a set of functional innovations to support that.

SAP Cash Management works only using the new SAP Fiori user interface (UI). There is no option to use new functions via the SAP GUI. SAP Cash Management consists of several functional components— Bank Account Management, Cash Operations, and Liquidity Management—that support business requirements.

Bank Account Management

SAP Cash Management offers a new approach to manage bank accounts centrally. This functionality is called Bank Account Management and offers the following main features:

- **Management of bank accounts hierarchy**
  Bank accounts are presented in a hierarchical way in Bank Account Management and are easily accessible by the central cash manager. Bank and bank account masters are master data and no longer Customizing data. Bank accounts can be easily grouped for cash pooling and reporting purposes.

- **Approval process for creating, changing, and closing bank accounts**
  The bank account managing process is now more business-oriented rather than IT-based. Approval flows are seamless and easy to maintain and execute with no need to perform configuration steps. This includes also setting defined fields, which can be maintained only after specific approval is obtained.

- **Cash position analysis on bank accounts instead of G/L accounts**
  There is no longer a need to check the balance of your G/L accounts

representing your bank accounts, but you can refer to the bank account itself.

- **Additional account attributes linked to bank account master data**
  Account attributes are now part of bank master data and bank account master data.

- **Integrated cash pooling and cash concentration functionality**
  This functionality is simplified and integrated into the bank account hierarchy.

For customers who don't want to use the full scope of the new features offered by SAP Cash Management, it's possible to use Bank Account Management Lite. It doesn't include workflow-based governance for opening, closing, and changing accounts; payment signatory; overdraft limit; review process; remote bank account support; bank hierarchy view and bank account group view; and bank contact person functions.

Cash Operations

SAP Cash Management offers a new set of features to support daily cash operations. The following features are accessible via the new SAP Fiori UX and are designed to support the overall concept of central cash management:

- **Overall monitoring of bank statements**
  Monitors whether bank statements imported successfully.

- **Daily cash forecasts**
  Provides forecast of today's closing balance.

- **Bank risk analysis**
  Analyzes deposit distribution in terms of bank ratings and identifies deposits in high-risk bank accounts.

- **Bank transfers and payments initiation**
  Makes bank transfers.

- **Approving and monitoring payments**
  Approves payments or bank transfers.

In the past, these features were actually part of FI-BL and SAP FSCM modules. Now they are combined under a similar UI and share a similar governance concept. In addition, a set of predefined analytical apps from the initial SAP Fiori launchpad provides an instant outlook over the company cash status and trends. From the top-level analysis, it's possible to drill down to the account and line item level. The SAP Fiori UX offers more analytical possibilities than the SAP GUI.

Liquidity Management

Reliable cash forecasts play a critical role in business operations. Sufficient cash must be available to support daily operations, and, at the same time, there must be no excess cash lying in bank accounts uninvested.

SAP addresses the liquidity planning and management topic with the new Liquidity Management functionality that is part of SAP Cash Management. It provides features to create and manage the liquidity plan of a company and compare actual figures against the plan.

As with all new SAP Cash Management functionalities, Liquidity Management is designed to support a centralized cash management process. The entire process is controlled by the embedded SAP BPC engine and can be enhanced using its features. By default, it supports standard planning techniques such as the following:

- Creating the plan based on reference data

- Auto filling with reference or plan data

- Adjusting currency and hedging

- Tracking plan data entered by subsidiaries

Cash management processes within SAP S/4HANA can be integrated with the corporate workflow so that notifications are sent via e-mail to update or review the plan. The group cash manager can control the status of the cash forecast entered by subsidiaries. Entered forecasted data can be seen in planning reports to analyze cash sufficiency levels and adjust cash forecasts if needed. The system issues alerts if there are significant differences in the current plan as compared to the previous plan.

Based on the actual posted data, you can get an overview of daily cash inflows and outflows and analyze them for past weeks and months. Data are provided via the common SAP Fiori app with the ability to drill down to a detailed level.

In SAP S/4HANA Finance 1605, some enhanced functionalities were introduced in the following areas:

- Cash position details
  - Multiple day view in one page
  - More dimensions (planning level, G/L account, summarization term, planning group)
  - Ability to personalize the layout for analysis
  - Simplified backend for better performance
- Bank Account Management
  - Improved usability for countries only using International Bank Account Number (IBAN)
  - Easier configuration of field status groups
- Liquidity Management
  - Preconfigured Liquidity Forecast Details app
- One Exposure from Operations

- Integration with SAP ERP Materials Management (MM) and Sales and Distribution (SD)

These functions will also be included in SAP S/4HANA 1610.

3.3.5 SAP BPC for S/4HANA Finance

In the past, the planning process was performed mainly outside of the SAP ERP system, and ready-to-use data was uploaded to SAP ERP using the data structure of the respective functional component. As there are very different planning areas and respective data structures, this was usually done outside the system.

SAP BusinessObjects Planning and Consolidation (SAP BPC) is one of the products used to support planning. Along with common integration direction, the planning function is moving to a new integrated concept in SAP S/4HANA Finance, which is called SAP BPC for S/4HANA Finance. This offers an alternative to classic planning capabilities within the FI and CO modules. Along with UI improvements, this solution enables you to access actuals data and master data directly in SAP ERP without data replication. This integration eliminates some reconciliation issues and integrates finance processes within the company.

From the user interaction perspective, all planning activities can be accessed by a Microsoft Excel frontend to provide a common way of working and viewing planning data. There are no longer silos for the planning data such as planning in CO-PA and planning for cost centers or profit centers because all planning data are contained in a real-time InfoCube of the local SAP BW, which is optimized for SAP HANA. Actual data and master data are accessed directly in real time without any replication that would be necessary in a standalone SAP BW.

3.3.6 Profitability Analysis

SAP has made a clear statement with SAP S/4HANA Finance that the future direction of Profitability Analysis (CO-PA) is account-based CO-PA. This follows SAP's plan for simplification and integration of SAP S/4HANA and the overall SAP solution portfolio. Functional gaps, which differentiated costing-based CO-PA in the past, are now incorporated in account-based CO-PA. Additional developments for account-based CO-PA will soon shorten the functional gaps with costing-based CO-PA that are still in place today.

The main decision factor regarding which functionality to select must be whether you need a common and integrated profitability model or a more separate tool to calculate and analyze profitability. While account-based CO-PA is tightly integrated with FI and is always reconciled, this could be undesirable in some business environments. In such environments, costing-based CO-PA is still a valid option.

In this section, we'll take a look at the two types of CO-PA before jumping in to how SAP S/4HANA has affected a number of CO-PA processes: COGS postings, valuation, top-down distribution, and production variances. We'll end with a brief look at some of the new quantity fields.

Costing-Based and Account-Based Profitability Analysis

As stated previously, there are two types of CO-PA possible in SAP:

- **Costing-based CO-PA**
  This type groups costs and revenues according to value fields and costing-based valuation approaches, both of which you can define yourself.

- **Account-based CO-PA**
  This type is organized in accounts and uses an account-based valuation approach.

You select CO-PA types during the Customizing of the operating concern in SAP. You can even select both of them to be run in parallel, but fully

parallel implementation is hard to achieve because all assignments, allocations, and reports are defined individually per CO-PA type. Parallel implementation places a heavy burden on system maintenance and creates big reconciliation problems without really adding much business value.

As a result, in the past, SAP's recommendation was to use costing-based CO-PA as a main tool with account-based CO-PA activated for reconciliation purposes with FI. Additionally, there were functional gaps that made using costing-based CO-PA preferable to account-based CO-PA.

In SAP S/4HANA, additional functions are available in account-based CO-PA that were previously only possible in costing-based CO-PA. Of course, new functionality isn't a copy-paste of what was done in costing-based CO-PA because CO-PA must still be reconciled with FI.

In addition to new functional features, there are also architectural changes in SAP S/4HANA Finance. To keep constant reconciliation between FI and CO-PA, fields from CO-PA are now part of table ACDOCA. Account-based CO-PA and FI are now updated at the same time during the postings, which eliminates the need for reconciliation between these functional components.

With the addition of CO-PA fields to table ACDOCA, now it's possible to derive them during any P&L posting using the CO-PA derivation tool (Transaction KEDR). This allows you to derive certain characteristics in real time, instead of waiting for period-end closing.

Cost of Goods Sold Postings

There is a timing difference between COGS postings to FI and costing-based CO-PA. Posting to FI is done at the moment a finished good is issued from the stock, whereas posting to costing-based CO-PA is done at the moment of billing. COGS in CO-PA is derived from the VPRS

condition (representing the COGS item) in the billing document or from a standard cost estimation using a CO-PA valuation. In the second case, you can split COGS based on standard cost estimate cost components and put them into different value fields. In FI, COGS is derived on the other side from the material valuation view of the sold good.

The main disadvantages of this timing difference are the following reconciliation problems:

- What if the good is issued from stock, but the invoice isn't issued yet?

- What if the VPRS condition isn't correctly maintained in the SD pricing?

- What if the return of sold goods is performed in a different period?

All costing-based CO-PA business and technical issues pile up until the end of the month, and then the results could hardly be reconciled. This resulted in companies writing big manuals on how to track and handle different types of differences and introducing complex business controls.

Since SAP ERP 6.0, EHP 4, the system could post values to costing-based CO-PA at the moment of goods issue. Not a lot of companies use this function because of the following restrictions:

- There is no possibility to split COGS down to cost components.

- Not all characteristics available during goods issue are compared to billing; therefore, the profitability segment for COGS isn't posted to the same level as revenue.

In SAP S/4HANA Finance, SAP introduced a new function for account-based CO-PA, which is intended to solve the first problem in the preceding list. Now it's possible to split COGS based on the cost components of the standard cost estimate and post this split to different G/L accounts. Posting is done at the moment of goods issue, so values are always reconciled between FI and CO-PA.

This is similar to CO-PA valuation based on the standard cost estimate in costing-based CO-PA. The difference here is that values are posted to

accounts (as there are no value fields in account-based CO-PA).

The following restrictions remain, however, compared to costing-based CO-PA:

- Only one cost component structure assignment is possible; otherwise, double postings would result.

- There's no possibility to perform revaluation of cost components based on the actual price from the ML. Posting is done to one COGS account in this case. SAP promises to deliver this function later.

Because posting is performed at the moment of goods issue in account-based CO-PA, it's not posted with the same analytical details as a document from billing because CO-PA characteristics are derived from the sales order.

In addition, when you avoid differences between COGS values in FI and CO-PA, you receive differences between the billed quantity (revenue) and sold quantity (COGS) at the same time. In costing-based CO-PA, these were the same figures by definition. In account-based CO-PA, these can be different because they come from different sources.

Valuation

The valuation function is, to some extent, utilized by most of the companies using costing-based CO-PA. In simple cases, this function allows you to split COGS according to cost components of standard or actual cost estimates. We touched upon this function in the previous section and showed that in SAP S/4HANA Finance, this function is realized for account-based CO-PA.

A more complex valuation solution in costing-based CO-PA can be realized using the conditions and costing sheets. This functionality allows you to build dependencies between posted values to CO-PA and generate additional postings based on user logic. This is sometimes used

for value field corrections, transfer prices treatment, and intercompany cases. The problem is that these additional CO-PA postings aren't depicted in FI and therefore pose reconciliation issues.

In SAP S/4HANA Finance, valuation functionality isn't available for account-based CO-PA. If there is a requirement to generate additional postings, they must be configured and created in SD and/or FI and only from there moved to CO-PA. This is possible because the SD pricing procedure uses similar functions to CO-PA costing sheets. Of course, this method requires more complex SD Customizing and additional G/L accounts, but, in the end, you'll receive more reconciled results.

For postings in FI, there is no such functionality as costing sheets, and additional postings must be generated using different methods. However, the underlying concept remains that there must be no postings in CO-PA that aren't reconciled with FI.

Top-Down Distribution

There has always been a long-lived misunderstanding that top-down distribution wasn't allowed in account-based CO-PA. Actually, top-down distribution is available in account-based CO-PA, but the processing instruction differs compared to costing-based CO-PA, as there are no value fields in account-based CO-PA. When you select the VALUE FIELDS tab in Transaction KE28 for account-based CO-PA, you won't find the expected value fields and accounts (see Figure 3.17). You must select the value in the object currency and then combine it with the cost elements that store your revenues, for example, to make your distribution. That is a little bit more difficult than directly accessing one of the 200 value fields, but you can definitely set up a selection logic to pick up the reference data you need to make the distribution.

Figure 3.17 Top-Down Distribution Value Fields

Therefore, top-down distribution isn't really a differentiator of costing-based CO-PA because this function can be used in account-based CO-PA as well.

Production Variance Allocation to Profitability Analysis

In costing-based CO-PA, it's possible to transfer production variances from variance calculations to CO-PA and segregate different variance types by different value fields. This functionality wasn't available previously in account-based CO-PA.

In SAP S/4HANA Finance, you can now post production variances to different accounts based on the different variance categories. These accounts are then taken up to account-based CO-PA. Customizing is similar to the FI transfer structure, which is used for the same function in costing-based CO-PA (see Figure 3.18).

Figure 3.18 Detailed Price Difference Accounts

Additional Quantity Fields

It's a common business requirement not only to store the sales order quantity for financial analysis but also to convert the quantity into the Unit of Measure (UoM) that is common across the product lines. Historically, in financial reporting, only quantities such as invoice quantity and delivered quantity are stored. This applies also to account-based CO-PA, where quantities from FI are used.

In costing-based CO-PA, you can define additional value fields to store additional quantities and define rules on how to derive such quantities.

In SAP S/4HANA Finance, it's possible to define up to three additional quantity fields in the Universal Journal. The result is similar to what you could achieve with additional quantity value fields in costing-based CO-PA (see Figure 3.19).

Figure 3.19 Customizing Additional Quantity Fields in Table ACDOCA

In addition, a BAdI is available in SAP S/4HANA Finance that allows you to influence UoM conversion as in costing-based CO-PA.

3.3.7 Central Finance

One of the implementation scenarios for SAP S/4HANA Finance is the Central Finance scenario. For customers that see the benefit of the new functionalities of SAP S/4HANA Finance but aren't able to upgrade their legacy systems to SAP S/4HANA because they have a hybrid multi-ERP system landscape or such an upgrade would be too complex, costly, or time-consuming, SAP offers Central Finance as a deployment option.

This section explains the concept of Central Finance and how organizations can benefit from SAP S/4HANA Finance features such as real-time central reporting based on the Universal Journal, the new user experiences via SAP Fiori, and the improved functionalities under SAP S/4HANA Finance without disrupting the existing application landscape.

The concept of the Central Journal (see Figure 3.20) is that legacy ERP systems (SAP and non-SAP) are connected via an SAP Landscape Transformation Replication Server (SAP LT Replication Server) to an SAP S/4HANA Finance system that acts as the central repository for financial data. SAP LT Replication Server handles both the initial load and the new financial transaction updates.
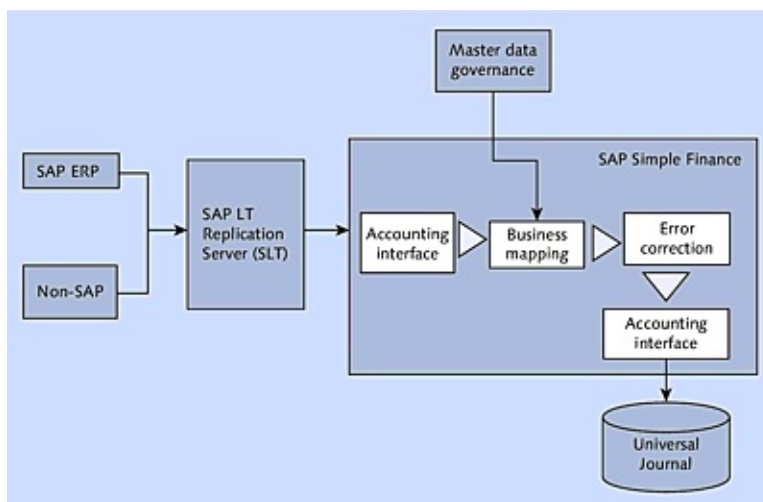
Figure 3.20 Central Journal Concept

In a little more detail, the process works as follows:

- Data (master data and transaction data) is replicated in real time from legacy systems to a central system via a Central Finance accounting interface using the SAP LT Replication Server.

- Centralized data structures (e.g., common central chart of accounts, single central controlling area, single central operating concern) are set up in the central system. SAP Master Data Governance (SAP MDG) can support data harmonization in the central system on an ad hoc basis.

- Business rules and mappings are set up in the central system to convert and harmonize incoming data from legacy systems.

- The SAP S/4HANA Finance internal accounting interface transfers harmonized data to the format of the Universal Journal entry in the SAP HANA database.

- The Universal Journal entry database in SAP HANA is then the underlying data platform on which SAP S/4HANA Finance operates.

By applying this scenario, source systems are untouched and continue to work as before. You can then use the following functionalities to leverage SAP S/4HANA Finance capabilities:

- Real-time replication of FI and secondary CO postings from several source systems into a central SAP S/4HANA Finance system

- Document drill back to the original FI document in the source system

- Replication of cost objects (production orders, product cost collectors, and internal orders) from source systems to the central system

- Mapping functionality for harmonization of master data before posting into Central Finance

- Access to existing master data mapping from SAP MDG (optional)

- Centralized error handling with the error correction and suspense tool

The key element in this Central Finance scenario is the Universal Journal. As stated before, to realize the single version of truth for finance, it's very important that an organization have a clear idea of its financial reporting requirements. Next the organization must have the governance in place to guarantee that business processes are harmonized and that data are defined and captured in a common and consistent way across all business units. Central Finance offers you an implementation scenario with the following characteristics:

- Headquarters can establish a single source of truth for getting more financial insight into what's happening in the company with a higher data quality due to built-in SAP ERP validations.

- You can harmonize your master data on the fly in the central system without having to do a large harmonization project throughout your entire system landscape (e.g., common central chart of accounts, single central controlling area, single central operating concern).

- You can establish a financial data warehouse that is updated in real time and fully reconcilable because it shares the same transactional data model as the source system (in contrast to SAP BW).

The Central Finance scenario can also offer you the following:

- The benefit from the flexibility and speed of reporting of SAP Accounting powered by SAP HANA (G/L, P&L, CO-PA)

- The ability to report your P&L on any dimension (e.g., down to the product level)

- The advantage of new reporting capabilities of SAP S/4HANA Finance (SAP BusinessObjects Analysis, edition for Microsoft Office, and SAP BusinessObjects Design Studio)

- A central place to prepare your consolidation and perform adjustment postings and allocations

For the future outlook of functionalities provided by Central Finance, see
[Section 3.6](#).

3.3.8   Real-Time Data and Soft Close

As stated previously, SAP S/4HANA Finance enables continuous insight
into your financial figures in real time via the Universal Journal, which will
have a huge impact on the financial closing process. One key feature of
the Universal Journal is that it brings together FI and CO data in one
single table. In SAP ERP, there was a strict border between the FI tables
and CO tables that caused reconciliation issues between these tables
and caused CO-related data (e.g., WIP) not to be visible in FI until, for
example, a production order was settled at month-end.

Now because all data for FI and CO are stored in table ACDOCA, WIP is
visible immediately, which means financial reporting on WIP can be done
anytime, anyplace, and anywhere. The settlement still must be run at
month-end, but this will only be a kind of technical step now because all
reporting on WIP won't be dependent on the settlement anymore.

The same applies for profitability-related data. In SAP ERP, a derivation
rule had to be applied to get profitability data on the required level of
detail, and this data was only available in CO. Now derivations are done
on the spot and will make daily reporting on profitability possible. In
addition, because all CO data are stored in one table, integrated
reporting over these modules is possible.

Another example is that table ACDOCA combines ledger and subledger
data in one table as well. The impact for fixed assets accounting is that,
for example, all information around planned depreciations is visible in real
time as well, so you don't have to run the monthly depreciation to have
the accumulated depreciation values available for financial reporting. This
information will have the correct cost center assigned to it as well, so the

information needed for cost center reporting is also available immediately.

The consequence of this is that many activities that were traditionally done as part of the month-end close process aren't needed anymore or shift to a process during the month, which enables soft closes. Financial reporting is heavily impacted by this because most of the month-end reports can be run on a daily basis now. This will have an effect on your financial workforce as well. A lot of activities in the past were based on transactional activities, meaning preparing the data to run a financial report at month-end. Because the data are already available in real time now, you no longer need people who can transact the data but people who can use this data to perform predictive analysis.

In the example of a traditional close shown in <u>Figure 3.21</u>, note the following challenges:

- Multiple batch run dependencies
- Batch processing bottlenecks delaying downstream activities
- High effort for correcting errors
- Solving complex issues delayed until post-close
- Solutions made under extreme time pressure
- Delayed visibility on reporting
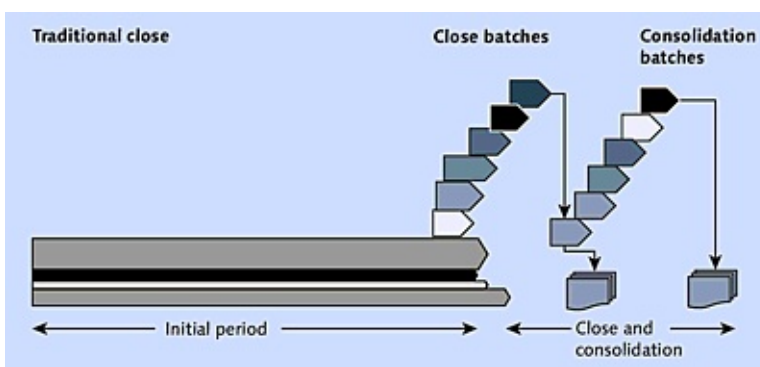
Figure 3.21   Traditional Financial Close

SAP S/4HANA Finance improves this in the following ways, as depicted in Figure 3.22.

- Elimination of batch jobs bottlenecks

- Continuous intercompany reconciliations

- Continuous financial reporting visibility

- Automation of routine tasks

- Full management visibility of the closing task by providing an SAP Fiori Financial Closing app
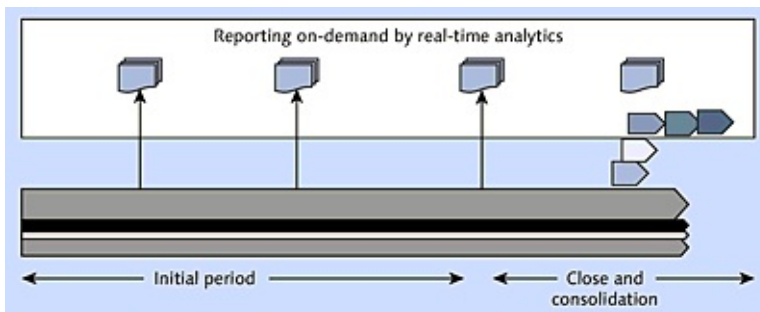
Figure 3.22   Financial Close with S/4HANA Finance

3.4 Maturity and Release Restrictions

When discussing SAP S/4HANA Finance release restrictions, we need to make a distinction between the different versions of SAP S/4HANA Finance. Released in March 2015, the add-on version was called release 1503. This version only contained simplifications for finance and didn't change the logistics part. Logistics was simplified with the introduction of the SAP S/4HANA core that was released in November 2015 and called release 1511. This release not only simplified the finance part on the same level as in release 1503, but also simplified the logistics part as well. Keep in mind that the 1503 and 1511 releases are two different products and run on different code lines. While these two code lines are integrated in the 1610 release, you do need to handle them separately in earlier versions.

In May 2016, SAP launched release 1605 for SAP S/4HANA Finance. This version removes some of the release restrictions that applied for finance mainly in the currency and valuation area. It provided no solution for the restrictions provided in the SAP S/4HANA core version. Consequently, the SAP S/4HANA migration programs wouldn't support the migration of your SAP ERP system if you were hitting these restrictions. This should be fixed in the 1610 release.

> **Note**
>
> For more information on adopting SAP S/4HANA and what restrictions may apply to your organization, see Chapter 9.

Regarding the maturity of the product, we don't necessarily need to make a distinction between the two different versions. SAP S/4HANA Finance was the first to become available, and it took almost half a year (two support packs) to mature. Therefore, the SAP S/4HANA core release got these fixes from these support packs as well. When looking at the

maturity from a bug fix perspective, the system is stabilized. If we look at other aspects of the maturity, we consider SAP S/4HANA Finance not to be fully mature yet. Following are some areas where improvements can still be made:

> **Note**
>
> Note that the following items are speculation on the part of the authors. While we may see all of these changes in future releases, we may also see none.

- **Table ACDOCA architecture**
  Table ACDOCA may be only the first step to realizing a single version of truth. Although table BSEG for handling open item management and table BKPF for storing header data information are still used, they could have been part of table ACDOCA as well. Further, the fact that the SAP BPC for S/4HANA Finance solution isn't storing its data in table ACDOCA because the table is only used for storing actual data and not plan data jeopardizes the single version of truth concept. Just by adding a simple indicator, you could select actual data or plan data in the same table ACDOCA as well.

- **SAP Cash Management reporting and liquidity forecast**
  SAP Cash Management isn't using table ACDOCA in full. When planning items, a different set of tables is used. An improvement could be made by storing all relevant items for FI and SAP Cash Management (plan and actual) in a single table to guarantee the single version of truth concept.

Depending on the SAP S/4HANA release, the Universal Journal might have some release restrictions regarding currencies and transfer pricing as well. As depicted in [Figure 3.23](#), SAP supports two different code lines for on-premise—SAP S/4HANA Finance and SAP S/4HANA Enterprise Management—both with their own release strategies.
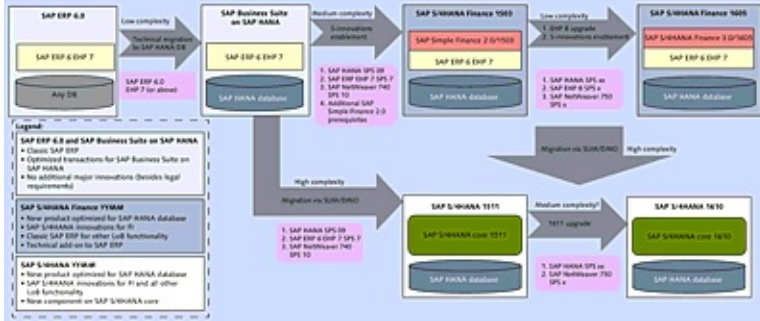
Figure 3.23 SAP S/4HANA Support for Two Code Lines: SAP S/4HANA Finance and SAP S/4HANA Enterprise Management

The SAP S/4HANA Finance edition had a new release in May 2016 called 1605 that resolved most of the existing release restrictions in FI. These release restrictions were related to currency support and transfer pricing. In SAP ERP, the currencies and associated currency types listed in Table 3.3 were supported. By activating parallel ledgers in FI, you could support up to three different currencies. In CO, there were only two, and the ML supported three different currencies.

FI (Table BSEG)	Local Currency	Second Local Currency	Third Local Currency
CO (table COEP)	Local object currency	CO area currency	–
ML	Local currency	Second ML currency	Third ML currency

Table 3.3 Currency Support in SAP ERP

By the introduction of SAP S/4HANA, all these ledgers were integrated in the Universal Journal that supported three currencies only:

- Local currency
- Global currency
- First free currency

The first currency was used to represent the local currency, the second to represent the global currency, and a third currency that was freely definable. However, multinational groups that need to report profitability for the group in total as well for their individual units normally require up to three different perspectives—legal, group, and profit center views—to support transfer pricing via the ML. The Universal Journal setup can't support that concept because it only has one currency, so related currency type was left and three currency fields were needed.

In SAP S/4HANA Finance 1605, this problem has been resolved. Now, next to the local and global currency, the Universal Journal supports eight freely definable currencies per ledger:

- Local currency
- Global currency
- First free currency through eighth free currency

This enables support for the previously supported currency types from the ML as well as taking away the existing release restrictions for on-premise deployments of SAP S/4HANA Finance.

Furthermore, there are two options available for storing multiple valuations in FI. One is the approach where every valuation is stored in a separate ledger, a parallel single valuation ledger, so that there is a clear separation of postings and reportings on a specific valuation (see Figure 3.24).

Ledger	Company	CURTP (local)	CURTP (global)	CURTP1	CURTP2	
OL	1000	10	30			Legal view
GR	1000	11	31			Group view
PC	1000	12	32			Profit center view

Figure 3.24 Currency Support in SAP S/4HANA Finance 1503 and SAP S/4HANA Enterprise Management (Parallel Single Valuation)

The other is that multiple valuations are stored in a single ledger, the multivaluation ledger, as shown in Figure 3.25.

Ledger	Company	CURTP (local)	CURTP (global)	CURTP1	CURTP2	CURTP3	CURTP4
GL	1000	10	30	11	31	12	32

Legal view — Group view — Profit center view

Figure 3.25   Currency Support in SAP S/4HANA Finance 1503 and SAP S/4HANA Enterprise Management (Multivaluation)

These currency and ledger functionalities will be added to the SAP S/4HANA Enterprise Management 1610 release as well.

3.5   Business Case

Before you decide to move to SAP S/4HANA Finance, you must consider the elements that will underpin the business case for SAP S/4HANA Finance (Figure 3.26).
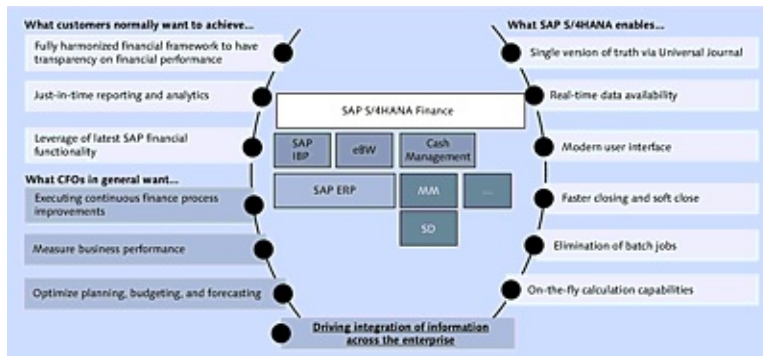
Figure 3.26   The Business Case for SAP S/4HANA Finance

Some points that can help the business case for moving to SAP S/4HANA Finance are as follows:

- As indicated in Section 3.2, SAP S/4HANA Finance will be a boost for organizations looking to become performance accelerators. SAP S/4HANA Finance is focused on enabling a CFO to run a real-time business for better decision-making.

- While SAP S/4HANA Finance enables the CFO vision of accessing real-time financial information to better facilitate decision-making, this is an opportunity to help the CFO and finance function on this transformational journey around access to real-time data and transformed business processes.

- This will be a great opportunity to help your customers; you need to listen to their pain points first before positioning SAP S/4HANA Finance functionalities such as Central Finance, real-time data availability, faster closing, new planning and forecasting functionalities, and new UI.

- SAP S/4HANA Finance is expected to offer a wide range of benefits

with a very friendly UI enabled by a number of SAP Fiori apps. These benefits include the following:

- A single source of truth with the new Central Journal will result in seamless integration between transactions and analytics. Use of the Central Journal will streamline and eliminate cycle times and data reconciliations.

- On-the-fly capabilities are available for moving period-end FI processing, such as GR/IR clearing, cost allocations, and FI/CO reconciliations, from batch to real time. The speed and online availability is achieved using the in-memory functionality within SAP HANA and the reduction of aggregation tables.

- Innovative rapid planning and forecasting combined with predictive analysis enables exploring new business models and immediately assessing potential effects on the bottom line. This functionality particularly caters to the new role of the FI function—value generation through data insight and data intelligence.

- New reporting and analytics capabilities are provided for FI users with self-service access to all information, allowing instant insight-to-action—historical data can now be used for predictive analysis—with reports and dashboards available on mobile devices.

- Global regulatory compliance capabilities are provided across currencies, languages, and industries with built-in legal compliance capabilities and continuous risk assessment along all enterprise processes.

- The cost of storage is reduced because the database size is smaller with fewer aggregation tables.

- The Central Finance implementation scenario enables you to quickly harmonize and standardize your financial data.

In summary, SAP S/4HANA Finance offers you a wide range of improvements that will help build your business case. Before initiating

any SAP S/4HANA Finance project, building the business case is important because it helps you stay focused and manage the expectations and outcomes of the project.

3.6   Future Outlook

Especially for the Central Finance scenario, we expect many functionalities to be added in the future. In the first release of SAP S/4HANA Central Finance in April 2015, only G/L level data was replicated to the Central Finance system. As a result, Central Finance could only be used for reporting balance sheets and P&L statements and as a single source for feeding SAP BW and financial consolidation systems. In the SAP S/4HANA Finance 1605, functions were delivered that will allow the replication of clearing data for Accounts Receivable (AR) and Accounts Payable (AP) items as well. In the near future, we expect that Central Finance will be able to replicate all subledger-level data as well, such as AP, AR, and assets, so it will be possible to position financial shared services on top of the Central Finance instance. In this case, financial shared service employees don't have to log on to the various SAP ERP systems anymore but can perform their tasks based on the information stored in the Central Finance instance. In addition, Central Finance will make it possible to have the following capabilities in real time:

- Central SAP Cash Management and liquidity forecast position

- Central AR and AP processing such as SAP Collections Management and Dispute Management and SAP Credit Management

- Central payments and reconciliation functions

- Central fixed assets accounting

- Central closing based on soft close principles

- Central intercompany reconciliation

- Central consolidation functionalities using the Universal Journal as a basis

In the longer term, we expect that Central Finance will develop as the single source for all financial transactions, financial planning and consolidation, and reporting (Figure 3.27).
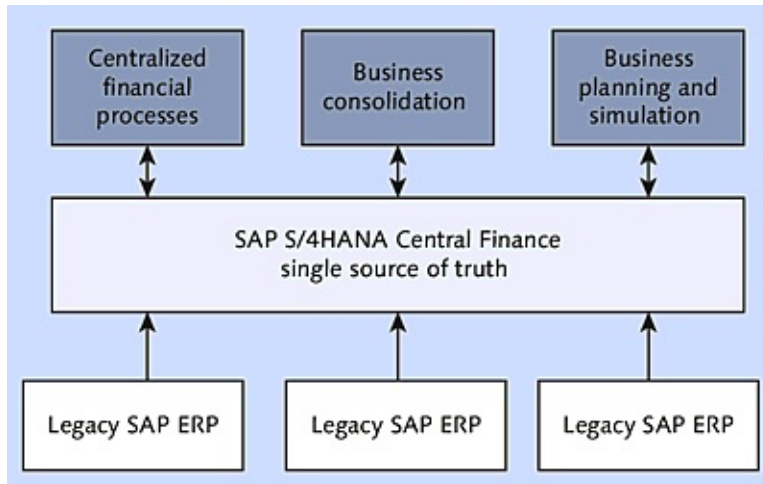
Figure 3.27   Expected Future Architecture of Central Finance

All of this will make the Central Finance implementation scenario very interesting for companies who lack a strong centralization culture but are looking for more centralized and transparent finance operations. Therefore, SAP S/4HANA Central Finance may be the right choice under the following conditions:

- If the short-term goal is limited to centralizing finance functions only

- If standardization of nonfinancial functions isn't required short term or isn't achievable due to lack of global governance

- If you can agree on a global coding block structure for FI

- If having G/L-level data only is acceptable in the short term

- If you want to use it as single source for interfacing to your consolidation system

- If you accept the uncertainty of the SAP road map regarding supported functionalities

In addition, we expect some further improvements in the SAP S/4HANA core. In general, more SAP Fiori apps will be delivered to support the various FI job roles. We also expect SAP to provide more enhanced financial planning functionalities and to build extensions for SAP BPC for S/4HANA Finance, to allow for real-time consolidation as well as enhance the predictive and simulation capabilities in the FI domain (see Table 3.4).

Solution Today	Planned Innovation for 1610 Release	Future Outlook
- SAP Accounting - SAP BPC for S/4HANA Finance - SAP Fiori apps and enriched mobile experience - SAP Smart Business Cockpit	- Additional SAP Fiori apps for controller - Extensions to SAP BPC for S/4HANA Finance to support real-time consolidation - Improved plan and actual reporting - Enhanced planning capabilities such as new Universal Journal planning - Enhanced collaboration control and monitoring capabilities - Digital boardroom - Budget management - Enhanced SAP Ariba integration - Customer payment portal support by SAP HANA Cloud Platform	- Completion of SAP Fiori renewal - Embedded forecasts and prediction - Embedded simulation - Unified approach to cost allocation (for actual and plan) - Budget management

Table 3.4   SAP Road Map for Finance

We also expect SAP to offer more functions to support the soft close process, SAP Treasury and Risk Management (TRM), and the area of collaborative finance operations. An example of the last one is the innovations delivered via SAP HANA Cloud Platform around the centralization of AR, which will support the following:

- Automated credit integration of credit bureau rating information into SAP Credit Management

- Customer fact sheet that provides anywhere access to AR data for the sales team or executives

- Customer payments that will improve the collaboration with customers on open item clearing and allow customers to pay bills with bank transfers

3.7 Summary

In this chapter, we showed clearly that SAP S/4HANA Finance perfectly addresses the pain points identified in the various IBM CFO surveys over the past years, which makes the surveys excellent sources for building the business case for SAP S/4HANA Finance.

Next, we talked about key functionalities in SAP S/4HANA Finance, its maturity, and its future outlook. In the next chapter, we'll discuss SAP S/4HANA logistics functionalities in more detail.

In this chapter, we'll see how SAP S/4HANA can address the pain points of today's C-level executives and how you can use this input to drive the business case for SAP S/4HANA.

4   SAP S/4HANA Materials Management and Operations

This chapter focuses on the SAP S/4HANA logistics functions, also known as SAP S/4HANA Materials Management and Operations. SAP S/4HANA Material Management and Operations isn't a formal product name but is an umbrella term within SAP S/4HANA Enterprise Management, which includes the following lines of business (LoBs):

- Manufacturing
- Supply chain
- Sourcing and procurement
- Sales

The first release of SAP S/4HANA Materials Management and Operations was delivered by SAP in November 2015 (also known as the 1511 release). With this release, SAP delivers a massive wave of simplification and innovation in the SAP S/4HANA core. Enterprises can now drive end-to-end digitized operations across all mission-critical processes of an enterprise. In this chapter, we'll only focus on the key areas for SAP S/4HANA Material Management and Operations and describe the key functionalities that were delivered as part of the first release (1511) and the second release (1610). The scope for SAP S/4HANA Materials Management and Operations include the following:

- SAP Fiori role-based user experience (UX) that can be run on any device and was designed for exception-based handling.

- Innovations in the core processes of manufacturing, supply chain, sourcing and procurement, and sales. Processes have been simplified and optimized by combining Online Transaction Processing (OLTP) with Online Analytical Processing (OLAP). It now offers functionality to enterprises to run massive amount of data in a fast way for their day-to-day transactions and reporting.

- Elimination of functional redundancies to increase system throughput and reduce data memory footprint.

Additionally, we'll use the details of the IBM studies (also discussed in Chapter 1 and Chapter 3) to focus on the insights from the chief supply chain/operations officer (CSCO) to answer the following questions:

- How do CSCOs view the world?

- What are their key challenges today, and how do they prepare themselves?

We'll focus on the insights from the latest two chief operations/supply chain studies, where more than 650 supply chain executives were interviewed. Based on the results of the studies, we'll provide insights on the group of so-called "torchbearers," who are C-level executives with a strong reputation as leading innovators with superb financial track records and identify the most important performance factors that these outperforming executives have compared to their peers. We'll reveal today's key challenges from CSCOs, see how SAP S/4HANA features can address these pain points for each LoB, and discuss the key business benefits.

Finally, we'll look at the business case for moving to SAP S/4HANA and provide a list of future planned innovations for each LoB in SAP S/4HANA.

4.1　IBM Chief Supply Chain Officer Survey Findings

The role of the chief supply chain officer (CSCO) today is broader and more complex than ever. His/her role is no longer restricted to optimizing operations such as planning, manufacturing, quality, sales, and delivery. Today's digital economy and its continuous connectivity and information exchange (through the Internet of Things [IoT], social networks, etc.) are transforming business processes, business decisions, and business outcomes. Expectations from customers and partners have changed too; they are becoming more demanding than ever.

CSCOs realize that digital transformation is important to achieve in their enterprise. To recap what we discussed in Chapter 1, all C-level executives surveyed rated technology as the most important external force. In fact, the survey found the following:

- More than 75% of the business leaders involved believe digital transformation in their business processes is a critical factor for their company to achieve over the next two years.

- Almost all employees believe digital transformation is the right way forward for their organization. Digitization and digital technologies are everywhere. The digital economy has an effect on everyone's personal lives, and it only makes sense to bring digitization into their professional lives as well with the same ease of use, the same connectivity, and the same digital-driving opportunities.

C-level executives know that they have to develop a new strategy to digitize their enterprises. Insights from the CSCO study revealed that CSCOs want their enterprises to be more open, integrated, visible, and transparent. Figure 4.1 shows this vision to make more use of advanced analytics and modeling tools for decision-making and optimizing cost and service levels over the next few years. They want to optimize supply chain visibility to allow them to monitor their business processes and

create a forward vision by using real-time data to predict demand and act on changes quickly.
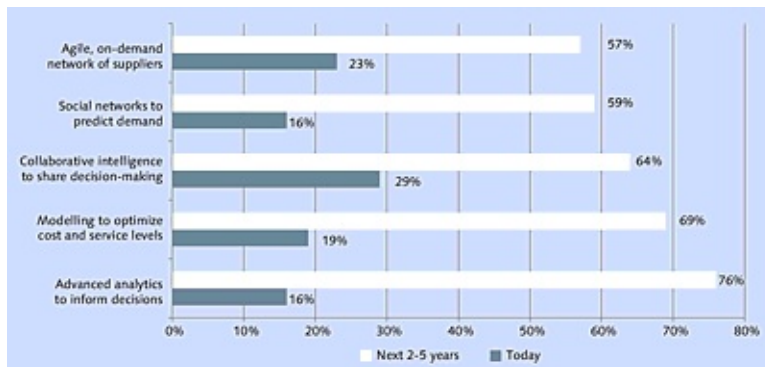
Figure 4.1   CSCO Study Findings: CSCOs Intend to Use Advanced Analytics and Modeling Tools to Predict Demand and Make Better Decisions

According to the study, CSCOs also plan to collaborate much more extensively with their partners and customers over the next few years. They want to have a network of partners worldwide with whom they can share in decision-making and risks. Traditional competitors are converted into partners with the goal to increase efficiencies and add additional value to their products and services. CSCOs also realize the influence their customers have on their companies' product and service portfolios. CSCOs want to focus more on the use of the digital channel to directly interact with them and use social data to predict demand. They want to expand their network to include customers so they can collaborate with them directly to get a better understanding of their demands and incorporate that in their product and service lines, ultimately driving revenue growth.

Figure 4.2 shows the level of collaboration CSCOs want over the next few years almost doubled compared to today's. There is also a move toward a significant expected increase in using social data to predict demand.
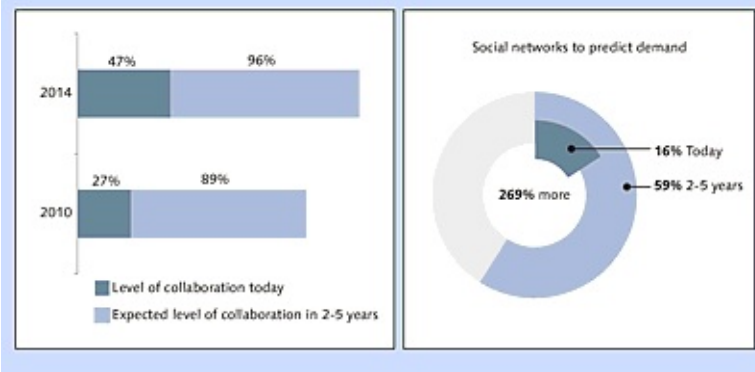
Figure 4.2 CSCO Study Findings: CSCOs Plan to Collaborate and Increase Use of Social Networks to Predict Demand

Based on the results of the study, it's clear how important technology will be for enterprises in the digital economy in which we live. The focus for the corporate IT function will also shift as a result. Figure 4.3 shows the importance of the IT department to change focus. Traditionally, the IT department's focus was mainly on basic support activities. However, in today's world, where digital transformation is a top priority for CSCOs, the corporate IT function needs to improve in its effectiveness and efficiency to better serve a digital, customer-activated environment.
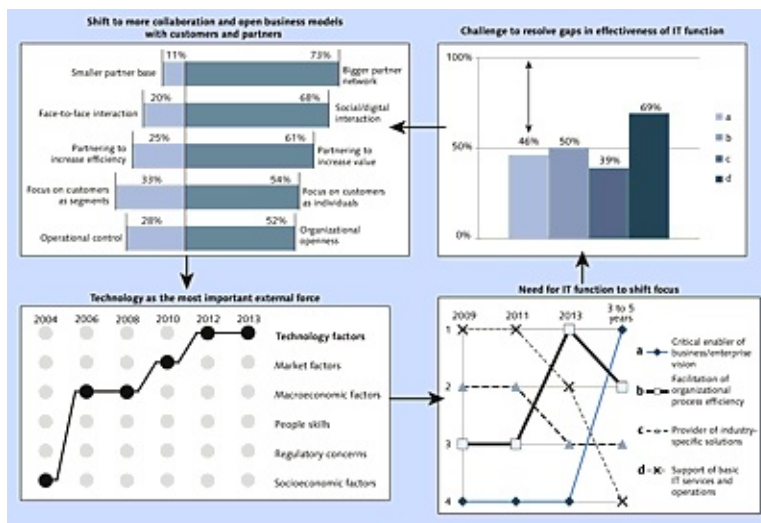
Figure 4.3 The Need for Digital Transformation and the Need to Shift Focus for the Corporate IT Function

The torchbearers of the group are already one step ahead. The study results reveal that these outperformers adopt an analytics-led and

technology-enabled approach that allows them to predict and drive their business to growth. Compared to the rest of their peers, these outperformers are investing more extensively in tools and activities to increase integration and visibility of their supply chain and collaborative information from their partners and customers. They are very similar to the CxOs in the performance accelerator organizations discussed in Chapter 3.

Torchbearers are also leading when it comes to understanding their customers. They are making much more effort, compared to their peers, to better understand their customers and incorporate their input into the distribution and production processes. Torchbearer CSCOs understand the value of using analytics to better predict changes and are much more willing to accommodate their customers' requirements. Figure 4.4 shows the areas where torchbearers are outperforming compared to their peers.
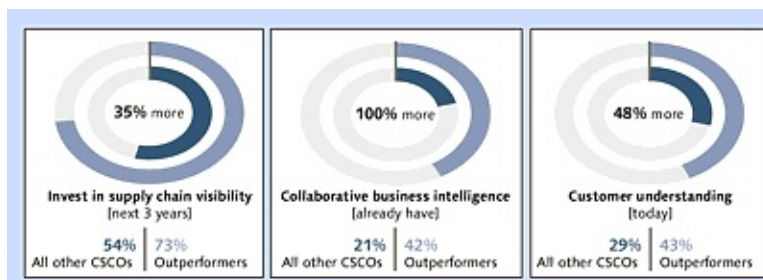
Figure 4.4   Areas Where Torchbearers Are Outperforming

In sum, the digital economy is a reality. CSCOs need to transform their companies into digital enterprises to keep up with today's digital world.

4.2   Addressing Logistics Pain Points

CSCOs are responsible for the mechanics of planning, production, logistics and customer service. But their role has become more challenging. They are responsible for not only controlling costs and increasing efficiency and productivities of their business processes but also for bringing and maintaining customer satisfaction to an all-time high by delivering the "perfect order." On top of this, the environment they are working in is changing rapidly and dramatically.

Based on the CSCO study, the following five key challenges have been identified:

- Lack of supply chain visibility

- Increasing volatility of supply and demand

- Increased complexity

- Lack of collaboration

- Lack of customer-friendly interfaces

In the following sections, we'll provide some further insights on each of these challenges and reveal how SAP S/4HANA addresses them.

4.2.1   Lack of Supply Chain Visibility

CSCOs are working hard to optimize their supply chains and make them more visible, but most CSCOs struggle to create a holistic view. In the traditional system, supply chain visibility is a challenge due to lack of real-time availability of granular data and advanced analytics and high complexity of system landscapes with information from different sources that aren't well integrated. Enterprises must first resolve their visibility challenges within the enterprises. In the second phase, they must extend that visibility to their external partners to have full visibility across the entire extended supply chain.

Following are some of today's key challenges caused by lack of visibility:

- **Inability to create a single view over the enterprise performance**
  This challenge results in local key performance indicators (KPIs) instead of globally defined KPIs. In traditional SAP ERP, there are no dashboards designed that can be used across the entire enterprise. KPI reporting usually is done based on information from multiple sources and on a local level.

- **Inability to detect, monitor, and follow up on critical situations**
  Due to a lack of real-time data and analytics, users can't analyze data based on the most up-to-date information to predict and act on changes. Additionally, traditional SAP ERP systems don't provide capabilities to allow the users to focus on critical tasks or exceptions (e.g., through system alerts or color-coding to create visibility in certain critical situations).

- **Inability to get accurate stock level information**
  This issue results in inaccurate production planning and increased stock levels. Material planners are unable to identify and react quickly on critical situations, such as material shortages, and sales representative don't have the most accurate view of the stock levels, resulting in incorrectly committed sales orders.

- **Inability to get full insight into procurement operations**
  The challenge to get the complete picture is caused by multiple sources of information (e.g., SAP Ariba Network, SAP Supplier Relationship Management [SAP SRM], SAP Supplier Lifecycle Management).

Next to the challenges within the enterprises, companies are also struggling to create transparency in the extended supply chain and have visibility in stock availability and capacities of their suppliers and logistics service providers. Additionally, due to lack of customer real-time data, enterprises don't have visibility into their customers' stock availability and requirements.

CSCOs know real-time data and advanced analytics are critical for their enterprises to become more transparent and visible. Most of them want to improve these areas but struggle to do so due to challenges and limitations with the traditional SAP ERP system.

With the following features of SAP S/4HANA, several key challenges can be addressed to increase supply chain visibility:

- SAP Fiori user interface (UI) offers one single place with all dashboards, according to the user role.

- Real-time reporting and advanced analytics are available at any point in time, providing accurate transparency across different KPIs throughout the entire supply chain.

- The Material Requirements Planning (MRP) Cockpit provides real-time data from all areas of materials management, providing solution suggestions for material shortage situations and enabling the user to simulate the future situation in detail.

- Real-time inventory management provides full visibility of accurate inventory positions across multiple plants and creates a single source of truth for inventory in one system.

4.2.2   Increasing Volatility in Demand and Supply

In the past, competition meant that you had a competitor in the same industry who came up with a cheaper or better product or service. Today, the competition isn't visible until it's too late. Competition doesn't just come from the same industry anymore; new competitors are emerging from old industries and also from digital invaders with totally different business models.

CSCOs are worried about these new invaders entering their territory. Based on the results of the study, executives believe industry

convergence is the biggest trend that will emerge over the next three to five years.

Additionally, CSCOs are also being challenged by their customers, who are more and more demanding and have a lower threshold to move to your competition. Customers today, on the whole, expect the following:

- **Speed**
  Customers want their orders to be processed and delivered with an even shorter lead time.

- **Flexibility**
  Customers want to have the flexibility for placing short-notice orders and to make changes to their orders.

- **Service**
  Customers expect a more personal and individual approach, as well as immediate feedback to their queries and order status questions.

Additionally, growth rates across various emerging markets imply that rising labor costs can alter the traditional model of choosing manufacturing locations. Today's outperforming organizations take a different approach; they are moving the production location closer to the demand, based on total landed costs (total price after a product arrives at the customer's door). Our C-level executives have to prepare themselves for a future in which technology advances are increasingly blurring the distinctions between different industries and where new competitors are emerging from left field. With the increasing volatility in demand and supply, they have to prepare themselves and make their supply chain flexible to handle changes quickly. Companies need to be prepared to actively redesign their operating models to create an innovative ecosystem and boost their digital acumen.

With SAP S/4HANA, enterprises can be more resilient against increasing supply and demand volatilities. SAP S/4HANA creates opportunities to

reinvent business models and drive revenue and profit growth via the following:

- Features that allow enterprises to easily connect to people, devices, and business networks to deliver new value to their customers on any channel

- Real-time business insights, advanced analytics, and modeling tools to better predict demand and have higher transparency into critical situations

- Improved and optimized processes, such as advanced available-to-promise (ATP) processes with flexible rules to quickly respond to changes in customer and demand priorities

- Prescriptive decision support that alerts enterprises of critical situations and potential solutions via simulation capabilities of future stock levels to improve decision-making and reduce critical situations

4.2.3   Increased Complexity

Products and supply chain processes are becoming more and more complex. On one hand, complexity is caused by increasing customer demand and specific requirements for products and services. On the other hand, complexity is also introduced due to globalization, the efforts to expand business into new markets with low-cost manufacturing locations, and the need to offer new and innovative products and services. With rising competition, companies are emphasizing the importance of new business models to generate additional value to the product range and conquer new demand channels of increasingly digital customers.

The key challenge for the CSCOs is to simplify and optimize the supply chain processes and landscape, while still offering the capabilities for enterprises to run complex processes. They want intelligent products that are capable of automating processes in production, logistics, product

returns, and failure analysis. The C-suite study showed that the majority of executives still rely on traditional techniques (e.g., brainstorming and predictive analytics) to identify the next new trends in their business. Most of the CSCOs in the traditional system lack support for simplification and standardization of processes, using advanced analytics, and using modeling tools to optimize their flows. The use of innovative technologies, such as cognitive computing, prescriptive analytics, or simulations technology to truly simply their processes is still low.

SAP S/4HANA simplifies and standardizes several core processes into one single integrated business suite as the backbone of the enterprise, where speed plays the biggest role. Simplifications and standardization of core processes within SAP S/4HANA Materials Management and Operations include the following:

- Simplified data model for Inventory Management (IM), resulting in a significant decrease in tables and a reduction in the complexity and redundancy of tables

- Simplified data model in Sales and Distribution (SD), resulting in fewer document tables and the elimination of rebate index tables

- Simplified reporting, alerting, and exception-based management using the SAP Fiori UX across all areas

- Simplified and standardized automated and streamlined return order processes and one-step management of contracts

4.2.4   Lack of Collaboration

CSCOs want to expand their network and collaborate more with their customers and other external influencers. They want to improve flexibility and reduce the cycle time to market through efficient and tight collaboration with their suppliers. They also want to convert traditional competitors into partners to mitigate risks, reduce costs, and even use their support for codevelopment.

CSCOs also want to collaborate more with their customers. Through tight collaboration with their customers, they can get a better understanding of their requirements and set and shape their short-term and long-term demand.

CSCOs want to build an agile, on-demand virtual network of partners with whom they can share timely information that can be used to sense, predict, and act to optimize outcomes. By using collaborative information more extensively, they want to better manage their performance and involve their partners to make important decisions and increase supply chain flexibility and visibility. They want to integrate digital-physical strategy to combine their physical product/service flow with their digital operations and share predictive insights with their partners.

SAP S/4HANA offers a single platform for integration of core enterprise management processes. Compared to the traditional SAP ERP system, SAP S/4HANA offers several features that allow seamless collaboration between internal core processes. For instance, the MRP Cockpit functionality provides improved integration capabilities between production and procurement. Real-time material flow data and analytics provide users from both departments a clear view of the stock situation for in-house and procurement production materials. With the release of version 1610, capacity planning became part of the core due to the embedded Production Planning and Details Scheduling (PP/DS).

SAP Extended Warehouse Management (SAP EWM) is also now part of the core product, and so can be used instead of SAP ERP Warehouse Management. The main advantage is that additional supply chain management systems are no longer required, which simplifies the system landscape. When data is created in SAP S/4HANA, it automatically syncs with PP/DS and SAP EWM without the need for middleware.

Additionally, SAP S/4HANA offers standard features to improve collaboration with SAP S/4HANA extended solutions such as the SAP Ariba Network, SAP SuccessFactors, and SAP Hybris.

4.2.5   Lack of Customer-Friendly Interface

In today's platform, information is often spread across various systems, and CSCOs can't easily access demand and sales history data through one single report in order to predict customer demand. Due to a lack of real-time reporting and advanced analysis, CSCOs can't quickly detect issues or monitor their business processes efficiently. Often, their employees have to go through various screens (or even various systems) to check the status of sales orders, which doesn't allow them to serve their customers efficiently and easily.

CSCOs want to have a flexible customer platform that can serve customers accurately and effectively. They want a platform that capitalizes on the available customer data and uses it to look at their behavioral patterns, transactional histories, and feedback to predict new trends and manage their supply chain proactively. Real-time demand signals to alert employees to critical situations and better integration between sales and marketing functions to ensure activities are coordinated between the two departments.

With SAP S/4HANA, enterprises can now have a user-friendly SAP Fiori UX that can offer users a personalized experience. Through the different SAP Fiori apps, users can now run insights at any point in time on any device.

In the next section, we'll go into more detail about the key challenges per LoB, address the SAP S/4HANA functionalities, and dig deeper into the improvements that SAP S/4HANA will bring.

4.3   Key Functionalities

SAP S/4HANA is the digital enterprise resource planning (ERP) core built on SAP HANA, and it's the next-generation business suite that enables companies to reinvent business models and drive new revenues and profits. The digital ERP core is the key foundation and enabler for business innovation and optimization, and it helps enterprises drive digitization of their critical business processes across all operations.

Enterprises can run their advanced analytics at any point in time at all levels of granularity in real time and from a single system source, increasing supply chain visibility and transparency. They can now easily connect to people, devices, and business networks in real time and deliver new value in the digital economy. Additionally, SAP S/4HANA offers capabilities to predict and simulate business outcomes that will allow them to quickly respond and make better decisions.

With these core capabilities, CSCOs can now expand their digital transformations across the entire value chain to do the following:

- Improve collaboration with suppliers and customers

- Deliver new and more personalized experiences to their customers, along with better services due to a better understanding of the customer demands and better integration between business processes.

- Manage their assets more effectively and drive new business insight through real-time information on big data. They now have the ability to leverage an open innovation platform to quickly integrate, extend, and build innovative SAP Fiori apps and embed device data across the value chain to create new business models.

With SAP S/4HANA, the innovations can be split into three different categories:

- **Re-architecting the functional core**

  In this category, innovations have been made within the SAP S/4HANA core. The technology footprint has been optimized and modernized and OLTP and OLAP have been enabled, which allows the processing of on-the-fly reporting and analytics.

- **Responsive UX**

  This category focuses on SAP Fiori, a role-based UX with a new responsive design. SAP Fiori apps can be run on any device and have been designed for exception-based issue handling.

- **Unifying the functional core**

  The focus for the third category is the elimination of redundancies, which have been built in to the SAP Business Suite over the years, resulting in a simplified suite.

SAP S/4HANA resolves some of the key challenges and provides a single source of truth, as well as advanced analytics and insights via real-time data. With SAP S/4HANA, enterprises can truly become analysis-led and technology-enabled digital enterprises. You can make your supply chain more transparent and create a more agile environment where you can predict and respond more rapidly.

In the following sections, we'll go through the key functionalities provided by SAP S/4HANA per LoB and address the key innovations, optimizations, and simplifications in SAP S/4HANA Materials Management and Operations.

4.3.1   Manufacturing

A material planner is responsible for hundreds of materials and is challenged with dozens of exceptions in a day. He has to make sure there is enough supply to meet demand and identify and take action on material shortages and other critical situations quickly.

Following are some of the key challenges in manufacturing today:

- Production planning and evaluation in the traditional system is time-consuming and labor-intensive. Due to the high volume of data, execution time for MRP runs is long and needs to be scheduled in batch processes, either once a week or a few times a week. The material planner can't detect critical situations easily, and his day-to-day work often requires intensive manual analysis of the stock requirements list and data from multiple sources.

- Lack of real-time information causes inaccurate data for reporting and analysis, which results in the following:

  - Inaccurate production planning, causing incorrect inventory levels

  - Inaccurate capacity planning and leveling of resources

  - Insufficient information to detect and focus on critical situations only

  - Poor decision-making processes due to the lack of a real-time single view of materials and inefficient processes to evaluate solutions (need to navigate to multiple transactions)

  - Inability to minimize production risks across the networks (due to lack of complete and accurate manufacturing data)

- Many applications and disparate systems for different processes, creating different versions of truth, and duplicated and scattered information

Due to these challenges, the traditional system doesn't provide sufficient capabilities for companies to improve service levels and inventory accuracy, to avoid critical situations, and to drive revenue growth. In the following sections, we'll look at the major functionality that SAP S/4HANA has introduced in the area of manufacturing.

MRP Live

SAP S/4HANA offers MRP Live, which is an optimized MRP functionality in an SAP Fiori app with several improvements, including real-time data

and advanced analytics to improve material flow visibility to enable better decision-making for the material planner. With MRP Live, production planning can be done based on real-time data, and stock situations can be analyzed based on the most up-to-date material and stock information. This will allow a more accurate MRP run and reduce the lead time for planning.

With MRP Live, users have access to real-time data that can be run on any device via SAP Fiori and for which the UI is fully adoptable based on the user role. Companies can analyze material flows in real time with a single query access to data. The rules that define shortages can be flexibly determined to provide insights into material shortages, and demand and supply can be presented in chronological order, showing the exact level of stock by day.

The system supports a real-time alert functionality based on the current stock requirements situation. This allows users to be proactive—rather than reactive—and take actions quickly to avoid critical situations. ATP confirmation to customers will be faster and more accurate. With the real-time data and analytics in SAP S/4HANA, users can monitor the standard processes in an efficient way and focus specifically on exceptions. Companies will have better control over their material availability, resulting in fewer stock-outs, decreased stock levels, and an increase in customer satisfaction.

The MRP Cockpit is the main entry point for the material controller to identify disruptions in the material flow and review the impact of these issues quickly. MRP proposes solutions and provides simulation capabilities to support user decision-making, resulting in decreased material shortages.

With the Manage Material Coverage app, users can with material availability details and solution suggestions by the system. The system will perform a rating for each solution to indicate the viability of the solution; 2 stars resolves the issue, and 1 star resolves the issue partially.

The user can preview the suggested solution, and the system will provide a simulated view of the solution, taking into account any possible constraints such as maximum order quantities and inventory in supplying plants.

Additionally, in MRP Live, the MRP Dispatcher offers automatic determination and selection of planning mode for each material based on the functional requirements of the material. It offers a new mode and a classic mode, as follows:

- **New mode**
  Supports procurement and in-house production, delivery schedules and configurable materials. This mode will be enhanced continuously in future releases.

- **Classic mode**
  Supports capacity planning and discontinuation. Special functionalities in MRP will remain in the classic mode, together with existing customer enhancements, which means there is no loss of functionality, and the special functionalities can be used immediately in a compatible way.

SAP S/4HANA significantly improves the performance of the MRP run (Figure 4.5). In the classic MRP, the application server has to call to the database table multiple times for each table one by one, and a lot of data has to be transferred and read by the application server. This causes performance issues, so executing an MRP run in the traditional system is a time-consuming process and often has to be scheduled in batches to handle the data.
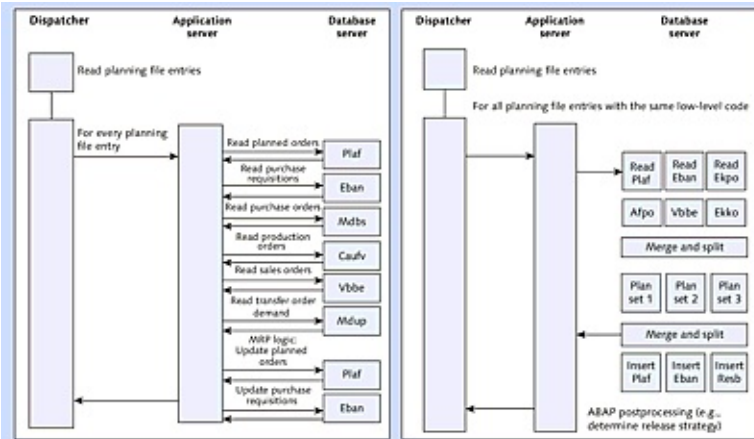
Figure 4.5 Classic MRP vs. MRP Live

With SAP S/4HANA, the MRP run is significantly improved. With the parallelization functionality of SAP HANA, different tables can be read at the same time, and data from these tables can be transformed into a common structure, ignoring all the columns that aren't needed by MRP. The data in the database server is used to detect material shortages. MRP creates planned orders and purchase requisitions to cover these shortages, and these objects are again inserted into the database at one time. MRP Live can read material receipts and requirements, calculate shortages, and create planned orders and purchase requirements all in one database procedure. In SAP S/4HANA, an MRP run can be up to 10 times faster compared to the classic MRP, and users can run MRP as frequently as needed without system performance issues.

MRP Live offers the following business benefits:

- Increased visibility of material flow, improving efficiency and accuracy of production planning
- Proactive decision-making and ability to react quickly to demand changes due to improved analytics and real-time reports
- Flexibility in tailoring capacities and receipts to meet required quantities
- Real-time visibility to inventory levels and automation of procurement proposal creation

With MRP Live, SAP provides a product design that is lean and flexible. With the real-time analytics and decision support of MRP Live, material planners can now work more efficiently and focus more on exceptions and problem solving, rather than standard operational tasks.

SAP Integrated Business Planning

SAP Integrated Business Planning (SAP IBP) is SAP's new state-of-the-art platform for real-time supply chain planning that is built on SAP HANA and fully integrated with SAP S/4HANA. In the long run, SAP IBP will replace SAP Sales and Operations Planning (S&OP). SAP IBP will bring several enhanced functionalities, such as statistical forecasting techniques, multilevel demand and supply planning, collaboration tools, and user-friendly Microsoft Excel and web-based UIs. It's being developed to deliver integrated planning across sales and operations, demand, inventory, supply, and responsible planning. Additionally, a supply chain control tower is provided for dashboard analytics monitoring.

Note

At the moment, SAP IBP is only available on SAP S/4HANA Cloud and can be interfaced with on-premise deployments of SAP S/4HANA. SAP IBP is an additional product and therefore additional are costs associated for licensing and implementation.

General Functionality

In SAP S/4HANA, storage location MRP isn't available anymore; MRP can only be planned on the plant and MRP area levels. With the introduction of MRP areas, MRP requirements for different subcontractors can be differentiated within the same plant. MRP areas cover the same requirements for MRP on the storage location level (through MRP type ND or VB).

In the traditional MRP, SAP ERP doesn't create planning file entries on the storage location level. MRP in SAP ERP has to plan all materials separately in the planned storage locations and plant levels every time inventory or an expected receipt is changed in a single separately planned storage location. In SAP S/4HANA, the system can create planning file entries on the plant and MRP area levels. There is no need to set up MRP area-specific materials master data anymore for every subcontractor.

Additionally, in SAP S/4HANA, changes have been made to the product master data, as the material number has been extended to 40 characters. The related functionality for extended material numbers can be switched on; however, the technical Data Dictionary (DDIC) object contains this length of material number. This change doesn't represent any issues for a greenfield implementation and, in fact, paves the way for industry-specific content to be enabled within the SAP S/4HANA core release, such as for the automotive industry. In fact, the IS-Automotive extension is where the 40-character material number originates.

SAP provides migration tools to analyze the impact of this change in the DDIC; however, this is limited to the identification of customer tables containing this domain. This change represents a significant consideration for migration customers, as their custom code should be reviewed and assessed for impact, which could be a significant task.

Also in the realm of the product master, several fields in the MRP view won't be used anymore in SAP S/4HANA (e.g., storage location MRP, quota arrangement usage [procurement data], etc.). There is also a new material type, SERV. In SAP S/4HANA, material type SERV is introduced for the product master for simplification purposes. Because not all fields and user departments are relevant for this type of material, in SAP S/4HANA, these fields are hidden to give it a more simplified and leaner look. Additional configuration for this material type is required.

SAP S/4HANA has simplified the subcontracting and sourcing logic. In SAP ERP, there are three different ways of planning parts for a subcontractor, as follows:

- Planning subcontracting demand together with internal demand in the make-to-stock planning section (SAP ERP 3.0 logic)

- Separating subcontracting demand and stock into single subcontracting planning sections (one section per subcontractor) and planning uncovered subcontracting demand together with internal demand in the make-to-stock planning section (SAP ERP 4.0 logic)

- Planning separately the demand of every subcontractor by means of subcontracting MRP areas (SAP ERP 4.5 logic)

In SAP S/4HANA, the 4.0 logic was removed while the 4.5 logic was simplified. Additionally, the following is now true:

- Default parameters are used if MRP area-specific material master records don't exist.

- MRP areas for every subcontractor can be created.

- MRP area/supplier-specific material master data can still be created if required.

SAP S/4HANA offers a reduced set of sources of supply and a simplified sourcing logic. The following types of sources of supply are offered:

- Production versions: procurement type E (in-house production) or X (both procurement types)

- Purchasing info record: procurement type F (external procurement)

- Delivery schedules: procurement type F (external procurement)

- Purchasing contract: procurement type F (external procurement)

Following are some of the key simplifications in sourcing logic in SAP S/4HANA:

- Production versions are the only sources of supply for in-house production and are integrated into quota arrangements. In the traditional SAP ERP system, the source of supply for internal production was determined via a selection method in the material attributes of quantity, explosion data, and production version. A production version references a routing, and the routing is used to create production orders.

- In SAP S/4HANA, MRP only selects production versions that are neither Locked for Usage nor Locked for Automatic Sourcing, as opposed to Locked or Not Locked in SAP ERP. The new status Locked for Automatic Sourcing corresponds with the Relevant for Automatic Sourcing indicator in the purchasing info records. One production version can be defaulted for new planned orders and manually dispatched to proper lines/work centers.

- In SAP S/4HANA, you don't have to create a source list entry for purchasing info records that are relevant for MRP. A new indicator in the purchasing info records Relevant for Automatic Sourcing can be set for records that are relevant for MRP.

- Source lists aren't yet considered in the latest SAP S/4HANA releases, as a workaround quota arrangement can be used.

- You no longer need to set up material master attributes for consideration of quota arrangements for SAP ERP. In SAP S/4HANA, MRP will always consider quota arrangements.

Finally, with release 1610, PP/DS can now be accessed in SAP S/4HANA through manufacturing planning capabilities. This change will reduce integration efforts because integration with master data and work center resource isn't needed anymore, thus more seamless master data and UI harmonization. Functionalities include the following:

- Use the new Create Optimal Orders for Shipment app to order multiple materials in one purchase order and to optimize order quantities to

best use the means of transport.

- Plan critical products (e.g., long replenishment lead time).

- Optimize and plan the resource schedule by taking the resource and component availability into account.

- Cover product requirements in procurement proposals for in-house production or external procurement.

- Create executable production plans.

- Access the production scheduling board through a web-based graphical scheduling tool for PP/DS that allows access to some of the new functionalities in this list.

Figure 4.6 shows the traditional process in SAP ERP versus the new reinvented process in SAP S/4HANA.
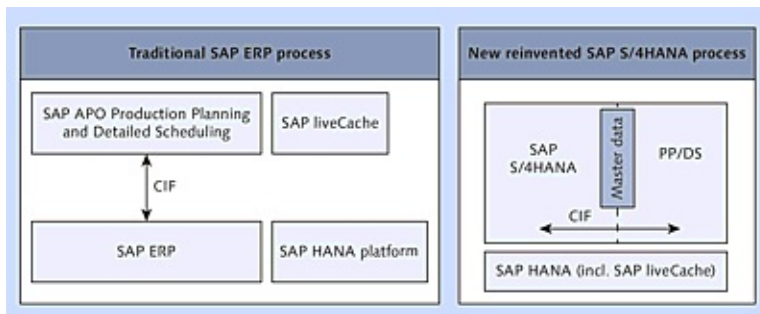
Figure 4.6   Production Planning and Detailed Scheduling: Traditional SAP ERP vs. SAP S/4HANA

4.3.2   Supply Chain

In today's world, a company has to meet three key demands: speed, individuality, and innovation. With the rise of new technologies, customer expectations have increased significantly. Customers have more specific product requirements and want the delivery of their orders as quickly as possible. In addition, with the heavy competition today, customers have a lower threshold and can switch at any moment to another supplier or to someone who hasn't entered the market before.

Following are some of today's key challenges for supply chains:

- Increasing customer requirements causes companies to produce products adapted to individual requirements. Classic inventory planning can't keep up with the flexible accommodations or custom configurations that customers are expecting today.

- Lack of real-time reports on stock levels often leads to delivery delays and dissatisfied customers.

- Lack of transparency and real-time insights causes companies to struggle with data analysis.

In the following sections, we'll take a look at two of the major changes SAP S/4HANA brings to the supply chain: the simplification of the Materials Management/Inventory Management (MM/IM) data model and the simplification of the inventory valuation data model. We'll then discuss some of the innovations to the IM functionality in SAP S/4HANA and a few of the SAP Fiori apps available in this area.

Finally, we'll conclude the section by discussing the embedded SAP Extended Warehouse Management (SAP EWM) functionality brought to SAP S/4HANA with release 1610.

Material Management/Inventory Management Data Model Simplification

In SAP ERP, material documents are stored in two document tables, MKPF and MSEG. Additionally, there are other tables that store aggregated actual stock quantity and material master attributes. On top of these, specific tables with aggregated actual stock quantity by stock type (e.g., sales order stock) also exist.

With SAP S/4HANA, material document data won't be stored in tables MKPF and MSEG anymore. Instead, it will be stored in the new denormalized table MATDOC, which will contain the header and item data of a material

document as well many other attributes. The tables for aggregated actual stock quantities won't exist anymore; instead, actual stock quantity will be calculated on the fly from the new material document table MATDOC. As a result, the new data model will work on the database level in an INSERT mode without database locks.

Figure 4.7 shows the traditional data model and the new simplified data model in SAP S/4HANA.

The key benefit of the SAP S/4HANA data model change is a significant decrease of aggregates and history tables (24 tables), resulting in the following:

- Increased throughput due to fewer tables to be updated and thus fewer tables to be locked

- Better and faster reporting as most information comes from just one table MATDOC, and more flexibility as actual stock quantity data is calculated on the fly

- Flexible design for new stock types (no additional tables)
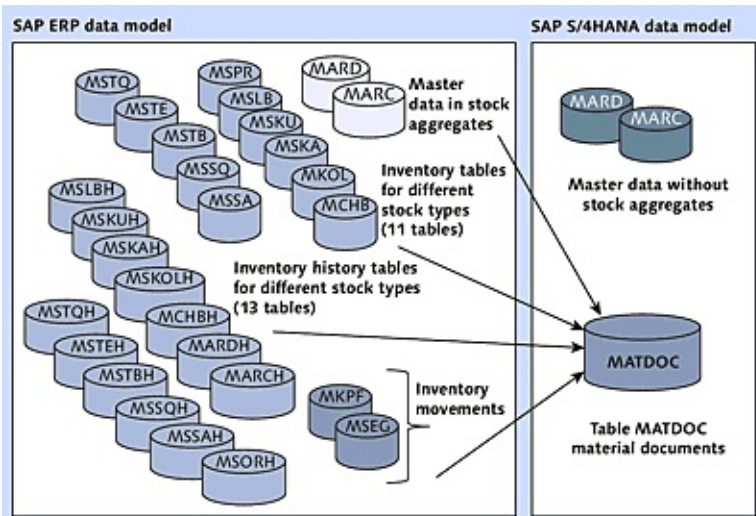
Figure 4.7   Inventory Management: Data Model Design

All aggregates tables will continue to exist in SAP S/4HANA. Through a redirect feature in SAP S/4HANA, any redundant table will be guided to

the new table. Therefore, all customer coding will continue to work in SAP S/4HANA.

Inventory Valuation Data Model Simplification.

In SAP ERP, the inventory valuation tables contain transactional as well as master data attributes. With SAP S/4HANA, this will be simplified. The inventory valuation tables do still exist as DDIC definitions as well as database objects. However, they will only be used to store material master data attributes. The transactional fields will be retrieved from the SAP Material Ledger (ML), which is mandatory with SAP S/4HANA. As a result, those fields aren't updated anymore in the original tables. The original tables will be updated less often, which will increase the system throughput.

SAP S/4HANA features scalable material valuation capabilities using only one SAP ML. That way, customers can use multiple currencies and valuation methods per different accounting laws such as generally accepted accounting principles (GAAP). In the traditional SAP ERP system, material valuation needs to occur on the IM level and the MM level.

Activation of the ML is mandatory with SAP S/4HANA, which enables improved and more flexible valuation methods in multiple currencies and parallel accounting standards. It also improves scalability of the business processes. In addition, the ML is a prerequisite for the use of actual costing.

With SAP S/4HANA, there is a simplification of the data model structure for inventory valuation. Data will now be stored mainly in the Universal Journal table `ACDOCA`.

Inventory Management

IM powered by SAP S/4HANA enables organizations to harmonize warehouse inventories and demand and supply planning, as well as use all data and analysis on a company-wide basis. With real-time processing of inventory postings and inventory values rather than overnight jobs, warehouse spaces can be reduced to a minimum and lead to a higher accuracy of inventory, increase in turnover, and reduced days of items on stock.

Additionally, IM can also take all production locations and external supply chains into account and can manage the changing demand for smaller lot sizes passing through entire logistics operations with all involved parties. Real-time information, including early error detection, creates precise where-used information per unit.

SAP S/4HANA allows real-time processing of inventory postings and visibility to warehouse inventory, resulting in the following business benefits:

- Improved on-time delivery

- Increased inventory turnover

- Reduced cost of inventory

- Single source of truth of inventory in one system

- Decreased stock levels due to increased transparency

The SAP Fiori offers three types of apps: transactional apps, analytical apps, and fact sheet apps.

Transactional apps allow you to execute specific tasks and transactional activities. Transactional apps that are currently available for IM allow you to do the following:

- Post goods receipts (GR) for purchase orders.

- Transfer stock from one storage location to another storage location and for changes to stock type.

- Manage stock by posting an initial GR or scrapping from stock.

Analytical apps are used to provide real-time insights and/or KPI information into specific parts of a process. Related to IM, an analytical app is available for material document overview and stock overview (for a single material). The analytical app provides the user an overview of inventory level and material postings at any point in time and on any device.

The SAP Fiori fact sheet apps allow users to quickly navigate to other related documents and provide links to follow-on processes. Fact sheets for IM are provided for the following:

- Goods receipt
- Goods issue
- Material

SAP EWM Embedded in SAP S/4HANA

Traditional SAP ERP Warehouse Management (WM) is available within SAP S/4HANA, and all existing business processes and functionalities will remain available. However, traditional WM isn't the target architecture and in the long term will be replaced by SAP EWM. Release 1511 already provided integration for a decentralized SAP EWM deployment. As part of release 1610, one of the key innovations is SAP EWM embedded in SAP S/4HANA, which provides state-of-the-art warehousing capabilities within one system. With this functionality, SAP offers an additional deployment option for its customers to have SAP EWM deployed within the core of SAP S/4HANA.

Figure 4.8 shows the available options for deployment. SAP ERP WM is already available as part of SAP S/4HANA. With release 1511, standard integration to decentralized SAP EWM and SAP ERP WM is offered. As

stated previously, SAP EWM embedded in SAP S/4HANA is included in release 1610.
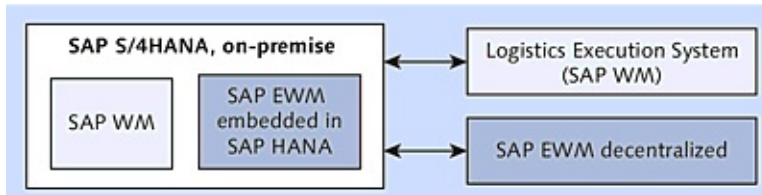
Figure 4.8   Warehouse Management Deployment Options in SAP S/4HANA

In the long term, SAP will continue to support and invest only in SAP EWM (SAP EWM embedded in SAP S/4HANA and decentralized SAP EWM), and a common core of functionalities within EWM will evolve over time for both options. Decentralized SAP EWM, either integrated to SAP S/4HANA or SAP ERP, will remain a valid deployment option on the longer term due to various business reasons for customers, such as the following:

- Risk mitigation

- Regional SAP EWM systems

- Multiple SAP ERP connections (e.g., some logistic service provider scenarios, where multiple SAP ERP systems needs to be connected)

SAP EWM embedded in SAP S/4HANA will contain the scope of SAP EWM 9.4, and both deployment options will have an almost identical common core, covering the same business scenarios and processes with very few minor exceptions (e.g., multiple SAP ERP connections aren't possible in SAP EWM embedded in SAP S/4HANA). The technical integration with SAP ERP will be different for SAP EWM embedded in SAP S/4HANA and decentralized SAP EWM; however, the same integration will be used with other systems (e.g., SAP Global Trade Services [GTS] or SAP Transportation Management [SAP TM]). SAP EWM embedded in SAP S/4HANA will use the scope of SAP EWM 9.4 with a main focus on simplification and reduction of redundant objects and data.

With SAP EWM embedded in SAP S/4HANA, SAP provides the latest warehousing capabilities that are also in SAP S/4HANA. Following are the key benefits of this change:

- One single system

- Reduction of data redundancy

- Simplification

The detailed benefits of each area will be further described in the following subsections.

One System

First, with SAP EWM embedded in SAP S/4HANA, the integration with SAP S/4HANA core processes is simplified. Core interfaces are no longer required for master data objects, resulting in a reduction of data replication, which offers the following benefits:

- Reduced database footprint

- Reduced effort for monitoring and data alignment, thus less total cost of ownership (TCO)

- Simplification of system and data setup

Master data objects and actual data, for example, accounting objects and material values, are all within one system, allowing a direct read of data, increasing system throughput, and reducing system complexity. In the decentralized SAP EWM version, several almost identical Customizing tables exist between the SAP ERP system and SAP EWM. In SAP EWM embedded in SAP S/4HANA, these redundant tables are reduced, resulting in a significant reduction of Customizing in SAP EWM.

Additionally, with SAP EWM embedded in SAP S/4HANA, the SAP Fiori launchpad is enabled, providing warehouse users with a similar UX as the SAP Fiori launchpad as the single point of access for all apps.

We'll now describe the main details of these changes for each object:

- **Business partners**
  In the classic version of SAP EWM, core interfaces are needed to transfer business partners (customers/vendors) to SAP EWM, and these will be mapped to business partner objects in SAP EWM. SAP EWM uses a different numbering, and due to differences in data objects, different address check routines need to be set up in SAP ERP and in SAP EWM. With SAP EWM embedded in SAP S/4HANA, there will be only be one business object (i.e., business partner), which will be used for both customers and vendors across different LoB in SAP S/4HANA.

- **Material master**
  Like business partners, in SAP EWM embedded in SAP S/4HANA, there's no need to transfer master data from the SAP ERP system to SAP EWM; instead, all the relevant data (e.g., various SAP APO tables) will be read through Core Data Services (CDS) views and used for SAP EWM. SAP EWM embedded in SAP S/4HANA also provides the additional benefit of support for the 40-digit material master.

- **Batch master**
  In SAP EWM embedded in SAP S/4HANA, all relevant batch information will be available immediately for usage within SAP EWM. This offers users various benefits such as the ability to manage batches with shelf life even without batch classifications and the ability to manage batches based on plant-specific attributes, which is a limitation in SAP EWM 9.4.

Figure 4.9 shows the traditional scenario and the new SAP EWM embedded in SAP S/4HANA scenario for the three data objects.
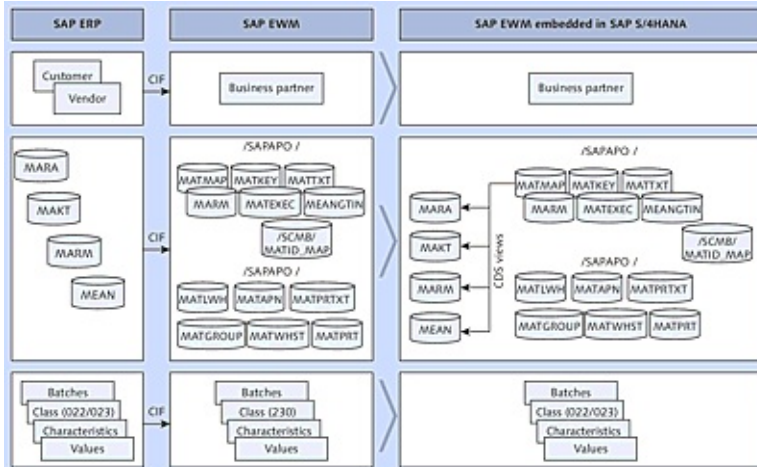
Figure 4.9   Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA

Next to the preceding data objects, the same principle applies for the following data objects:

- **Product valuation data and accounting data**
  Standard table MBEW is used to store material valuation data. Specific information from this table in the traditional scenario is transferred through remote function calls (RFC) into two tables in SAP EWM to store the material price and split valuation. In SAP EWM embedded in SAP S/4HANA all material values can be read directly in SAP S/4HANA from the main table MBEW.
  In addition, only relevant accounting objects will be replicated in SAP EWM through RFC; therefore, not all accounting-related information is available in SAP EWM. With SAP EWM embedded in SAP S/4HANA, all accounting documents will be immediately available and can be accessed directly. There is no longer any need to replicate accounting objects.

- **Project stock**
  With SAP EWM embedded in SAP S/4HANA, the existing table /SCWM/ERP_PSP with the mapping and conversion routine will be redundant because you can access standard table PRPS directly.

- **Dangerous goods/hazardous substance and phrases**
  No data replication through Application Linking and Enabling (ALE) is

required. With SAP EWM embedded in SAP S/4HANA, you have direct access to all standard tables.

With SAP EWM embedded in SAP S/4HANA, several Customizing tables have been eliminated due to similar Customizing in SAP ERP. An example is table `THUTYPE` in SAP ERP for the handling unit type configuration and its equivalent in SAP EWM, table `/SCWM/THUTYPE`, with the exact same configuration. As a result of this, 12 different tables have been removed in SAP EWM, eliminating double data maintenance and risk for data mismatch.

Reduction of Data Redundancy

The following changes have been made to optimize processes and reduce data redundancy:

- **Expected goods receipt (EGR) will no longer be used**
  With decentralized SAP EWM, EGR can be used to copy data from a purchase order or production order to the inbound delivery. Data replication occurs through a report in SAP EWM. With SAP EWM embedded in SAP S/4HANA, EGR no longer exists and isn't needed anymore because the inbound delivery can be created directly from the purchase order production order with the most up-to-date information. Figure 4.10 shows the decentralized SAP EWM option versus the new SAP EWM embedded in SAP S/4HANA version.
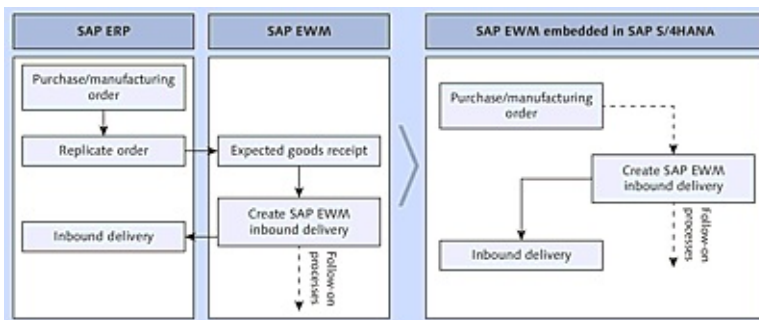
Figure 4.10   Expected Goods Receipt in Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA

- **Delivery request (notifications) and posting change request document eliminated**

  The delivery request (notification) document can be used for inbound and outbound processes to save and transfer all relevant information from a reference document to the delivery document. With decentralized SAP EWM, the delivery request (notification) document is skipped and instead the delivery document in SAP EWM is created directly from either the inbound or outbound delivery document in SAP S/4HANA. As a result of this, any functionalities in standard SAP EWM that are linked to the delivery request or notification document will no longer be available in SAP EWM embedded in SAP S/4HANA.

  The same applies for the posting change request document. In SAP EWM embedded in SAP S/4HANA, the posting change document is created directly from the outbound delivery document.

  Figure 4.11 shows the current process and the new option for both inbound and outbound processes.
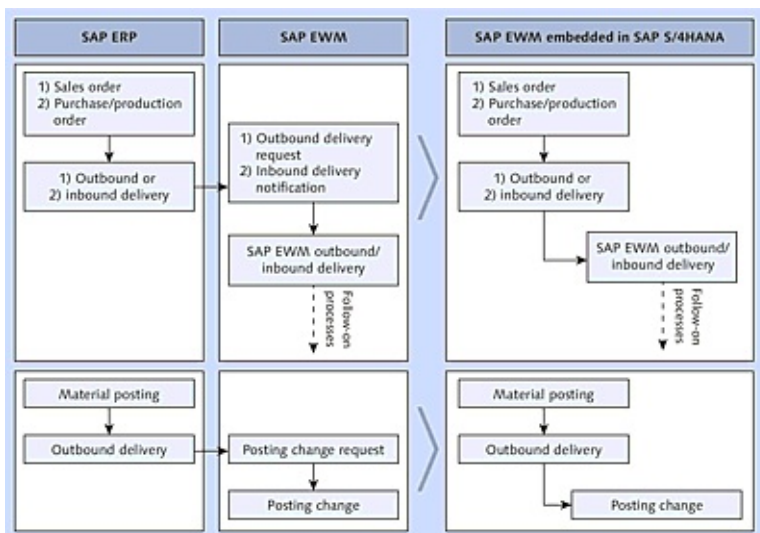
Figure 4.11 Delivery Request (Notifications) and Posting Change Request Documents in Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA

Elimination of the Quality Inspection Engine

The elimination of quality inspection engine is the result of reduction of data redundancy is an important new benefit. The Quality Inspection Engine had been used as a lean solution to support the quality inspection process and offered functionalities that provided flexibility for configuration inspection rules. In the classic SAP EWM scenario, inspection details are set up in the material master, and the inspection rule details are set up to determine the inspection relevance of a document.

With SAP EWM embedded in SAP S/4HANA, no inspection setup is required in the material master; all details are captured in SAP EWM embedded in SAP S/4HANA.

Due to the elimination of the Quality Inspection Engine, the process will be optimized significantly. In classic SAP EWM, the inspection process is as follows:

1. In SAP EWM, a GR of an inbound delivery is waiting to be posted.

> **Note**
>
> The trigger can also be at delivery creation or IN YARD status.

2. Based on the inspection rules setup, the Quality Inspection Engine will determine whether it's relevant for the inspection process.

3. If yes, an inspection document is created and saved.

4. After release of the inspection document, the Quality Inspection Engine informs the SAP ERP system of the creation of an inspection document.

5. An inspection lot is created based on the inspection setup data in SAP ERP. The inspection document in the Quality Inspection Engine and inbound delivery is updated accordingly.

6. The inspection is executed and details are recorded in SAP ERP.

7. The usage decision is also recorded in SAP ERP.

8. SAP ERP transfers the relevant inspection details to the Quality Inspection Engine, and the inspection document is updated.

9. Follow-up actions in SAP EWM are executed accordingly.

With SAP EWM embedded in SAP S/4HANA, the inspection process is as follows:

1. In SAP EWM, a GR of an inbound delivery is waiting to be posted.

2. Based on the inspection rules setup, in Quality Management (QM) in SAP S/4HANA, the system determines whether it's relevant for the inspection process.

3. If yes, the system determines the inspection setup data and creates an inspection lot.

4. The inspection is executed and details are recorded in SAP ERP.

5. The inspection details are recorded.

6. The usage decision is recorded.

7. In SAP EWM, follow-up actions are executed accordingly.

In the first release of SAP EWM embedded in SAP S/4HANA, the quality inspection process comes with a basic scope. Several processes have still not been included yet in SAP S/4HANA release 1610, and other functionalities are included in QM in SAP S/4HANA.

Following are some of the processes that aren't included yet in the first release:

- Several inspection object types, such as preliminary inspection inbound delivery, counting, and preliminary inspection handling unit

- Partial inspection lot decisions

- Presampling in production

- Returns inspection

Following are the processes that are included in the core QM functionalities instead:

- Physical sample-drawing procedure, quality level, or dynamic modification

- Inspection rule features, document attachment, and findings

Simplification

As a result of release 1610, SAP EWM embedded in SAP S/4HANA offers massive simplifications through reduction of redundant data and through leaner processes and fewer business documents. Additionally, specific functionalities within the classic SAP EWM have been disabled or replaced to meet SAP S/4HANA guidelines and vision. The following functionalities have been disabled/replaced:

- **SAP Transportation Management (SAP TM), also known as freight order management (FOM)**
  The decision to not include FOM in SAP EWM embedded in SAP S/4HANA is mainly because SAP TM offers enhanced functionalities and will be moving into SAP S/4HANA in 2017. SAP TM is also offered as a sidecar solution.

- **Labor demand planning**
  Labor demand planning isn't offered in the first releases of SAP S/4HANA because reengineering of the SAP S/4HANA core functionalities are required to meet SAP S/4HANA guidelines. As a result, labor demand planning will be scheduled for a later release of SAP S/4HANA.

- **Supply chain routing (SAP Supply Chain Management [SAP SCM] routes)**
  SAP doesn't want to offer routes in SAP ERP, SAP TM, and SAP SCM in the long run; therefore, the SAP SCM routes are disabled, and only SAP ERP routes are used.

- **Microsoft Silverlight UI replaced by SAPUI5 technology**
  The official end of support date for Microsoft Silverlight is October 5, 2021. Microsoft Silverlight will be replaced by SAPUI5 technology for the following four use cases:

  - Creating appointments

  - Monitoring appointments

  - Planning staging areas

  - Maintaining capacity

Due to the mentioned massive simplifications of SAP EWM embedded in SAP S/4HANA, the effort for basic setup of SAP EWM has reduced significantly and now only requires a third of the setup required in the SAP EWM/SAP ERP integration guide.

4.3.3   Sourcing and Procurement

One of the key challenges within sourcing and procurement today is the technical complexity of the landscape related to the previous solutions introduced for procurement, such as SAP Ariba, SAP SRM, and SAP Supplier Lifecycle Management. Different systems are providing operational, tactical, and strategic activities, resulting in many challenges in aligning data across systems and supporting the data.

With the introduction of SAP S/4HANA Enterprise Management, some of the traditional challenges are being addressed by the following:

- Leveraging the SAP Ariba Network to overcome the complexity of supply chains and to provide a system that functions as a single point of interaction.

- Enable self-service purchasing using SAP Ariba

- Integrating SAP Supplier Lifecycle Management functions with collaboration tools for a more efficient and tighter collaboration with

business partners to reduce time to market, increase flexibility in the context of volatile demands, and increase supply chain visibility

- Introducing a simplified process using one data object for purchasing requirements, which helps to shorten process cycle times

- Using built-in transactional or strategic analytics, for example, through improved contract monitoring or supplier evaluation reporting

SAP S/4HANA provides a streamlined view of all procure-to-pay processes and gives you the visibility and insights you need to make strategic decisions or to optimize the procure-to-pay processes. With the new system capabilities combining OLAP with OLTP on the same SAP Fiori screen, drilling down into the lowest level of details with real-time exposure gives performance providers a compelling value proposition to exploit. In the following subsections, we'll discuss the most important new functionalities introduced with SAP S/4HANA Enterprise Management to the sourcing and procurement space.

Supplier Lifecycle and Performance Management

With the initial release of SAP S/4HANA Enterprise Management, SAP has made the move to incorporate the following three core business functions (excluding sell-side components) from the SAP Supplier Lifecycle Management solution within the latest releases of SAP S/4HANA:

- **Supplier portfolio management**
  Strategic procurement activities such as supplier categorization are now enabled through the portfolio management business function. Specifically, strategic buyers can classify and manage their supply base within purchasing categories. The integration components for Dunn & Bradstreet (D&B) integration are also included in the SAP S/4HANA core delivery.
  With SAP S/4HANA, suppliers can be classified based on various

criteria such as spend, strategic importance, risk, and so on. Companies can define internal activities to track supplier performance and view and analyze supplier information. This gives companies transparency on their supplier portfolio based on these classifications and reduces risks by identifying low-performing suppliers.

- **Supplier evaluation**
Supplier evaluation and performance management processes can be initiated and managed across the supplier base by strategic buyers. In the traditional system, no real-time data was available due to the volume of the data, causing a lack of transparency and decision support. In SAP S/4HANA, the full question library and survey management functionality is available for use, so business user input on supplier performance can be evaluated and included as input for supplier management activities with the additional improvements in SAP S/4HANA:

  - Questionnaires defined directly in SAP S/4HANA

  - Monitor and search flexibility for evaluation responses and ability to navigate to response details

  - Ability to create evaluation requests and distribute to appraisers

- **Collaboration and activity management (integration with SAP Jam)**
Increased collaboration functions are enabled for the Purchasing users to communicate and collaborate with internal parties through activity integration with SAP Jam. The sell-side components and functionality aren't yet available in the initial release, so relevant sell-side integration with suppliers isn't yet possible.

Additionally, several new SAP Fiori apps have been developed for use in the SAP Supplier Lifecycle Management functions:

- Task processing for management of internal collaboration activities

- Completion of supplier evaluation surveys by internal users

- Supplier activity management

- Supplier lists and portfolio statuses

- Supplier appraisal

- Supplier portfolio and category management

- Purchasing categories created, managed, and assigned to the supply base

- Management of supplier evaluation processes by the strategic buyer, including evaluation of results

The GUI transactions for vendor master are made obsolete in line with the change in data model in SAP S/4HANA. The business partner is now the primary business objects for both vendors' and customers' master data, so the business partner transactions will be used for creating or maintaining the business partner.

Sourcing and Contract Management

The processes from a sourcing and contract management perspective that are delivered within the first releases of SAP S/4HANA are streamlined and mostly based on the standard SAP ERP transactional processes, facilitated through the same SAP Fiori apps that have been available since the first release of the SAP Fiori principle transactional apps.

The processes and transactions available within the SAP S/4HANA core components related to sourcing processes are limited to the standard request for quotation (RFQ) and quotation transactions from SAP ERP.

The contract management functions that are present within the SAP S/4HANA initial releases are the same as those contained within the SAP Business Suite powered by SAP HANA enabled by the SAP Fiori principle apps.

There are three main SAP Fiori apps that enable operational contract management:

- Purchase Contract
- Contract Line Item
- Manage Purchase Contracts

The contract management processes are facilitated through these SAP Fiori apps, which deliver a display-only view of the standard SAP ERP data structures for contracts. The Manage Purchase Contracts app delivers an analytical view of contract usage, status, and validity.

A set of SAP Fiori apps for establishing and managing purchasing info records is used within the SAP S/4HANA core component, allowing the overview of the various sources of supply for a particular material across plants and purchasing organizations. The SAP Fiori app Manage Sources of Supply gives a list display of the purchasing info record and links to the SAP Fiori fact sheet apps for displaying purchasing info records.

For complex source-to-contract functions, SAP Ariba is recommended.

Operational Procurement

There are a number of key changes to the operational procurement processes that will be employed within the SAP S/4HANA Enterprise Management core in the following areas: self-service procurement, collaboration, UI changes, and purchase order output.

In the traditional SAP ERP system, there is no real-time insights for the operational purchaser to perform his day-to-day tasks. Decisions are made based on outdated data, and there is no real-time KPI reporting, which makes improving the service level challenging.

With SAP S/4HANA, users can get real-time insights and KPIs immediately. The operational purchaser can do his job based on the most up-to-date information, and at any point in time, users can run real-time KPI reports to get insight on their performance. SAP S/4HANA offers the following real-time KPI reports:

- Purchasing and invoicing spend

- Contracts

- Purchase order average delivery time

- Supplier information

SAP S/4HANA provides the operational purchaser a holistic view of activities within operational procurement.

Real-time analytics facilitates the purchaser to directly react to spend exceptions or overdue purchase order items.

Self-service requisitioning is a new capability in SAP S/4HANA. The self-service procurement processes have been simplified by consolidating the shopping cart and purchase requisition objects into a single structure based on the purchase requisition. The basic process of requisition, approval, purchase order creation, and GR is facilitated by the new UI changes described next. With SAP S/4HANA, customers have an integrated catalogue functionality within the purchasing requisition SAP Fiori apps that is based on the Enterprise Search functionality. The SAP ERP self-service procurement business function is made obsolete with the SAP S/4HANA core deployment.

In the traditional system, a user has to go through multiple screens to find and assign sources to purchase requisitions. The creation of purchase orders is often done through a batch input report. In SAP S/4HANA, all tasks to search, find, assign a source of supply, and create a purchase order can be done in one screen. The system automatically proposes the available sources of supply to the purchaser. This significantly increases

the efficiency and the speed for the purchaser to assign supplies to the purchase requisitions. Additionally, a new SAP Fiori interface will be introduced to convert purchase requisitions to purchase orders. Transaction ME57 is still available through the GUI.

The creation of manual purchase orders in SAP S/4HANA is supported by several capabilities to improve efficiency:

- Users are allowed to select previous purchase orders or sources such as a template, minimizing errors and improving efficiency.

- Several fields are prefilled based on the selected supplier or material type.

- A draft purchase order is created automatically when sessions are lost and retrieved automatically when logged on again.

A number of additional SAP Fiori apps are delivered to manage this streamlined procurement process:

- Create Purchase Requisition

- My Purchase Requisitions

- Confirm Goods Receipts

The SAP Ariba Network is currently only available for use with SAP ERP 6.0 and forms a core part of the SAP S/4HANA release. SAP Ariba integration can be done via three distinct methods (see Figure 4.12):

- Direct integration of SAP S/4HANA through standard output management

- Through SAP Process Orchestration (SAP PO) (on-premise)

- SAP HANA Cloud Integration (cloud deployment)
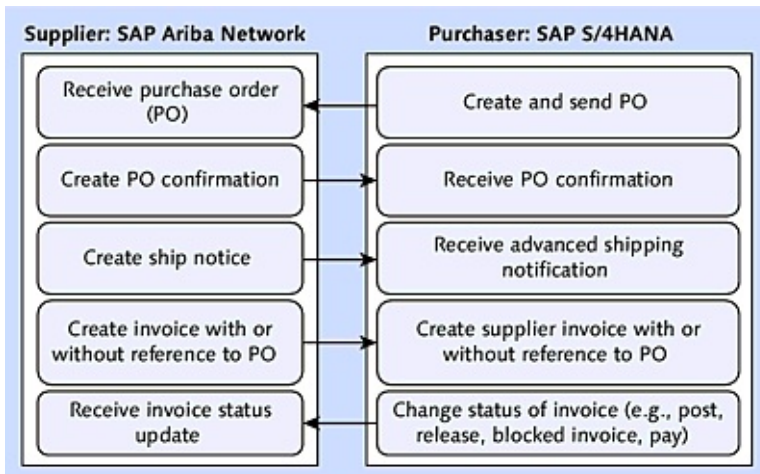
Figure 4.12 SAP Ariba and SAP S/4HANA

With SAP S/4HANA, a new output management approach is in place. By design, the new output management includes cloud qualities such as extensibility enablement, multitenancy enablement, and modification-free configuration. Therefore, the complete configuration differs from the configuration that is used when output management is based on table NAST. The new configuration is based on the Business Rule Framework plus (BRF+), which is accessible for customers. In SAP S/4HANA, the target architecture is based on Adobe Document Server and Adobe Forms only. For the form determination rules (along with other output parameters), the BRF+ functionality is used (in this sense, in combination with the message determination). Output management based on table NAST is no longer supported for new documents in purchase orders. Purchase orders that are migrated from legacy systems and for which table NAST based output has been determined can be processed with this technology. For all new purchase orders, the new output management is used. Therefore, in Procurement for purchase orders, there is a need to adapt the configuration settings related to output management.

Organizations face a number of challenges within Accounts Payable (AP) processes that should be addressed with systemized solutions in the future:

- Slow invoice processing, leading to late payment and endangering

supplier relations

- Lack of visibility into invoice and payment data

- Slow invoice/payment approvals

- High percentage of exceptions, which require manual handling

SAP S/4HANA seeks in the future to address all of these issues by simplifying processes for collecting, registering, and checking invoices; verifying them against preconfigured business rules; and handling exceptions with SAP solutions for invoice and payables management. However, this is currently an area where little is delivered within the SAP S/4HANA core that can be considered best practices. The current processes focus around the standard Logistics Invoice Verification (LIV) processes, in conjunction with SAP Fiori-enabled invoice approvals. The SAP road map will start to incorporate the open text Vendor Invoice Management (VIM) functionality, but it's currently unclear to what extent; that is, whether this will include optical character recognition (OCR) and exception handling, and how this will integrate with invoice handling in the SAP Ariba Network.

Additionally, there is a change of authorization concept for the supplier invoice. Before when posting invoices for a specific company code, the user was checked to ensure he was authorized for any plant. Now, the system checks in general the authorization for the company code. If an item is changed with a purchase order reference, the specific plant is checked.

Business Partner

In line with the change in the data model, the business partner is now the primary business object, meaning the business partner transactions are now used to complete the creation or maintenance of the business partner. This will allow a holistic view of the business partner for all applications. However, in terms of managing the configuration, certain

constraints exist when dealing with the business partner object; for example, the customer vendor integration (CVI) mapping and business partner number ranges must be considered across multiple application areas.

The traditional SAP ERP system has redundant object models for master data. With SAP S/4HANA, the business partner approach is now capable of centrally managing master data for business partners, customers, and vendors. During the course of the business relationship, the business partner can assume other business partner roles, and, in this case, with SAP S/4HANA, the general data, which is independent of a business partner's function or of application-specific extension, need not be created again. This prevents data from being created and stored redundantly.

As a result, the standard IDoc type for vendor master integration CREMAS is discontinued and not available within an SAP S/4HANA system. Therefore, the replacement technology for business partner replication via service-orientated architecture (SOA) must be used.

4.3.4   Sales

The role of the internal sales representative has become more and more challenging. Today, customers are more demanding than ever and are expecting a more personal approach to service. Additionally, they want the most up-to-date information related to their orders and delivery time lines at any point in time. Expecting sales representatives to share information with them, listen to their feedback, and involve them in the order fulfillment process creates many challenges for the sales representative:

- **Lack of real-time data**
  Real-time data is necessary for managers to make more efficient order fulfillment decisions.

- **Advanced analytics**
  Lack of advanced analytics hinders the creation of a holistic view of the supply chain processes.

- **Integration**
  Better integration of the various components of the supply chain is necessary to identify risks and issues more quickly (e.g., stock shortages).

- **Collaboration with customers**
  Enterprises need to collaborate with their customers to improve and personalize the customer experience to drive growth.

SAP S/4HANA can support today's key challenges in sales. Its capabilities offer an internal sales representative a comprehensive overview of the current order fulfillment situation. Real-time data and on-the-fly analytics can be used for troubleshooting and decision-making purposes.

Sales Order Fulfillment Cockpit

The SAP Fiori UX provides you with the sales order fulfillment cockpit. In the traditional SAP ERP system, the internal sales rep has to check multiple reports to get a holistic view of all related processes. Multiple issues in one order can't be detected easily in one step, creating a higher risk of undetected exceptions. Problem-related communication and decisions can't be tracked in the system, and reports need to be run multiple times.

SAP S/4HANA allows the user to monitor, manage, and collaborate on sales orders due for shipping and invoicing, allowing customers and company agreements to be easily fulfilled on time and accurately. By using the SAP S/4HANA sales order fulfillment cockpit facilitated by the SAP Fiori frontend UI, the sales representative can filter sales orders with

issues and get insight into the process execution. He can visualize issues over the entire end-to-end sales process in a single dashboard.

The sales order fulfillment cockpit in SAP S/4HANA offers the following business benefits:

- Enables visibility into order fulfillment

- Provides the internal sales representative the ability to focus on critical issues/exceptional cases

- Combines analytical insights with operational actions to allow internal sales representative to run actions directly and track the progress at any point in time

- Improves collaboration with internal and external contacts to resolve issues

With the sales order fulfillment cockpit, companies are now able to reduce their order-to-cash cycle time, increase their service level, and reduce outstanding payments.

Let's examine some changes to peripheral solutions that have occurred with the introduction of SAP S/4HANA:

- **SAP Global Trade Services (GTS) replaces SD foreign trade/customs**
  The foreign trade/customs functionality won't be available anymore in SAP S/4HANA because GTS is the successor of this requirement. SAP GTS (previously provided as an external service installed as an additional instance) can be natively integrated with SAP S/4HANA. Letter of credit, legal control, export control, and preference management in foreign trade/customs aren't available anymore in the material master; instead, the SAP GTS-based functionalities can be used. GTS offers additional functionalities for import management and export management. For intrastate, a customer can leverage the functionality within SAP S/4HANA.

Prior to conversion, careful analysis of all currently used foreign trade processes is needed. If the customer uses a third-party foreign trade system, it's possible that an adjustment is needed by the respective third-party foreign trade system, or SAP GTS can be connected to SAP S/4HANA to run the respective foreign trade processes.

- **SAP Credit Management replaces SD credit management**
  With SAP S/4HANA, SAP Credit Management (FIN-FSCM-CR) will be used. SAP provides tools to migrate to SAP Credit Management, which contains several elements:

  - Configuration data

  - Master data

  - Credit exposure data

  - Credit decision data

- **Settlement Management replaces SD rebates**
  SD rebates will be replaced by Settlement Management, which means that all existing rebate agreements can only be processed up until the end of the validity date and after that closed by a final agreement. SAP CRM's Trade Promotion Management (TPM) customers who want to integrate their existing SAP CRM TPM scenario with SAP S/4HANA still have to use SD rebate processing, which has been optimized for the database footprint.

- **SAP Revenue Accounting and Reporting replaces SD revenue recognition**
  SD revenue recognition isn't available in SAP S/4HANA. Instead, SAP S/4HANA functionality should be used that supports the new revenue accounting standard according to International Financial Reporting Standard 15 (IFRS 15) and adapted by local GAAPs.

In SAP S/4HANA, various existing status tables have been eliminated, and all fields under these tables have been moved to the corresponding header and item tables for sales documents, deliveries, and billing

documents. The document flow table has been simplified as well. Redundant document and rebate index tables have also been eliminated (see Figure 4.13).
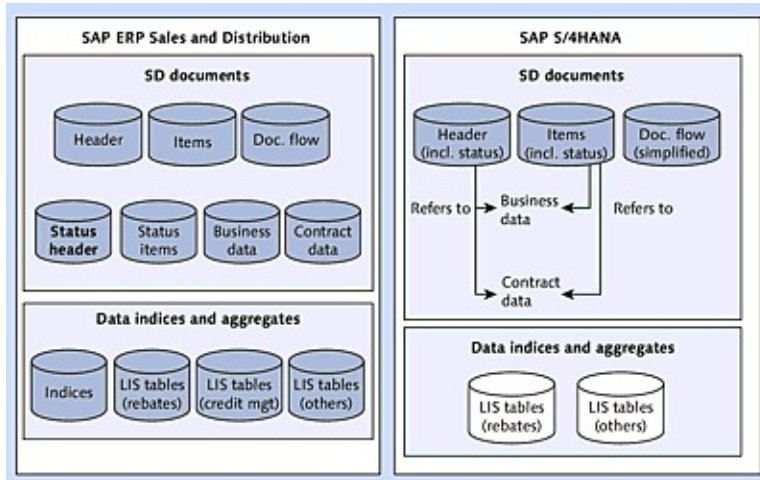
Figure 4.13 SD Data Model Simplification

With the changes in the data model, SAP S/4HANA offers the following key benefits:

- Lower TCO due to data model simplification

- Reduced memory footprint (e.g., simplified document flow, elimination of index tables, fewer aggregates)

- Increased performance of SAP HANA queries and code pushdown (one SELECT statement instead of two SELECT statements, easier join for header/items, including status and business data)

- Increased robustness of rebate processing (no redundancies due to aggregates)

- Faster business outcomes with reduced operational cost

- Increased competitiveness with integrated, fast, and flexible business processes

- Higher employee productivity with focus on value-added tasks

Advanced Available-to-Promise

Release 1610 has provided additional functionalities related to ATP:

- Mass functionality for availability check for sales, planned orders, and production orders.

- New release for delivery app, which shows the order confirmation status of sales order requirements. This app offers the ability to prioritize sales orders, assignment of stock and manipulation of already-confirmed order quantities in case of confirmation deficit.

- New SAP Fiori UX for back order processing setup, with a new concept to allow setup based on predefined confirmation strategies. Additionally, filtering and prioritization can be used to select and sort requirements for each confirmation strategy.

- New SAP Fiori app for back order processing to display the results of back order processing runs. Grouping and aggregation capabilities to allow collective allocations and easy identification of issues.

- Additionally, several new SAP Fiori apps have been introduced with release 1610 to allow better monitoring and a more comprehensive overview of order-to-cash processes, including the following:

  - Order to Cash Performance Monitor

  - Sales Order Full Fulfillment Monitor

  - Sales Contract Fulfillment Rates

  - Quotation Conversion Rates

4.4 Business Case

In this section, we'll discuss the business case for SAP S/4HANA. First, we'll look at SAP S/4HANA as the next-generation business suite and see what key benefits SAP S/4HANA gives to enterprises from a business and technical perspective. We'll describe the core capabilities that SAP S/4HANA offers as the digital core and how it can support enterprises to become digital enterprises.

Additionally, we'll go through each LoB and reveal their key challenges and how these challenges can be addressed with SAP S/4HANA. Lastly, we'll provide a summary of the top five key CSCO challenges and a summary of the SAP S/4HANA functionalities.

4.4.1 SAP S/4HANA: The Digital Core

SAP S/4HANA is the next-generation business suite that enables companies to reinvent business models and drive new revenue and profits. With SAP S/4HANA, enterprises can now easily connect to people, devices, and business networks in real time to deliver new value in the digital economy.

SAP S/4HANA enables enterprises to do the following:

- Drive digitized mission-critical business processes across all operations.
- Get instant business insight on one single source of live information on any device.
- Predict and simulate to anticipate future business outcomes.

With these core capabilities, SAP S/4HANA will allow enterprises to expand their digital transformations to reach all corners of their enterprise and collaborate with suppliers, deliver new experiences to their customers, and manage their assets more effectively.

Following are some of the key benefits of SAP S/4HANA, as the digital core:

- **Real-time operations and analytics**
  With SAP S/4HANA, enterprises are now able to run their operations in real time and use real-time data to analyze and predict changes, which will have a massive impact and change how enterprises are working, how they are doing business, and how they are organized.

- **Ability for prediction and simulation**
  With the help of predictive and simulation tools in SAP S/4HANA and real-time business insights, employees have better support to drive perfect decisions, optimize productivity, and increase profitability significantly.

- **Cognitive-enabled processes**
  SAP S/4HANA offers cognitive-enabled processes that not only help employees better understand the situation but also help them make better and more informed decisions.

- **Agility**
  The digital economy requires a flexible system that creates agility in an enterprise to quickly respond to market or organizational changes. SAP S/4HANA offers the ability to rapidly enter new markets, acquire and onboard new companies, or reflect organizational changes in a tenth of the time it takes with the traditional system.

SAP S/4HANA is designed to drive instant value across LoB and industries and master complexity end to end.

From a business perspective, SAP S/4HANA creates opportunities to reinvent business models and drive revenues in the following ways:

- Enterprises can connect to people, devices, and networks to deliver new value to their customers.

- Enterprises can simplify their processes and improve efficiency.

- Enterprises can now get instant insight on any data from any processes in real time.

From an IT perspective, SAP S/4HANA creates the following opportunities to dramatically simplify the landscape:

- Enterprises can now reduce their data footprint with larger data sets in one system. SAP ERP, SAP SCM, SAP SRM, and SAP PLM are integrated into one system with one source of live data.
- Innovation is made simple, as SAP S/4HANA provides an open platform to drive advanced applications.
- Business users can leverage a simple and role-based UX based on modern design principles to minimize training efforts while increasing productivity.

Now, let's look at some of the key features within SAP S/4HANA and see how these features can help you build a business case for SAP S/4HANA within individual areas.

4.4.2 Manufacturing

Table 4.1 shows the key challenges for the CSCO in the manufacturing area and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Enterprise Management Can Address This Challenge
1. Lack of visibility: - Lack of real-time availability of granular data to identify and analyze bottlenecks and improve planning and execution decisions.	MRP Cockpit improves the following: - Transparency on internal and external shortages across the entire enterprise. - Visibility of accurate inventory position across multiple plants.

• Lack of tightly integrated supply chain capability to respond to variable market conditions. • Have a centralized demand and supply planning capability to create a forward vision. Use real-time market and customer-related data to predict and manage shifts in demand. • Lack of analytical insight to drive optimal performance of assets, facilities, and energy.	• Ability to track overall material flow and visibility over fast and slow runner inventories. • Increased visibility into capacities and bottlenecks. • Real-time stock alerts, based on current stock situation.
2. Increasing volatility in demand and supply: • Limited real-time and advanced analytics doesn't provide sufficient capabilities for CSCOs to predict demand and identify issues quickly. • Most processes requiring human intervention don't offer opportunities to automate specific tasks and have users focus on exception-based management.	MRP enterprises can be more resilient against supply and demand volatilities, due to the following: • Real-time alerts of supply problems, improving transparency into critical situations. • Faster MRP runs to propagate demand information faster and allow quicker action in response to changes in demand and supply. • Prescriptive algorithms such as decision support in case of changes in demand and supply. • Simulations and evaluations of supply alternatives. • Ability to manage and track change requests.
3. Increased complexity: • Lack of support for using robotics. The usage of	Simplifications in the following processes: • Introduction of MRP area level,

robotics continues to increase as new applications are found across the value chain from production to warehousing, distribution, and the customer. • Increased complexity due to globalization and the respective efforts to expand into new markets, seeking low-cost manufacturing locations and the need to offer new and innovative products and services.	offering a more advanced and efficient logic and allowing a larger degree of differentiation possibility in MRP. • Simplified subcontracting logic. • Simplified sourcing logic. • Several product master fields eliminated to avoid redundant setup. • Production planning and detailed scheduling embedded into SAP S/4HANA, resulting in complexity in integration.
4. Lack of collaboration: • Lack of collaboration between different departments due to different systems and lack of integration. Collaborative demand planning should establish flexibility in the planning process on different levels of aggregation with different groups of customers. • Lack of collaboration with external partners for support for codevelopment.	• MRP Cockpit allowing seamless collaboration between production and procurement departments. • Improved collaboration among R&D, sales, and manufacturing by creating seamless visibility into new product development projects, available and required capacities, and current sales figures and promotion budgets, as well as better integration of product design with manufacturing. • Improved integration between sales and production through the integrated ATP processes. • Improved collaboration through standard integration with the SAP HANA extended solution SAP IBP.

Table 4.1 Manufacturing Challenges and SAP S/4HANA Advances

4.4.3   Supply Chain Management

Table 4.2 shows the key challenges for the CSCO for the area of supply chain management and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Enterprise Management Can Address This Challenge
1. Lack of visibility: • Lack of visibility of most-up-to-date stock levels (internal and extended supply chain). • Lack of real-time support to improve planning and execution decisions. • Lack of support to identify, where and how many products are stocked, how to allocate stocks to improve the service levels and reduce logistics costs, and how to reduce waste along the supply chain.	SAP S/4HANA provides increased visibility using the following: • Real-time insights on inventory levels, improving accuracy. • Advanced ATP, improving visibility to remaining noncommitted inventories and possibilities to cover incoming customer orders. • SAP EWM embedded into SAP S/4HANA, increasing transparency.
2. Increasing volatility in demand and supply: • Limited system capabilities to provide real-time data to identify issues and to react on stock shortages and ultimately improve service level and optimize processes.	Enterprises can be more resilient against supply and demand volatilities due to the following: • Better real-time data and analytics allowing enterprises to quickly identify issues and follow up. • Real-time alerts of the current stock situation and supply issues.
3. Increased complexity:	SAP S/4HANA provides simplifications in the following processes:

• Complex data models for IM (various tables for stock status), increasing complexity in programming and decrease of throughput. • Inflexible valuation methods, not allowing different currencies, and complexity in table structure containing transactional data and master data attributes (decrease of throughput).	• Simplified data model for IM reducing memory footprint. Only main tables remaining, no redundancies. • Simplified inventory valuation data model of one valuation method instead of two in the traditional SAP ERP system (IM+ML). In addition, transactional data are retrieved from the ML instead of stored in separate tables, increasing system throughput. • SAP EWM embedded into SAP S/4HANA, reducing complexity in interfaces and data setup. • Integrated QM processes and increased efficiency by optimizing quality inspection process.
4. Lack of collaboration: • Inability to view accurate inventory levels across different departments, resulting in different views, incorrect commitments to customers, and misalignment between departments.	SAP S/4HANA improves collaboration using the following: • Advanced ATP allowing better visibility to remaining noncommitted inventories and possibilities to cover incoming customer orders. • Increased collaboration between manufacturing, logistics, sales, and quality team through embedded quality management and extended warehouse management processes.

Table 4.2 Supply Chain Management Challenges and SAP S/4HANA Advances

4.4.4 Sourcing and Procurement

Table 4.3 shows the key challenges for the CSCO for the procurement area and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Enterprise Management Can Address This Challenge
1. Lack of visibility: • No single view of the entire purchase order flow. • Lack of real-time data to provide accurate inventory levels. • Limited search capabilities; users have to go through different screens (or even different systems) to view data related across contract worklists and contract and supplier data. • Users have to access different systems to be able to view different data across the entire flow.	Improved visibility and transparency with the following: • Ability to track purchase order flow. • Visibility of accurate inventory position across multiple plants. • Dynamic and flexible search feature across contract worklists with capability to navigate directly to contract and supplier fact sheets. • One system for purchasing of all direct materials, indirect materials, and services with a harmonized UI.
2. Increasing volatility in demand and supply: • Lack of an integrated view of the process doesn't provide sufficient support to enterprises to be more prepared for volatility in demand and supply.	SAP S/4HANA for sourcing and procurement help reduce the impact of volatility in supply is reduced with the following: • Standard integration for SAP Ariba for a more efficient procurement

• Lack of analytics.	process. • Advanced analytics to identify discounts and pricing opportunities for better supply planning.
3. Increased complexity: • Technical complexity of the landscape due to different solutions for different parts of the processes. • Challenges aligning data across different systems.	Complexity is reduced by the following: • One-step management of contracts and use of self-service requisitioning for procurement. • One central master data object (business partner) for vendors, customers, and business partners. • Standard integration with SAP Ariba for more optimized processes and one single source of truth.
4. Lack of collaboration: • Lack of integration between different systems, providing a single source of truth. • Inability to view the entire material flow for in-house production and procurement production.	Collaboration is enhanced with the following: • Ability to secure many-to-many networked collaboration with trading partners. • Seamless collaboration between production and procurement departments via MRP cockpit. • Standard integration with SAP S/4HANA solutions, such as SAP Ariba to improve collaboration.

Table 4.3 Sourcing and Procurement Challenges and SAP S/4HANA Advances

4.4.5   Sales

Table 4.4 shows the key challenges for the CSCO for the sales area and how SAP S/4HANA functionalities can address today's challenges.

Challenge for the CSCO	How SAP S/4HANA Enterprise Management Can Address This Challenge
1. Lack of visibility: • Traditional SAP ERP system doesn't provide capabilities to provide a holistic overview of the order fulfillment flow. • Lack of real-time visibility of accurate inventory level results in incorrectly committed sales orders.	SAP S/4HANA provides the following: • Advanced a single source of holistic transparency on sales order fulfillment issues on desktops and tablets. • Increased visibility to remaining non-committed inventories and possibilities to cover incoming customer orders. • Sales order fulfillment cockpit improving visibility of the order flow and allowing internal sales representatives to monitor and focus on exceptional cases. • Increased visibility through new improved SAP Fiori apps for performance and order fulfillment management.
2. Increasing volatility in demand and supply: Insufficient capabilities to meet the increasing customer demand due to the following: • Lack of order flow status and inability to track orders. • Insufficient system support to	SAP S/4HANA improves the process through: • Improved sales processes help enterprises be more prepared for volatility in supply. • Improved customer retention by enhancing the flow of information on order status and

allow exception-based work. • Inability to have an accurate overview of stock levels.	tracking. • Accelerated complaints and returns management. • Exception-based working to monitor and react to shortages faster. • Clarification of issues effectively and efficiently by prescriptive decision support and facilitated collaboration. • Advanced ATP process with flexible rules to quickly reschedule orders based on customer and demand priorities with prescriptive decision support.
3. Increased complexity: • Complexity in document tables. • Inefficient and complex process to get order status flow or stock status; need to go through different screens or different sources to get the full status.	Following simplifications have been made: • One central master data object (business partner) for vendors, customers, and business partners. • SAP GTS replaces SD foreign trade/customs. • SAP Credit Management replaces SD credit management. • Settlement Management replaces SD rebates. • SAP Revenue Accounting and Reporting replaces SD revenue recognition. • Various document status tables eliminated and moved to corresponding header and item

	tables.
	• Elimination of redundant document and rebate index tables.
	• Material master foreign trade will be replaced by SAP GTS.
4. Lack of collaboration: • Lack of integrated view of the ATP situation. • Lack of integration with SAP CRM-related systems, resulting in inability to view customer data to predict demand and take action accordingly.	Better collaboration due to the following: • Improved integration of sales and production through the integrated ATP process. • Standard integration with SAP S/4HANA extended solution SAP Hybris for improved collaboration.

Table 4.4   Sales Challenges and SAP S/4HANA Advances

4.4.6   Summary of SAP S/4HANA Key Benefits for Logistics

SAP S/4HANA can support the key challenges that CSCOs face today. The following subsections describe what SAP S/4HANA can help enterprises do to meet these challenges.

Increase Visibility

Within SAP S/4HANA, companies increase visibility across the enterprise in the following ways:

• Enterprises can run real-time mission-critical business processes across the entire enterprise.

• Companies can run advanced analytics at any point in time with the most accurate information.

- One single source of truth is provided.

- Solution proposal and simulation reduces human intervention effort to perform standard tasks. Instead, enterprises can focus more on exception-based handling.

Reduce Impact of Volatility in Supply and Demand

With SAP S/4HANA, enterprises can now be more resilient against supply and demand volatilities and increase competitiveness with integrated, fast, and flexible business processes. With the optimized processes and exception-based management in SAP S/4HANA, employee productivity will increase due to a higher focus on value-added tasks. Better integration of the processes enables higher visibility of the full supply chain, which will help reduce the impact of volatility in supply and demand due to better information, capabilities to proactively follow up on issues, and help with predicting changes.

Reduce Complexity

SAP S/4HANA offers reduced complexity in the IT landscape, resulting in faster business outcomes and reduced operational costs. The SAP S/4HANA digital architecture has three aspects:

- The standardized core processes are integrated into one single suite that serves as the backbone of the enterprise where speed plays the biggest role. Next to that, core processes are also wired in SAP S/4HANA in an innovative way, allowing application of new business models and processes such as IoT. In this layer, many simplifications and standardizations of core processes have been implemented (e.g., simplified data model for IM, exception-based management, etc.).

- A modular layer sits on top of the core serving as the middle office and allowing the maximum level of flexibility in reacting to customer requirements.

- An intuitive, user-friendly (SAP Fiori-based) layer supported by predictive and prescriptive analytics sits on top to collaborate with internal and external users.

This architecture enables users to run and process a massive amount of data in just a fraction of the time compared to the traditional SAP ERP system.

Improved Collaboration

With SAP S/4HANA, several new features have been offered that enable seamless collaboration between departments (e.g., between production and procurement through the MRP Cockpit, between sales and production through the integrated ATP, etc.). Additionally, collaboration isn't only limited to internal core processes; SAP S/4HANA offers standard integration with SAP S/4HANA extended solutions (e.g., SAP IBP, SAP Ariba, and SAP SuccessFactors).

User-Friendly Interface

With SAP S/4HANA, SAP offers its customers a flexible customer platform that capitalizes on the data that are available. It looks at their behavioral patterns, transaction histories, and feedback they provide to predict new trends and manage their supply chain proactively. With the user-friendly (SAP Fiori-based) interface, SAP S/4HANA offers a personalized experience with instant insight on any device.

4.5   Future Outlook

In this section, we'll describe the functionalities by LoB that are scheduled to be released in future release packs and/or SAP ERP functionality that will be replaced by SAP S/4HANA functionalities.

4.5.1   Manufacturing

Table 4.5 describes the key areas in manufacturing that are planned for future innovation: SAP IBP (as the long-term product replacing SAP APO), digital manufacturing, and SAP PLM.

Area	Current Planned Innovation
SAP IBP	SAP IBP will replace the current SAP APO in the long term. SAP IBP is delivered as an additional product only available on SAP S/4HANA Cloud and can be interfaced with on-premise deployments of SAP S/4HANA.
Digital manufacturing	• Engineering change management. • Manufacturing engineering: visual enterprise, manufacturing planning, visual work instructions, and variant configuration. • 3-D printing and collaboration on design and documents via SAP HANA Cloud Platform.
SAP PLM	• Visual Enterprise Manufacturing Planner to hand over the engineering bill of materials (EBOM) to manufacturing bill of materials (MBOM); interface between them. • Classification reuse of UI components. • Management of change records. • Versioning for bill of materials (BOM), BOM where-

	used list, and BOM comparison.

Table 4.5 Outlook for Manufacturing with SAP S/4HANA

4.5.2 Supply Chain

Table 4.6 provides the high-level overview of planned innovation for the supply chain area. The major planned improvements for the near future are in the area of embedded SAP EWM and SAP TM in SAP S/4HANA.

Area	Current Planned Innovation
IM	Optimized performance for goods movement.
UX	• Analytical SAP Fiori app for inventory managers. • Enhancements to SAP Fiori app for material document. • New SAP Fiori apps for physical inventory.
QM	• Advanced search for quality objects. • Improved efficiencies in QA execution processes.
TM	SAP TM will be embedded in SAP S/4HANA and will continue to run side by side until all functionalities are met by SAP S/4HANA.

Table 4.6 Outlook for Supply Chain Management with SAP S/4HANA

4.5.3 Sales

Table 4.7 provides the overview of planned future innovation for the sales area. The main area for improvement is in development of the UX (SAP Fiori apps).

Area	Current Planned Innovation
UX	• Enhanced data migration from SAP ERP to SAP

	S/4HANA.
	
	 • SAP Fiori apps for order-to-cash, returns and refunds, and sales KPIs.
	
	 • Improvements to SAP Fiori app for billing clerks:
	
	    ○ Display of contextual information about billing documents.
	
	    ○ Ability to create billing documents from a billing due list.
	
	    ○ Ability to search and display a document, release a document to accounting, and send the output to customer.

SAP Hybris Billing	• FI-CA connection to SAP HANA Cloud Platform Digital Payment Hub. • Billing plans, UI invoicing. • Intercompany bills. • Revenue accounting. • SAP Fiori app to analyze credit, plans, volumes, and more.

Table 4.7 Outlook for Sales with SAP S/4HANA

4.5.4   Sourcing and Procurement

Table 4.8 shows the overview of key planned innovations for the sourcing and procurement area. Future developments are in the area of SAP Fiori apps and the integration of SAP SRM functionalities either to SAP Ariba Network or to SAP S/4HANA.

Area	Current Planned Innovation
Operational procurement	Process simplification for the service procurement process, including the service entry data sheet.
UX	• Central page overview with procure-to-pay support on

	the SAP Fiori app.
	
	• Manage professional requisition.
	
	• Existing SAP Fiori apps enhanced:
	
	  ◦ Purchase Requisition
	
	  ◦ Purchase Order
	
	  ◦ Contract Processing

UX (Cont.)	• New SAP Fiori apps for the following:
	
	  ◦ Managing Scheduling Agreements
	
	  ◦ Quota Arrangements
	
	  ◦ Source Lists
	
	• Advanced search and navigation for scheduling agreements.

SAP SRM	SAP SRM functionalities will move to SAP S/4HANA or to SAP Ariba. Customers can continue to use SAP SRM side by side, but should not expect any new features.
Invoice processing	OpenText integration for supplier invoice processing.

Table 4.8 Outlook for Sourcing and Procurement with SAP S/4HANA

4.6   Summary

In this chapter, we went through the IBM C-Suite study results and identified the key pain points that CSCOs are facing today. Based on the insights from the C-Suite study, we identified the SAP S/4HANA features that can address the biggest pain points for each LoB and the key business benefits that SAP S/4HANA will bring to enterprises. Following are the key features in SAP S/4HANA that support today's CSCOs:

- Real-time data across the entire supply chain, improving accuracy

- Advanced analytics that allow users to run reports at any point in time to better monitor their processes, predict issues, and act accordingly

- SAP Fiori UX user-friendly interfaces that can be customized on a personal level, and several applications that can be run on any device

- Standard integration with SAP S/4HANA extended solutions, providing a more holistic and integrated view across all parts of the supply chain

- Data model simplification that significantly reduces the technical complexity of the system and increases system throughput

Additionally, we went through the list of planned future innovations for SAP S/4HANA Materials Management and Operations. Next, we will look at additional solutions that integrate with SAP S/4HANA as part of your SAP landscape.

This chapter addresses the growing SAP portfolio of products used to build a digital value chain. We'll cover the SAP products outside the SAP S/4HANA core solution that you'll need to complete a digital platform, as well as address the functional overlaps and synergies to give you a complete picture.

5   SAP S/4HANA and the SAP Landscape

Now that you understand the key innovations SAP S/4HANA provides for finance and logistics, we want to take a closer look into the extended SAP portfolio—those line of business (LoB) solutions that complete the SAP S/4HANA digital core (see Figure 5.1). These are still independent solutions that can be consumed standalone if this is required, but they are also tightly integrated with the SAP S/4HANA core to meet the demands of a digital platform. Like SAP S/4HANA, these solutions were also designed to support the drivers—real-time information, big data, customer experience, connected devices, and so on—of digital transformation.

Figure 5.1   SAP S/4HANA Suite and Line of Business Solutions

With these edge solutions, you can do the following:

- Simplify your procurements and sourcing strategy with SAP Ariba

- Manage your contingent workforce with SAP Fieldglass

- Control your travel and expense costs with Concur

- Optimize your Human Resources (HR) processes with SAP SuccessFactors

- Improve your customer relationship management with the SAP Hybris portfolio

In the following sections, we'll give you an overview of each product, its functional capabilities, and how it fits in to the overall SAP portfolio.

5.1   Sourcing and Procurement: SAP Ariba

SAP Ariba is the world's leading end-to-end software-as-a-service (SaaS) suite, combined with the biggest business commerce network to offer real-time collaboration between buyers and sellers. SAP Ariba is SAP's strategic sourcing and procurement solution embedded in SAP S/4HANA Enterprise Management procurement. Because the SAP S/4HANA suite contains all core functionalities and capabilities, SAP recommends SAP Ariba for source-to-pay as one of several edge products that complete the digital core.

Procurement with SAP Ariba is organized into three main processes:

- Sourcing and contracts

- Requests and purchases

- Invoices and payments

5.1.1   Sourcing and Contracts

The sourcing process focuses on the management of electronical requests for information (RFI), requests for quotation (RFQ), and requests for proposal (RFP). At the same time, sourcing is also

conducting process compliance, reverse auctioning, and reporting against business key performance indicators (KPIs). The contract process focuses on the management of contracts (e.g., expiration) and conducting authoring compliance.

The main areas of sourcing and contracts where SAP Ariba stands out are as follows:

- **Spend analysis**
  Spend visibility is very important for companies, but not all of them have good visibility into their spending. Traditionally, spend visibility has been data aggregation, dashboards, and reporting. Nevertheless, with SAP Ariba Spend Visibility powered by SAP HANA (hereafter, SAP Ariba Spend Visibility), companies are able to access commodity classification, supplier enrichment, market intelligence, and integrated spend management. SAP Ariba Spend Visibility will provide accurate ideas to make decisions such as improving the pipeline, increasing purchasing with suppliers, reducing inventory costs, mitigating supplier risk, and so on. Therefore, SAP Ariba Spend Visibility makes spend management more effective through data enrichment, 3D visibility for true spend intelligence, robust analytic tool and native integration to sourcing, contract management, supplier information, performance management, and procure-to-pay.

- **Supplier discovery**
  One of SAP Ariba's strengths is supplier discovery. The SAP Ariba Network can be used to search for new potential suppliers. Suppliers are required to introduce their commodities with a unique code (United Nations Standard Products and Services Code, UNSPSC), which enables customers to reach out to the suppliers. Suppliers must pay to be available in the SAP Ariba Network, unless a customer invites a particular supplier to an RFx; in that case, no extra costs (e.g., license costs) are charged to the supplier.

- **Strategic sourcing**

In the area of strategic sourcing, SAP Ariba has reported savings of up to 14% to increase profitability and growth, accelerate purchase transactions, source more than 500 categories, and proactively manage and mitigate risk. The SAP Ariba Network enables SAP Ariba sourcing to have a very agile and rapid way of creating and managing RFx or auctions. Customers have detailed information about responses from suppliers that were invited to the RFx or auctions, as well as real-time contact with those suppliers.

Strategic sourcing incorporates capabilities such as sourcing projects with the ability to embed best practices for sourcing process, approvals, and collaboration, as well as RFx and auctions management using electronic template-based event support for RFI, RFP, and RFQ. SAP Ariba supports multiple auction types, savings pipelines and tracking, decision support and optimization, integrated customer support, and out-of-the-box integration to spend visibility, discovery, contracts, suppliers, and procure-to-pay.

- **Contract management**

  SAP Ariba Contract Management manages all of the organization agreements and subagreements on an integrated SaaS platform. It creates workflows during contract creation and maintenance. It leverages prebuilt best practice templates and workflows and improves collaboration with suppliers. Contract lifecycle management provides organizations the opportunity to put their users in charge of contract maintenance. A contract repository is available for contract users in SAP Ariba. Getting into the contract detail, there is also the possibility to add clauses to the clauses repository.

5.1.2 Requests and Purchases

Request processing focuses on strategic requisitioning capabilities, such as collaborative requisitioning and approvals, supplier onboarding, and catalog management, among others. The buying process focuses on

order routing, spot-buy capabilities for noncontract spending, purchase order generation, and supply chain execution.

The main areas of requests and purchases where SAP Ariba stands out are as follows:

- **Collaborative requisitioning and approvals**
  The SAP Ariba Network enables multiple suppliers to collaborate. It works with catalog and noncatalog items, supports a spot-buy functionality, and enables collaborative configuration of complex items. The approval phases include the four steps called precollaboration, begin collaboration, end collaboration, and postcollaboration.

- **Catalog management**
  With SAP Ariba Network, there are three types of items in a catalog: standard catalog, noncatalog, and punch-out catalogs. A punch-out catalog is a special version of a supplier's web catalog that is connected to the procurement system of a purchasing organization. Punch-out items behave the same way as catalog items in that a supplier can have one or more links to the punch-out catalog. Catalog kits enable adding multiple, bundled products with one click.

- **Order routing and notices**
  Among other order routing functionalities, orders are transmitted through the SAP Ariba Network, exported to SAP ERP, copied, dispatched manually, and combined.

- **Spot buy**
  Indirect materials such as one-offs or emergency purchases that usually need rapid processing can be bought using SAP Ariba Spot Buy. These suppliers are referred to as the "long-tail" or one-off suppliers. Approved SAP Ariba Spot Buy suppliers can be found in the SAP Ariba Spot Buy catalog, which follows corporate policies, secure payment, and shipment of goods. Typically, these nonsourced goods make up to 15% of the overall indirect spend.

- **Supply chain execution**
  Efficient supply chain execution is one of the important competitive key differentiators of the global and outsourced economy. Companies are asked to collaborate with all trading partners through one single global solution across multiple processes and geographies in real time. SAP Ariba Collaborative Supply Chain is based on the SAP Ariba Network connecting all systems and stakeholders, collaborating effectively with multiple tiers of suppliers, and trading partners at the same time in direct materials procurement. It manages all relevant processes, including consigned inventory, rolling delivery schedules, and contract management. SAP Ariba users can respond to changes in supply and demand in real time and identify errors using configurable business rules with automated validation and reconciliation.

5.1.3 Invoices and Payments

Invoice processing focuses on digitizing invoices into an electronic format, which contains process steps such as delivery, matching, validating, and approval of invoices. SAP Ariba proactively converts suppliers submitting paper invoices to an electronic process after they reach a certain volume threshold, reducing the expense of paper as a positive side effect.

Payment processing focuses on synchronizing the delivery with electronic payments to eliminate risks and inefficiencies.

The main areas of invoicing and payments where SAP Ariba stands out are as follows:

- **Invoice automation**
  Buyers have taken a series of approaches to automate their invoice processing. The invoice workflow for Accounts Payables (AP) streamlines the capturing, processing, matching, and finally approving of all invoices. Business users of SAP Ariba Invoice Management can

create their own workflows tailored by categories of spend, suppliers, or other business crucial variables. Invoicing can be done easily and anywhere by e-mail or smartphone supporting remote and line-level invoice approval. It supports monitoring of both transaction details and supplier performance.

- **Invoice reconciliation**
  SAP AribaPay allows for simple supplier reconciliation. Invoices are matched either two ways or three ways. In the two-way scenario, after receipt, both the supplier invoice and the corresponding purchase order are matched, validated, and finally reconciled. In the three-way scenario, the purchase order receipt is considered additionally. Invoices aren't changed; instead, a copy of the invoice is created and changed. Validation is done on both the header and line item level by comparing amounts of each level to each other's document. In a final step, amounts are paid.

- **Discount management**
  With SAP Ariba Discount Professional, suppliers are supported if requesting discounts from their buyers, enrolling in net or discount terms, and offering and accepting dynamic discounts. Buyers are supported in the ongoing management of discounts.

- **Working capital management**
  Usually, suppliers face challenges with inconsistent payment terms such as rigidly initiated payment terms from buyers. SAP AribaPay manages and extends payment terms of the working capital, which usually strategically results in reduced days sales outstanding (DSO) on the supplier side or as extended days payable outstanding (DPO) on the buyer side.

- **Business-to-business (B2B) payments**
  A secure partner is engaged to capture, manage, and maintain sensitive supplier bank information to bridge the gap between invoicing and payment. Payment control is improved at a lower cost of

processing. At the same time, the risk of fraud associated with payments is minimized.

- **Expense reimbursement**
Travel expense reimbursement (done with Concur) provides all employees functionality to enter, calculate, approve, and finally reimburse expense types such as mileage of private cars used, meals, accommodation/hotels, and local and public transport.

- **Bank automation**
SAP AribaPay eliminates the need to maintain supplier bank account information as bank account data are stored in an external IT environment. Supplier payment inquiries are reduced when paying suppliers automatically.

5.1.4   SAP Ariba and SAP S/4HANA

SAP's strategy for procurement is divided into two blocks: operational transactions (materials management, purchase order, operational contract, etc.) are part of SAP S/4HANA Enterprise Management, and strategic collaboration is covered by the LoB solutions from SAP Ariba, SAP Fieldglass, and Concur, as shown in Figure 5.2. This creates a set of hybrid solutions that reflect the demand of today's organizations and that leverage the advantage of SAP Ariba and SAP S/4HANA integration. Strategic sourcing is executed in the SAP Ariba applications; best value bids get finalized and result in a contract with price terms. The following scenario shows that SAP Ariba and SAP S/4HANA are perfectly working in a fully integrated way:

- With SAP Ariba Procurement Content, contract terms and pricing can be enforced at the catalog item level, driving compliance and resulting in realized savings.

- SAP Supplier Relationship Management (SAP SRM) users can punch out to the SAP Ariba Procurement Content catalog and search for

items and complete their purchase order process in SAP SRM.

- After purchase order execution in SAP SRM, the purchase order is sent over to the supplier via the SAP Ariba Network for fulfillment and invoicing.

From a licensing perspective, it's possible to have a licensing model around the pure cloud scenarios (with SAP Ariba as the procurement engine integrated into SAP S/4HANA) or for hybrid scenarios (SAP S/4HANA from end to end).
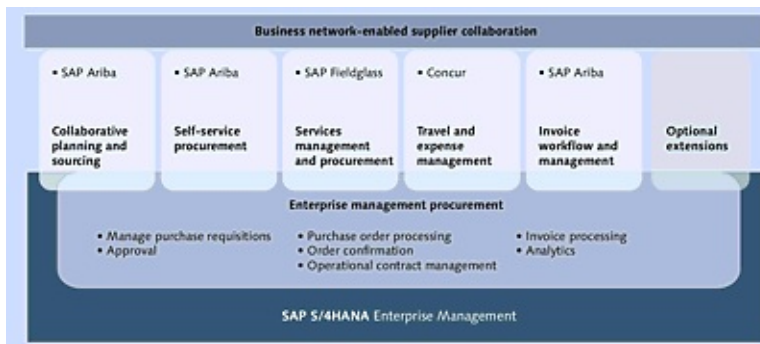
Figure 5.2   SAP S/4HANA Suite and Lines of Business

From a technical integration perspective, a lot of prepackaged integration content or best practices are already available from the rapid-deployment solutions (RDSs). These cover strategic procurement, operational procurement, and collaborative finance integration scenarios. According to SAP's future road map for SAP S/4HANA integration, there will be further integration content to ensure a rock solid and tight integration with the LoB solutions from SAP Ariba. If customers now want to move toward SAP S/4HANA, they can already start using SAP Ariba products to have real strategic sourcing in place.

5.2   Contingent Workforce Management: SAP Fieldglass

SAP Fieldglass is the leader in services procurement and contingent workforce management, and it completes the SAP portfolio for external services such as contingent workers, statement of work projects and services, independent contractors, and specialized talent pools. SAP Fieldglass's main solution is a cloud-based vendor management system (VMS) that automates the complete contingent and statement of work (SoW) labor lifecycle (see Figure 5.3). As part of the overall SAP S/4HANA strategy, SAP Fieldglass completes the exciting SAP SuccessFactors and SAP Ariba portfolio, and it gives customers total workforce management with full-time and contract workers on a single platform.
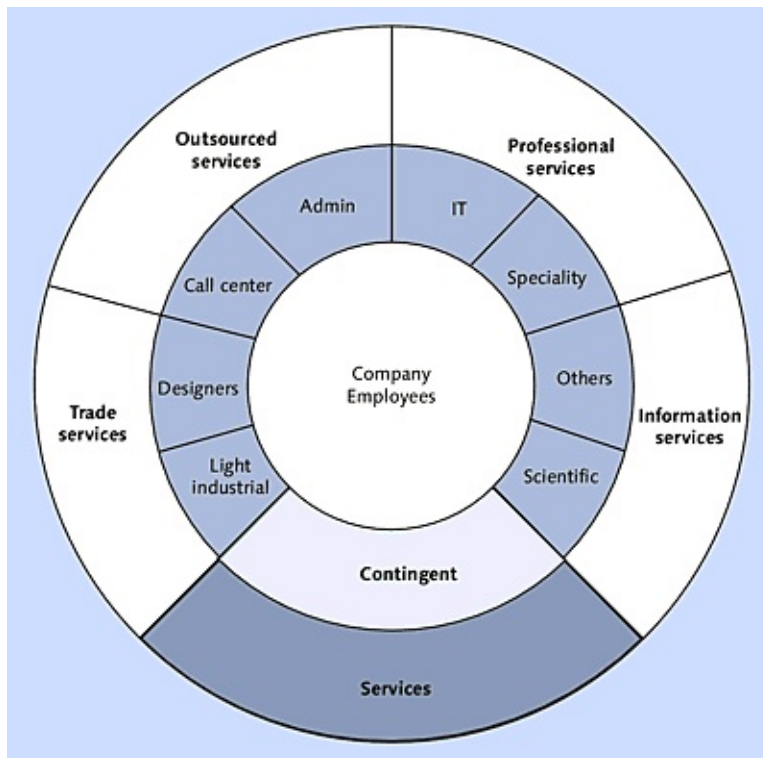
Figure 5.3   Overview of the SAP Fieldglass Services

5.2.1   Vendor Management System

SAP Fieldglass supports the full lifecycle of a service engagement, from creating the RFx to evaluating the service provided (see [Figure 5.4](#)). It provides the capability to support complex projects with multiple SoW and supports clients through the lifecycle from sourcing, engaging, managing, and invoicing.

The SAP Fieldglass VMS enables users to do the following:

- Use the Decision Wizard as a guide though the different engagement types and supports the best worker composition from temporary workers to consulting services.

- Create requisitions easily that cover the essential parts of a job posting to support hiring managers in their process.

- Perform approvals outside the tool via e-mail and cover multiple levels of authorization. They can be tied to different types of rules such as financial limits or departments/functions.

- Establish distribution lists to the top-performing suppliers, and from there, stepwise distribution to the second- or third-tier providers. This enables users to assign specific or important job posting/categories to preferred suppliers to increase quality.

- Use the candidate review to get a quick side-by-side comparison of candidates, build shortlists, track the whole history of candidates, and get guidance on the candidate's price.

- Improve the quality and experience of new workers with action items and checklists though the on- and off-boarding functions. This also provides transparency to the project management office.

- Adjust the time and expense functionality to the organization's needs to reflect different types of workers.

- Convert approved time sheets into an invoice that supports legal/tax requirements and discounts via the automatic invoicing function.
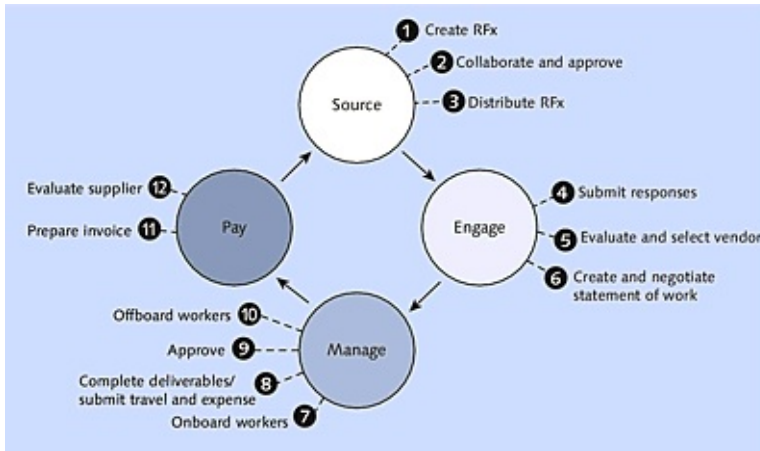
Figure 5.4 Typical Overview of a Service Engagement Lifecycle

In addition, there are business intelligence and administrative tools that support the overall process and provide you with the relevant transparency.

From an integration point of view, there are currently more than 800 integration points available and standard integrations into some of the LoB solutions from SAP. The overall platform is based on an n-tier J2EE architecture and is delivered as a multitenant SaaS solution hosted by SAP Fieldglass itself.

5.2.2   SAP Fieldglass and SAP S/4HANA

SAP Fieldglass follows the same strategic direction as the other cloud-based solutions outlined in Figure 5.2. Its focus is on services procurement and contingent labor; from a strategic perspective, it will be the go-forward solution for services procurement within the SAP solution stack. Therefore, tight integration between the other business networks products such as SAP Ariba and SAP SuccessFactors is required.

As an outlook for future releases, SAP has shared that it anticipates offering a standard integration for invoice processing delivered as prepackaged content for SAP S/4HANA within the next releases, which

would underpin the strategic positioning of SAP Fieldglass as part of the future SAP S/4HANA road map.

From a license perspective, SAP Fieldglass can be run as a separate solution with a separate license model that isn't part of the SAP S/4HANA license. If a customer is going to implement SAP S/4HANA, there is no conflict and no direct implication. Companies that want to implement SAP Fieldglass can already start with an existing ERP system; integration scenarios and packages are already available.

5.3 Travel and Expense Management: Concur

Concur is a solution that combines and integrates the overall spend into three major blocks: Concur Travel, Concur Expense, and Concur Invoice. The central principle is that all connected information can be managed in one place and provide transparency on the overall spend. Concur integrates with numerous third-party solutions and apps, from Airbnb and United Airlines to Uber and Starbucks.

5.3.1 Spend Management

All information used to plan a trip and to organize your travel is captured within Concur Travel, even if it's offline by a travel agent working with Concur. All of this information is exchanged with Concur Expense and flows into an employee report, which makes it much easier for employees to create their expense report.

The portfolio consists of five main products:

- **Concur Expense**
  Provides full visibility into spend and the ability to ensure policy and regulatory compliance. It provides you with the capability to synchronize your credit card as a baseline for the generation of your claims. It also provides a nice and easy user experience (UX) to guide you through your expense claiming process.

- **Concur Travel**
  Uses the same easy UX and simplifies the way you do your online travel reservation and booking. As already stated, this booking tool is tightly integrated with Concur Expense and feeds information as a baseline for your expense report.

- **Concur Invoice**
  Accelerates and simplifies the invoicing of expenses and reduces your invoice costs significantly. It helps you automate your invoices and get

transparency on your overall travel and expense spending.

- **Concur for Mobile**
Complements the web-based solution, so it's possible to manage the expenses as well as to do travel or invoice approvals.

- **Concur Data Insights**
Delivers the data and tools you need to control spending. Interactive dashboards, reports, and alerts provide a real-time view into what is being spent and who is spending it.

Integration of Concur Expense and Concur Invoice into SAP's HR and financial solutions is planned as part of the overall digital core strategy. Especially for HR, a legal reporting standard integration is planned for the near future. For Concur Travel, further integration into mobile with, for example, location-based bookings is planned. As part of the Concur Data Insights, a spend management dashboard with actionable analytics is planned.

Concur has two focus areas planned to enhance and integrate into the existing SAP portfolio:

- **Consistent preconfigured country regulatory templates across SAP and Concur**
The goal is to deliver simplified regulatory templates out of the box for existing countries such as Germany, the United Kingdom, and France, and with new countries.

- **Standard seamless, automated integration with SAP backend**
This integration is currently available via the Boomi connector for SAP, flat file, web service, custom connector, or customer bridge program. Further enhancements, especially in the area of employee/HR, include cost object data for HR and finance master data, and the support of finance interface postings.

5.3.2   Concur and SAP S/4HANA

Similar to the two previous products discussed, Concur is aimed at completing the business network and extending the SAP portfolio toward travel and expense management. From an implementation perspective, there are no limitations regarding SAP S/4HANA. The integration path is equal for customers running SAP ERP Human Capital Management (SAP ERP HCM) and SAP ERP Financials (FI) on separate instances and on a single instance, or for customers running SAP S/4HANA Finance, or any combination of such. From an integration perspective, SAP shared that standard integration packages will be available in the following releases that support integration scenarios via SAP HANA Cloud Platform or SAP Process Orchestration (SAP PO) that support FI and payroll postings.

From a financial perspective, Concur is available as a separate license and isn't being considered in the SAP S/4HANA license model.

5.4 Human Resources: SAP SuccessFactors

As part of the digital core strategy, SAP SuccessFactors is the default HR functionality of SAP S/4HANA. Mobile enabled with a modern UX, SAP SuccessFactors includes a complete set of core HR with payroll, tightly integrated talent management solutions, robust workforce analytics and planning, and social collaboration tools.

This cloud HR suite is a highly scalable SaaS solution that offers various ways to extend existing process functionality beyond what is available out of the box. Standard solution configuration capabilities are supported with the ability to create new objects and business rules with the Metadata Framework (MDF) and create new applications with SAP HANA Cloud Platform.

Further, standard integrations between SAP SuccessFactors and SAP S/4HANA are available to ensure that SAP SuccessFactors Employee Central is truly the next-generation core HR system of record for employee data.

Let's look at SAP SuccessFactors functionality.

5.4.1 Employee Data

SAP SuccessFactors Employee Central is the core HR component of the SAP SuccessFactors solution. It captures employee and organizational data, and it's built around the concept of self-service for HR professionals, managers, and employees.

SAP SuccessFactors Employee Central is an enterprise-grade, event-based transactional system with full workflow support. It includes position management, time-off management, global benefits, and reporting on employee and organizational data, as well as compliance and auditing. It also includes SAP SuccessFactors Employee Central Payroll, which is

provided as an SAP-hosted solution based on SAP's long established on-premise payroll engine.

5.4.2 Talent Management

SAP SuccessFactors has a broad array of talent management and related analytics functionality:

- **SAP SuccessFactors Recruiting Management and SAP SuccessFactors Recruiting Marketing**
  Together, these functions form a comprehensive recruiting solution that supports attracting, engaging, and selecting better candidates in an efficient way and then measuring the results or recruiting process. Recruiting Management is a mobile and socially enabled applicant tracking system that allows companies to select and hire the best talent faster. Recruiting Marketing is a social recruiting marketing platform that allows companies to attract and engage quality candidates via state-of-the-art social solutions, custom career sites, and analytics to measure efficiency of various recruitment channels used in recruiting marketing campaigns.

- **SAP SuccessFactors Onboarding**
  This solution for new hires and hiring managers improves time to productivity, job satisfaction, and new hire retention. It guides and empowers new hires to access SAP SuccessFactors solutions where they can fill in required new hire forms, access documentation, become acquainted with their new team, enroll and take initial training, set initial goals, and use social collaboration tools that will help them become familiar with the new work environment.

- **SAP SuccessFactors Learning**
  This is a comprehensive learning management system that supports social and mobile learning to ensure compliance and development of talent with enhanced learning experience. SAP SuccessFactors Learning enables managing, developing, and deployment of instructor-

led, offline, and formal and social online training.

SAP SuccessFactors iContent (a content-as-a-service [CaaS] solution) allows you to focus on learning quality and strategy while eliminating the need for hosting learning content and managing content infrastructure, as well as security, delivery, and updates of learning content.

- **SAP SuccessFactors Performance and Goals**

  This is a performance management and goal-setting solution that allows you to create an aligned and high-performing workforce. Goal management enables you to communicate company strategy, create meaningful individual and group goals across the company, and assign/cascade them to employees so that they can support company business goals and strategy. Goals execution and progress can be measured in real time. SAP SuccessFactors Performance and Goals delivers various types of evaluations, performance assessments, and performance calibration; it streamlines the performance appraisal process and helps managers by providing tools (writing and coaching assistant, legal scan) and content that ensure a meaningful and compliant performance review and feedback process. Employee performance tied up with business goals is measured and can be integrated with the company reward system.

- **SAP SuccessFactors Compensation**

  This is a comprehensive compensation management solution that helps to retain top talent by supporting a pay-for-performance strategy and process. Compensation management allows you to create reward budgets with flexible approvals workflows, and budget spending monitoring is supported by analytics. It also enables you to create compensation plans with various pay components, including basic pay, bonuses, and stock. Part of SAP SuccessFactors Compensation is the variable pay module that supports very complex bonus programs based on performance results from multiple employee assignments within the company. Compensation enables a pay-for-performance

reward culture by supporting reward pay based on performance results. Compensation calibration helps to make better compensation decisions with the support of objective ratings and ultimately helps to retain top talent and increase employee productivity.

- **SAP SuccessFactors Succession and Development**
  This solution supports succession planning and career development planning and allows you to identify, develop, and retain talent throughout the organization.
  Succession management allows you to identify key positions in the organization and nominate potential successors for those positions while monitoring their readiness to fill the role. The objective is to plan for staffing changes and ensure the readiness of nominated successors. Career development planning allows you to create development plans, track development activities for employees and nominated successors, and align learning activities with identified competency gaps to ensure that employees and successors will be ready to take on new future roles within the company. It improves motivation with continuous development and career planning where employees can track their preferred roles and monitor their readiness based on the competency levels required to progress to the role. A comprehensive talent search engine, nine-box grid performance-potential matrix, and talent calibration are also provided.

- **SAP SuccessFactors Workforce Analytics**
  This is a comprehensive analytics and reporting solution that allows you to create reports and dashboards (with trend analysis) with aggregated data and with the ability to drill down to deeper levels of detail. It comes with a set of predefined metrics and KPIs across core HR and talent modules. Workforce Analytics supports reporting on external data sources and can be connected to multiple systems to create cross-functional reports and dashboards. These reports and dashboards can be delivered to managers and business leaders in the form of published reports and easily consumable insights with a

combination of core HR, talent, and non-HR data. Workforce Analytics enables access to industry benchmarks so that companies using the solution can compare themselves with industry peers across various metrics.

- **SAP SuccessFactors Workforce Planning**
This solution addresses an organization's need to plan future workforce based on business need and trends. It's a strategic workforce planning tool based on a long-term planning approach (as opposed to a short-term, operational planning approach) to match the required workforce to projected future workforce demand in terms of cost and skills. Based on available workforce data and benchmarks, the solution allows you to assess the company readiness to execute various strategies (i.e., talent and reward strategies), forecast the impact of business decisions (i.e., mergers and acquisitions, development of new product line), mitigate the risk, and take specific actions that the solution proposes from library of strategies and actions. Multiple what-if scenarios can be modeled based on set parameters to analyze the cost impacts. Predictive capabilities are available to support capability analysis in the context of current trends.

5.4.3   SAP SuccessFactors and SAP S/4HANA

From SAP's perspective, SAP SuccessFactors (rather than SAP ERP HCM) is the go-forward human capital management solution for SAP S/4HANA and the go-forward solution for the HR category within SAP's diversified cloud strategy. With adoption of the SAP HANA platform for foundation, integration, analytics, and application development, and with SAP Fiori for UX, the SAP SuccessFactors suite is the firmly established solution in the SAP solution portfolio and the future SAP S/4HANA road map.

SAP S/4HANA delivers significant simplifications and innovations as compared to the previous generation SAP ERP solution where the SAP

ERP HCM component resided. At this time, SAP doesn't plan to take the SAP ERP HCM component to the same simplification and innovation process, and there are no plans to invest in new functionality and innovations in SAP ERP HCM. SAP S/4HANA doesn't have an on-premise version of an HR transactional system. However, it requires a simple set of HR data fields to support finance and other SAP ERP processes.

According to SAP, the current SAP ERP HCM portfolio will be updated and maintained until at least 2025, and SAP will continue to make double investments—minor on-premise investments and significant cloud investments. The SAP ERP HCM on-premise solution will be updated primarily within core HR localization, compliance, SAP Fiori unification, and UX areas.

The SAP SuccessFactors solution can be easily integrated from the data and process perspective with on-premise and other cloud systems via prepackaged and SAP-maintained integrations, predefined integration templates, and application programming interfaces (APIs) and custom integrations. Though customers have multiple options available for integrating SAP SuccessFactors with other solutions, SAP's preferred solution for SAP SuccessFactors integration middleware is SAP HANA Cloud Platform, integration services. It's an integration-as-a-service platform specifically designed to support integration of SAP's range of cloud solutions with other on-premise and cloud systems. SAP is significantly investing in extending the range of prepackaged integrations to SAP cloud applications and other vendors' solutions.

For companies using on-premise SAP ERP HCM that want to implement talent management solutions, SAP SuccessFactors is an obvious choice because no enhancements are planned for talent management on-premise solutions. For companies that want to implement an HR information system with SAP, SAP ERP HCM on-premise solution is still a viable option (i.e., it will still be tweaked for specific industry regulations,

compliance localization, and language support); however, from the long-term strategic perspective, SAP SuccessFactors Employee Central is a safer route.

In the end, companies that want to implement SAP S/4HANA can use SAP S/4HANA deployed on-premise or with SAP S/4HANA Cloud. Companies choosing SAP S/4HANA as their next-generation business suite and that also require a human capital management suite will likely focus on the SAP SuccessFactors solution due to the current and planned SAP investment level and innovation in cloud human capital management solutions, as follows:

- Prepackaged integrations are available now so companies can connect SAP SuccessFactors Employee Central with SAP S/4HANA Cloud and SAP Success Factors Employee Central integration with SAP S/4HANA, on-premise edition. Integration capabilities are via SAP HANA Cloud Platform, web services, and SAP PO for SAP S/4HANA, on-premise edition, and via SAP HANA Cloud Platform and web services for SAP S/4HANA Cloud.
  Companies that want to implement SAP S/4HANA, are using SAP ERP HCM on-premise, and aren't yet ready to implement SAP SuccessFactors can continue to use SAP ERP HCM, running in a separate instance or a single instance together with SAP S/4HANA. SAP has plans for prepackaged integrations to enable both scenarios.

- One SAP road map for SAP S/4HANA Cloud and SAP S/4HANA, on-premise edition, integration will likely expand in areas of employee integration, time sheet integration, total workforce integration with SAP Fieldglass, SAP SuccessFactors Employee Central, SAP ERP HCM, and SAP Ariba for the integration of contingent workforces. SAP also plans an interface for payroll postings to SAP S/4HANA Finance and an integration of supplier data from SAP S/4HANA to SAP SuccessFactors Employee Central to support the contingent worker assignments there.

5.5   Customer Relationship Management: SAP Hybris

In the age of digitalization, the demand for a customer-centric and everywhere-accessible buying experience is increasing. As part of SAP's own customer-focused strategy, the SAP Hybris portfolio addresses this demand and completes SAP S/4HANA.

The SAP Hybris portfolio includes four key offerings: SAP Hybris Commerce, SAP Hybris Marketing, SAP Hybris Billing, and SAP Hybris Cloud for Customer. As a portfolio, these offerings are fundamentally centered on customer engagement and commerce. Offerings include a combination of digital strategy, implementation services, and support services, which are integrated across multiple channels. But what use does this portfolio have within the world of modern business?

Today, business is about more than just business-to-business (B2B) or business-to-consumer (B2C) activities. The new buzzword is *customer-to-business* (C2B). Empowered customers are reshaping how business works and are expecting a new, deeper kind of engagement and experience. Consider the cases of Woolworths and Blockbuster; once dominating forces, they were forced into decline after failing to adapt fast enough to significant changes in technology and how influenced these changes should be by the perceived experience of the customer. Organizations are now starting to put customer experience at the core of their digital focus in the absence of physical stores via virtual style advisers, for example, and have hence secured a strong following. C2B business is about understanding and acting on customer signals and derived trends, building relationships, and delivering experiences that make customers ask for more. Customer engagement is reshaping industry dynamics and how businesses are run. The SAP Hybris portfolio can empower businesses to take control of their digital transformation journey and preempt their customers' behavior to secure the most appropriate response and to keep them engaged.

In this section, we'll discuss the offerings behind the core of SAP Hybris: SAP Hybris Commerce, SAP Hybris Marketing, SAP Hybris Billing, and SAP Hybris Cloud for Customer.

5.5.1   Commerce

Industries across the globe are investing in commerce and backend systems to meet the demands of today's increasingly sophisticated customers. Companies from all sectors are seeking backend systems that provide an integrated view of their core business processes.

SAP Hybris Commerce offers the following features:

- Fully integrated solution for commerce, sales, and service
- SAP Hybris catalog and storefront access for agents
- Customer and address data synchronization
- Integrated SAP Hybris customer ticketing system
- Integrated SAP Hybris assisted service module

Together, these key features enable businesses that run SAP Hybris Commerce to do the following:

- Enable personalized customer engagement.
- Improve customer relationships.
- Make sales processes more efficient.
- Provide exceptional customer service across channels.
- Gain a 360-degree view of customers.

The integration of SAP Hybris with other SAP solutions provides a standardized, ready-to-use framework that connects SAP Hybris Commerce's omnicommerce capabilities with SAP products, including SAP S/4HANA; SAP Configure, Price, and Quote; and SAP Hybris Marketing applications. This means that implementation partners no

longer need to build integrations from scratch. With fewer custom configurations, the integrations can be implemented faster and at lower costs. It offers integration options in several areas, including transfer of master data, integration with SAP Hybris Marketing and SAP Customer Activity Repository (CAR), and solution and services configuration, to name a few.

Alongside these key features, there are several accelerators available for SAP Hybris Commerce: B2B, B2C, China, and several industry-specific accelerators.

5.5.2   Marketing

The evolution of the digital economy has seen a change in buyer behavior, and marketers have been challenged to keep up. The trend is toward contextual marketing, which systematically delivers mass personalization of customer interactions by leveraging insights about each individual customer to shape the customer's experience as each interaction unfolds. Contextual marketing allows marketers to engage customers in an intelligent way that nudges them toward purchase rather than distracting them if they are already on that path.

SAP Hybris Marketing goes beyond customer relationship management to help marketers develop the full context of individual customers and deliver highly personalized content and interactions at every stage of the customer journey. It also helps marketers understand the performance of all marketing activities to optimize resources, drive customer advocacy, and stimulate growth.

SAP Hybris Marketing helps marketers do the following:

- Capture all customer engagement data along each customer's journey.
- Leverage advanced analytics to gain deeper customer insights into behaviors and motivation for accurate targeting and personalization.

- Enable real-time marketing with increased marketing transparency and internal collaboration.

- Play what-if scenarios and use predictive capabilities to optimize offers in the moment.

- Unify the customer view and create a single, always-current source for customer information.

SAP Hybris Marketing is a comprehensive marketing solution built on the digital platform and has the following offerings:

- **SAP Hybris Marketing Data Management**
  Leverage customer profile information to gain deep insights into customer's intent and motivations. Leverage advanced analytics to discover and visualize hidden trends, customer sentiments, and the customer journey insights.

- **SAP Hybris Profile**
  Capture relevant customer information across multiple sources and enrich customer information to provide real-time intent of customers. Gain insights about known as well as unknown customers in real time. Proactively identify customer opportunities.

- **SAP Hybris Marketing Segmentation**
  Slice and dice data on the fly using this high-performance customer-segmentation tool with insightful visualization and exploration tools. Use the waterfall UI with its rich set of targeting operations to build complex segmentation trees easily with real-time counting.

- **SAP Hybris Marketing Recommendation**
  Provide context-relevant, smart recommendations based on previous purchasing behavior in real time to leveraging predictive analytics. Self-learning models optimize the recommendations to the best offers. Increase conversion rates and average sales order size by cross-selling and up-selling.

- **SAP Hybris Marketing Planning**

Align marketing with transparent marketing plans. Manage the complete budgeting process, and gain insights into real-time budgets and expenses. Manage campaigns from a single calendar view of all relevant marketing activities. Keep track of key campaign figures.

- **SAP Hybris Marketing Insight**

  Gain a real-time understanding into your marketing performances with a management dashboard that shows all relevant marketing KPIs across the organization. Quickly identify opportunities and drill down to discover the key insights on segments, products, channels, budgets, campaigns, and assets.

- **SAP Hybris Marketing Acquisition**

  Plan and execute personalized and targeted multichannel wave campaigns through e-mail, SMS, direct mail, and others channels. Receive aggregated campaign performance information as well as detailed analytics at individual engagement levels.

- **SAP Hybris Marketing Convert**

  Leverage online browsing behaviors and purchase intent to retarget your customers and make it easy for them to convert. For instance, if a customer abandons a shopping cart, you can send him an e-mail with a reminder to complete the purchase with one click or deliver display ads based on recently viewed content.

- **SAP Hybris Marketing Loyalty**

  Plan and execute personalized loyalty programs and rewards. Capture customer insights through loyalty programs, and leverage the insights to deliver relevant loyalty marketing engagements. Convert customers into loyal brand advocates.

The combination of these offerings provides the needed functionality in the digital era.

5.5.3   Billing

We increasingly see a move to subscription and consumption business models and increased growth of partnerships across all industries. Companies are exploring new business models across all processes and industries with very different approaches. Many products and services are being repackaged, reengineered, or developed exclusively for monetization via a subscription model from companies ranging from OnStar and HBO Now to Zipcar and *Match.com*.

SAP Hybris Billing connects the front office with product and services monetization, offering a consistent experience across all channels and touch points. Companies have to deal with an increasingly larger customer database, where customer experience is critical. Additionally, an increasing number of businesses are incorporating new models that are focused on providing middleman/brokerage services, where, in principle, the same platform and solution is being used for B2B2C.

As shown in Figure 5.5, SAP Hybris Billing covers the complete exchange-to-exchange process as described here:

- **Design**
  Design bundles of products and services, defining the pricing policies and allowances, model of subscription contracts, and agreements with customers and consumers.

- **Sales**
  Manage quotations and contracts.

- **Deliver**
  Deliver sales bundles and services, register the usage events, identify the contract/client, and rate the services.

- **Billing**
  Handle billing and invoicing, with great flexibility on how invoices are issued, revenue assurance processes, and advanced collection managements.
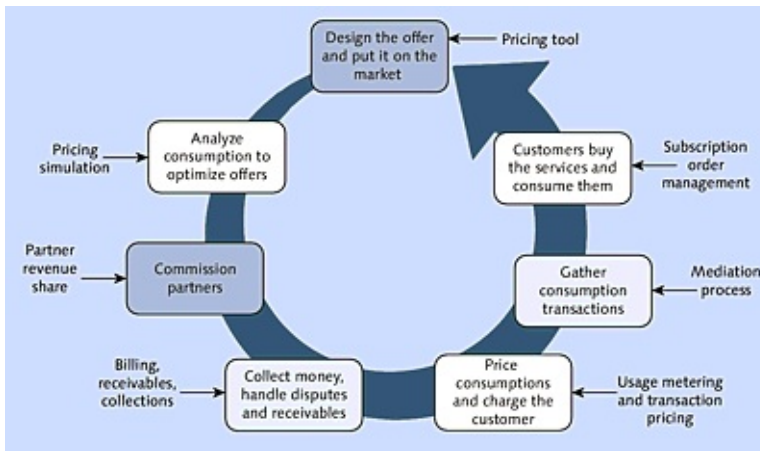
Figure 5.5   SAP Hybris Billing Solution Overview

SAP Hybris Billing connects to the other products within the SAP Hybris suite such as SAP Hybris Commerce and SAP Hybris Marketing. It can also help with the following:

- Enhanced customer experience with a complete subscription selling, solution bundling, monetization, billing, and self-care solution

- Better context and predictive pricing, with rich customer profiles based on real-time usage information, billings, and payment behavior tracking

SAP Hybris Billing is a modular solution, and, depending on the client's needs, the integration scenarios can vary from a lean subscription model to a complex subscription management scenario. In the complex scenario, a system is required to manage all changes to subscriptions (product change, extensions, etc.); integration with services activation systems or logistics systems, including sophisticated call center scenarios where it can also integrate with third-party customer relationship management/output management systems; and integration with SAP CRM and SAP ERP Sales and Distribution (SD) functionality.

5.5.4   Sales and Service

SAP Hybris Cloud for Customer is a full cloud solution that covers the two main areas of sales and services; it completes the SAP Hybris front-office

solution and is fully integrated into SAP S/4HANA.

SAP Hybris Cloud for Sales reflects the key requirements for selling in the digital era:

- Account management and intelligence to provide 360-degree customer information and intelligence

- Mobility support and personalization for any device

- Real-time and predictive analytics functionality to build up custom dashboards and ad hoc reports or forecasts based on SAP HANA

- Prebuilt integration scenarios into SAP S/4HANA

- Collaboration and social capabilities

SAP Hybris Cloud for Service helps companies serve their customers on every channel and is suitable for first-level support and field-service support. It provides the following functionalities:

- Contextual collaboration for fast support

- Omnichannel service, for example, social media, chat, e-mail, phone, and so on

- Native integration into SAP S/4HANA and SAP Hybris Commerce

- Solution finder capabilities for improved productivity that can integrate with different sources

- Real-time analytics based on SAP HANA

Together, these solutions comprise SAP Hybris Cloud for Customer, which forms an important part of the SAP Hybris portfolio and serves as a frontend layer to personalize and improve customer experience with SAP S/4HANA.

5.5.5   SAP Hybris and SAP S/4HANA

SAP Hybris extend the SAP S/4HANA suite for customer-centric activities. Because SAP Hybris consists of several subproducts, it has a separate license model that isn't included in the SAP S/4HANA license. You can purchase and run most of the products separately. Nevertheless, they are tightly integrated; for example, SAP Hybris Marketing is built on SAP HANA and leverages the full capabilities of the platform.

The implementation of SAP Hybris products isn't dependent on SAP S/4HANA, but they can complement the implementation for different scenarios; for example, you can use SAP Hybris Cloud for Customer to support smaller sales subsidiaries or business units and integrate into SAP S/4HANA.

From an integration perspective, several scenarios will be available in future releases but aren't yet confirmed and assigned to any release. The integration of the SAP Hybris Cloud for Customer to SAP S/4HANA Enterprise Management Cloud and on-premise SAP S/4HANA with the SAP S/4HANA Marketing Cloud via SAP HANA Cloud Platform or via SAP PO depends on the deployment model. Prepackaged content is available that supports the opportunity-to-order process between SAP S/4HANA and SAP Hybris Cloud for Customer.

5.6   SAP Master Data Governance

So far in this chapter we have primarily discussed the cloud-based solutions that complement the SAP S/4HANA core, but it's important to switch gears for a moment to cover SAP Master Data Governance (SAP MDG). Beginning with SAP S/4HANA 1610, SAP MDG is embedded into SAP S/4HANA, on top of being available on any database (including the SAP HANA database).

SAP Master Data Governance is an SAP NetWeaver-based product built on top of SAP ERP to help organizations enable governance processes for master data, ensure data quality, and remove data duplication. Master data can be created, changed, and approved centrally in the SAP MDG and distributed to enterprise-wide systems. This product works in conjunction with other products like SAP Information Steward to analyze data quality or with SAP Data Services, which has multiple features for extract-transform-load (ETL) functions, data quality enhancement, and even data consolidation.

SAP MDG 9.0 comes with pre-built master data models for business partners (supplier and customer), materials, FI-related master data like profit center, profit center hierarchy, cost element/hierarchies, cost center, cost center hierarchy, and general ledger accounts, and other master data from partners for enterprise asset management, retail, and fashion management. With every release, SAP is coming up with more contents around the data models.

SAP MDG also allows consolidation of master data in a governed manner. In this scenario, data can be loaded into SAP MDG; duplication checks and data merges are now possible.

The following features make SAP MDG the master data governance tool of choice for SAP-centric landscapes:

- Built-in data models and the possibility of extending standard data

models and creating new data models for master data objects

- Improved user experience with Web Dynpro-based user interfaces and more and more SAP Fiori-based UIs

- Requests for master data creation normally undergo approval cycles; with SAP MDG, different types of workflows are easily enabled with validation rules through the BRF+ framework, and ABAP workflows and parallel workflows are also possible

- Once the change request for a master data creation/change gets approved, it gets distributed to the downstream systems using data replication framework via standard ALE technologies, but other integration technologies like web services are also supported; SAP MDG provides out-of-box integration capabilities with SAP S/4HANA, SAP Ariba, and SAP Hybris Commerce

- Analytics for process KPIs are also available for SAP HANA databases

- Data quality enhancements through integration with SAP Data Services or Integration Steward, or for SAP HANA-based SAP MDG using SAP HANA platform services for quality enhancements are possible

- For the same master data, SAP MDG's key mapping concept maps the unique identifier for a particular system to the unique identifier in SAP MDG

SAP MDG can be deployed on-premise or in the cloud. There are a couple things to think about when it comes to SAP MDG and SAP HANA:

- SAP MDG can support co-deployment with SAP S/4HANA *and* be deployed as a hub model that distributes data to SAP S/4HANA (as shown in Figure 5.6).
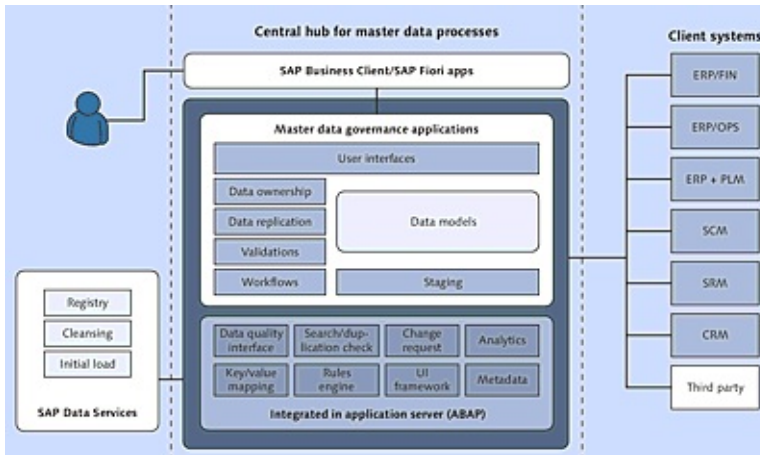
Figure 5.6   Sample Landscape with SAP MDG

- The key mapping function of SAP MDG can play an important role in Central Finance deployments to map financials master data from different systems.

- The consolidation scenario works better on SAP HANA, especially for large volumes of data.

- You can use smart data integration service in the SAP HANA platform for connecting to various source systems.

- Smart data quality services in the SAP HANA platform offer evolving data quality enhancement capabilities like address cleansing and records matching.

5.7   SAP S/4HANA Embedded Analytics

SAP S/4HANA embedded analytics is a collection of analytics features that enables users to perform real-time analytics on live transactional data. It comes with a set of predefined and prepackaged self-service data representations (i.e., virtual data models) to derive real-time insights from the data without worrying about the underlying data structure. These virtual data models can be extended, or new ones can be built to meet customer-specific requirements.

As you will see in Chapter 6, SAP S/4HANA, running on the SAP HANA database, reunites Online Transaction Processing (OLTP) and Online Analytical Processing (OLAP) in a single database. Operational reporting is available via SAP HANA Live and you can deploy SAP S/4HANA and a native SAP HANA data warehouse on the same stack.

In SAP S/4HANA, data models are represented using Core Data Services (CDS) views that are natively supported for SAP HANA and by ABAP (see Figure 5.7).
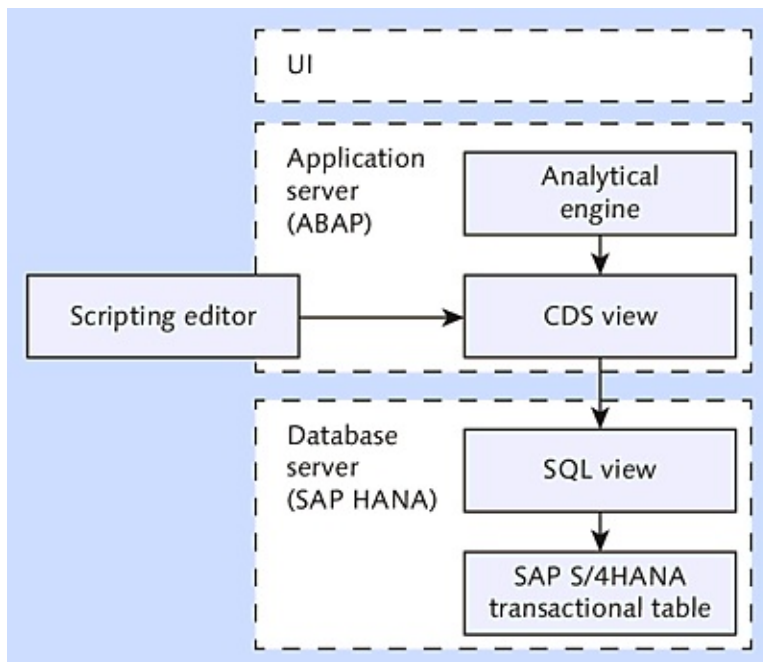
Figure 5.7   CDS Views Are the Models for Business Entities

CDS generates SQL views that are executed natively in SAP HANA, pushing the aggregation and data-intensive logic directly into the SAP HANA database layer. This eliminates aggregates, totals, and other types of data redundancies that have impeded business users from capturing real-time contextualized insights. With SAP S/4HANA embedded analytics, you can now report on the latest transactional data directly in SAP S/4HANA without having to send it to SAP Business Warehouse (SAP BW) for further processing. For a comparison of tradition analytics versus SAP HANA embedded analytics, see Figure 5.8.
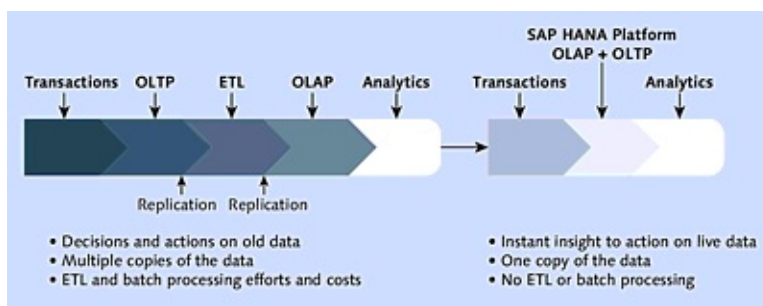
Figure 5.8 Traditional Analytics vs. Embedded Analytics

With traditional analytics, decisions were not always made on the latest data, there were multiple copies of many data points, and processing efforts could be large. With SAP S/4HANA embedded analytics, decision can be made on live data, there is only one copy of the data, and no ETL (extraction, transformation, and load) or batch process are required to load the data.

Best Practice for Analytics

SAP delivers a set of best practices for SAP HANA embedded analytics which include the following:

- The technical setup of CDS views for SAP S/4HANA embedded analytics (mandatory).

- Integration between SAP S/4HANA and SAP BusinessObjects Business Intelligence (optional). There is standard content available

for several areas such as finance, procure-to-pay, and order-to-cash. Integration between the SAP BusinessObjects BI platform and the SAP Fiori launchpad is also available.

- Integration between SAP S/4HANA and SAP BW (optional).

You can download the best practices for SAP HANA embedded analytics using the following URL: *service.sap.com/analyticswiths4h*.

5.8 Summary

This chapter gave you a good overview of the overall SAP portfolio and the LoBs that extend the SAP S/4HANA core solution to complete the requirements of the digital platform.

We introduced you to SAP Ariba, where we discussed the sourcing and procurement portfolio and how it relates to SAP S/4HANA Enterprise Management. We also gave you a view of possible hybrid procurement scenarios and how the overall procurement portfolio fits together. We provided you with an overview of SAP Fieldglass and the capabilities of the VMS around contingent workforce and service procurement, and then reviewed the capabilities of Concur around travel and expense management as an extension to SAP SuccessFactors. From there, we segued into a more detailed view of the SAP SuccessFactors functional capabilities and how they fit into the SAP S/4HANA and the other LoB solutions. Finally, we took a look at SAP Hybris and the customer engagement and service portfolio that ranges from commerce via marketing to billing and beyond.

We detoured briefly to cover how SAP Master Data Governance fits into the SAP S/4HANA portfolio. Since the most recent version of SAP S/4HANA, embedded SAP MDG functionality will help organizations handle critical governance processes for master data.

This is a good starting point to take a closer look at the technical architecture of SAP S/4HANA in the next chapter.

This chapter provides information about the architecture of SAP S/4HANA, including details around the underpinning SAP HANA platform and the SAP S/4HANA digital core.

6 SAP S/4HANA Architecture

SAP S/4HANA architecture is based on the SAP HANA database, and it primarily uses an SAP Fiori-based user interface (UI). The architecture can support both Online Transaction Processing (OLTP) and Online Analytical Processing (OLAP) data. It largely consists of simplified data models from the SAP Business Suite; these simplifications ensure that no aggregation or index tables need to be persisted in the database.

In this chapter, we describe the typical issues with IT that have led to the evolution of SAP S/4HANA. We also describe the SAP S/4HANA architecture, including data models, SAP HANA platform architecture, deployment models, and Application Lifecycle Management (ALM). We also cover the SAP S/4HANA core, including how the other components complement this core and how the user experience (UX) has changed to the current SAP Fiori UX.

6.1 Typical Issues in Information Technology Landscapes

Before we delve into more technical details of the SAP HANA platform and the SAP S/4HANA architecture, it's useful to think about common issues in IT landscapes that the SAP HANA platform has the potential to resolve.

The first common example is the struggle of traditional databases to handle enormous amount of data. We've implemented SAP ERP for a client who had to use a distributed environment for its core SAP ERP functions, causing a huge IT investment and a maintenance nightmare with hundreds of interfaces struggling to keep the distributed environment in synch. With the advent of the SAP HANA database, the systems can be consolidated back into a single instance of SAP ERP, reducing the total cost of ownership (TCO) to a great extent. In fact, consolidation of multiple large and small SAP/non-SAP systems is now possible using SAP S/4HANA as the target solution.

Another typical issue is the failing of batch jobs, which result in daily frustrations for IT support and failure to take some business actions in a timely manner. Think of a large retail customer who needs to move stock from the inventory at the warehouse to the stores in the morning based on a batch job report of the store inventory. If the batch job fails, the impact on the entire business is multiplied as the stock sits in the warehouse increasing the inventory carrying costs, the trucks are underutilized, and the stores have no stock resulting in dissatisfied customers. The same situation can be completely turned around by SAP HANA reporting, which takes only seconds to execute. These stock reports can be generated every day and on demand, thereby planning and executing the stock movements from the warehouses to the right stores in a timely manner.

Technical consultants have gone through the performance optimization problems for reports accessing huge amounts of data. Creation of secondary table indices was another action to speed up and optimize the performance of these reports. Maintenance of all these table indices had meant maintenance overhead and sometimes priority one production incidents. Now, with the SAP HANA database, secondary indices are a thing of the past. Report performances have increased to an incredible extent, with the right mix of code pushdown to the database layer. Using

the SAP HANA database also solves the problem with the table locks during peak loads.

Reporting can now be agile, with hugely improved performance, many types of flexible analysis, and a much-improved UX with SAP Fiori or SAP Fiori-like (SAPUI5-based) apps.

These are just some of the examples of IT problems that can now be solved with the help of SAP S/4HANA. The next questions are how these solutions are possible and what mechanics are involved from a technical perspective.

Note

For information regarding the functional issues that SAP S/4HANA can address, see Chapter 3, Section 3.3, and Chapter 4, Section 4.3.

6.2   The Journey from SAP ERP to SAP S/4HANA

In this section, we talk about the evolution of the SAP product from the SAP Business Suite to the latest product SAP S/4HANA. We also discuss the architecture of SAP S/4HANA, including how it forms the digital core of the modern enterprise, and the triggers for adopting SAP S/4HANA.

6.2.1   The Evolution of SAP S/4HANA

SAP launched the SAP HANA appliance in late 2010 to cater to high-volume real-time operational analytics. Next, SAP released the SAP HANA database in 2011, with SAP Business Warehouse (SAP BW) powered by SAP HANA. At present, both of these products have evolved for many clients and are used to cater to the overall analytics portfolio.

In 2013, SAP released the SAP Business Suite powered by SAP HANA, which provided faster transaction processing, as well as reporting capabilities. Up to this point, running your SAP Business Suite on SAP HANA was the same as running your SAP Business Suite on any other database, with the same data structure and almost the same code base. The only basic difference was that the code handling high volumes of data was being pushed down to the SAP HANA database layer.

With this release, supporting products evolved, for example, the SAP HANA Live views presenting the same semantic layer for each product like SAP ERP. These views were leveraged to create operational reporting, either on SAP HANA in one of the side-by-side scenarios where the SAP Business Suite ran on any database or in an SAP Business Suite on SAP HANA scenario. Currently, the SAP HANA Live views are used only in native SAP HANA applications, whereas Core Data Services (CDS) views are used in both native SAP HANA (version 10 upwards) as well as SAP S/4HANA applications, as we'll explain in the next few paragraphs.

In 2015, SAP introduced SAP S/4HANA as a completely new product, which is, as discussed previously, based on the simplified data model of the SAP HANA database, changed code base, and an SAP Fiori-based UI for many of the processes. ABAP-based CDS views are used to access the underlying data model, and the code generated for these views gets executed in the database layer.

What does the overall SAP S/4HANA architecture look like? At the core, there are the new simplified data models represented as the physical tables. The SAP S/4HANA business functions read/update data into these data models, and there are virtual data models (VDMs) based on CDS views built on top of these physical tables. To note, as of SAP S/4HANA 1610, not all the data models of the SAP ERP core have been transformed into simpler models. This simplification is still evolving.

As shown in Figure 6.1, a VDM is a structured representation of SAP HANA database views. Originally, VDMs referred to the SAP HANA Live view for SAP Business Suite.
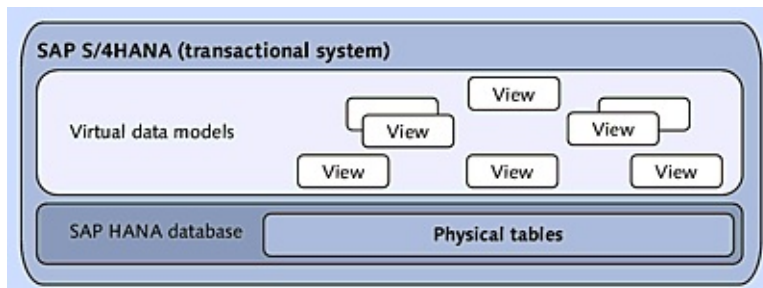
Figure 6.1 Virtual Data Model

CDSs are reusable views that serve as semantic data models not only to expose the underlying data into the operational reporting layer but also to provide additional functions such as views with aggregation, analysis, and union (combine multiple selections into one result set) functions. The CDS views can be created on top of tables or views. From SAP NetWeaver 7.4 onwards, CDS views are objects created in the ABAP layer. Before that, these views were built in the SAP HANA database layer and consumed in the ABAP layer as native SAP HANA objects. An

example of the results of a query based on a CDS view is shown in Figure 6.2.

The underlying technical innovation for the SAP S/4HANA architecture shown in Figure 6.3 is the SAP HANA platform, which uses the in-memory SAP HANA database.

Before SAP NetWeaver AS ABAP 7.4 SP 05, CDS was available only in the design-time and runtime environment of SAP HANA. Now, the CDS concept is also fully implemented in SAP NetWeaver AS ABAP, while the code execution is pushed down to the database. Thus, CDS can be handled in the ABAP layer using the same transport mechanisms as other ABAP artifacts.

Figure 6.2 CDS Query Sample Result

Figure 6.3 SAP S/4HANA Architecture

The simplification in the data model will result in a reduction in the database size as the number of redundant tables and the data to be stored in them diminishes with increasing simplification.

Some examples, as we saw in Chapter 3, are in the finance area where the following physical tables no longer exist but are replaced by views:

- Table ANLC: Fixed Assets: Cumulative Values
- Table BSAD: Index for Customers (Cleared Items)
- Table BSAK: Index for Vendors (Cleared Items)
- Table COSP: Cost Totals of External Postings
- Table COSS: Cost Totals of Internal Postings
- Table FAGLSBSAS: Index for G/L Accounts – New G/L (Cleared Items)
- Table FAGLBSIS: Index for G/L Accounts – New G/L
- Table GLT0: General Ledger Totals
- Table GLT3: Summary Data Preparations for Consolidation
- Table MLCD: Material Ledger

Another example of data model simplification in the finance area is for the Universal Journal entry in accounting. The new Universal Journal table ACDOCA provides real-time data from this single journal.

> **Note**
>
> For more information on the Universal Journal, see Chapter 3, Section 3.3.1.

The data model simplification is possible because of the SAP HANA database capabilities. Figure 6.4 shows the table simplification from SAP ERP to SAP S/4HANA.

There is an evolving road map (available at the **SAP Service Marketplace • Improvements & Innovations • SAP Roadmaps • Cross Topics • SAP S/4HANA**) that SAP has provided showing how the different pieces of the SAP Business Suite will be integrated together gradually to optimize the data usage and minimize the data replication across various products. The core of this innovation is the SAP HANA platform, which we'll cover in detail in Section 6.3.
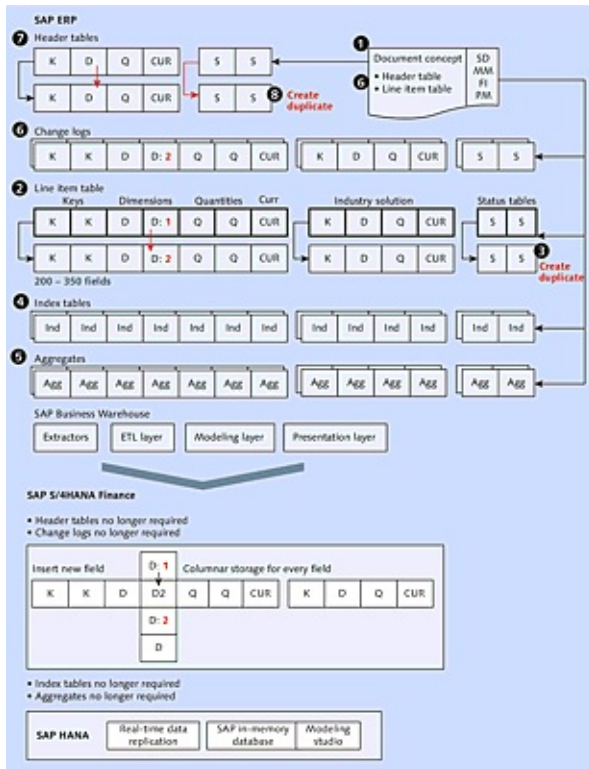
Figure 6.4   SAP S/4HANA: Changes in Tables

6.2.2   SAP S/4HANA as the Digital Core

Chapter 1 and Chapter 2 talked about how SAP S/4HANA forms an integral part of the IT digitalization agenda for many clients. To understand how SAP S/4HANA acts as the digital core, let's discuss what IT capabilities are needed by any product to form the digital core:

- Superlative UX

- Analytics at the point of interaction

- Real-time visibility of the enterprise to help with decision-making

- Support for various types of structured and unstructured data, as well as big data from various sources, including Internet of Things (IoT) and social media

- Integration of best-of-breed solutions across boundaries

SAP S/4HANA has all of these capabilities to qualify to be the digital core of your business, as detailed here:

- **Frontend**
  With the advent of SAP Fiori, cloud edition, the frontend components required include the SAP Fiori launchpad as well as SAP Gateway services, which are available on the SAP HANA Cloud Platform. The SAP Fiori apps can have the SAP S/4HANA core component as the backend system. Thus, the backend is untouched by the changes to any of the frontend components.

- **Analytics**
  The type of agility required by a business today—where customers expect personalized services, delivered now—can be supported only by the power of SAP S/4HANA as the digital core of the company. With the SAP HANA platform supporting both OLAP and OLTP data, SAP S/4HANA provides advanced analytical capabilities that weren't possible with traditional SAP ERP. SAP S/4HANA can do real-time analytics on transactional data at the time of the data entry itself. This is powered by the high speed of the SAP HANA database, which uses the VDMs through CDS views on the required data to do its analysis. Primarily, operational reporting can be used here.
  Other means of analysis are also available to SAP S/4HANA, depending on the scenario and availability of the tools. For example, SAP S/4HANA has built-in hybrid transactional and analytical applications such as SAP Smart Business Cockpits, multidimensional reports and analytical SAP Fiori apps, and embedded analytics, which include the Query Browser and Query Designer tools. For other types

of enterprise-wide analytics, SAP S/4HANA supports SAP BW for data extraction.

- **Business components**
  SAP S/4HANA Enterprise Management serves as the foundational solution of the SAP S/4HANA business suite. This solution is built on the SAP HANA platform and with user interactions via the SAP Fiori apps, forms the core of the business processes of the digital enterprise.

Some of the other solutions are getting integrated to this core to make use of the common data model and reduce data replication across system components. Let's discuss a few of these changes.

The SAP road map now includes imploding the industry solutions back into this core. Already in SAP S/4HANA 1511, several industry solutions became part of the SAP S/4HANA core (e.g., Consumer Products, Mill Products, Utilities, etc.). In SAP S/4HANA 1610, a majority of the functions of the industry solutions around Retail and Oil & Gas are also included.

Moving forward SAP will integrate full or partial solutions in the SAP S/4HANA core; for example, SAP Extended Warehouse Management (SAP EWM) is now part of SAP S/4HANA 1610. SAP Advanced Planning and Optimization (SAP APO) will be completely replaced by multiple solutions. The Production Planning and Demand Scheduling (PP/DS) and Global Available-to-Promise (GATP) functions are available and integrated with the SAP S/4HANA core in the 1610 release. The details of the features available are mentioned in the feature scope description at the SAP Help Portal (*http://help.sap.com/s4hana*).

Other cloud-based solutions—SAP Ariba, SAP SuccessFactors, SAP Fieldglass, Concur, SAP Hybris, SAP Hybris Cloud for Customer, SAP Financial Services Network, and third-party solutions such as Vertex for tax calculation—can be integrated with the SAP S/4HANA core through

various middleware products such as SAP HANA Cloud Integration, SAP Process Orchestration (SAP PO), the SAP HANA Cloud Platform, or web services. SAP S/4HANA 1610 provides built-in support for some of these cloud solutions (e.g., SAP SuccessFactors and Concur).

More details on SAP S/4HANA Cloud are covered in Chapter 8.

6.2.3   The Road Map to SAP S/4HANA and Innovations

For the IT department of an enterprise, the road map for SAP S/4HANA adoption depends majorly on the status of the IT landscape, especially the SAP footprint, and the short-term and medium-term focus areas. Let's discuss how the road map can be designed with a few example scenarios.

Triggers

Certain events trigger the evaluation of SAP HANA in its different forms, but here we'll talk only about those events that directly affect SAP S/4HANA considerations. You might begin considering the implementation of SAP S/4HANA under the following circumstances:

- **Business needs**
  Businesses may need functionalities that are available only in SAP S/4HANA, for example, a real-time operational report that influences business decisions. Businesses may also have certain pain points that can be solved by migrating to or implementing SAP S/4HANA. For example, there may be a consolidation scenario in which several large ERP systems need to be consolidated into a single large ERP system where all the business processes are aligned to the standard processes and are supported by a cutting-edge technology platform. This could be an existing system consolidation exercise or a result of a merger and acquisition. It could even be a divestiture where part of the functions and data are curved out, and the business wants to align the

remaining solution to the latest SAP solution, which is SAP S/4HANA Enterprise Management.

- **Greenfield implementation**
  Many of the clients who are implementing or reimplementing SAP ERP tend to start with the latest version of SAP S/4HANA Finance (e.g., 1605) or SAP S/4HANA Enterprise Management (e.g., 1610). For more information, see Chapter 9.

- **Technology drivers**
  There can be several technology drivers for an SAP S/4HANA adoption evaluation, including TCO reduction through infrastructure footprint reduction or landscape simplification.

- **Hardware considerations**
  For many clients, the SAP HANA road map evaluation gets triggered by their hardware refresh cycle. Instead of going with the traditional hardware, they choose to select hardware to support the SAP HANA platform so that they don't need to invest in the hardware for a reasonably longer period. Thus, they get the latest innovations of the database and, at the same time, have a future-proof solution. Many such clients like to go step by step and opt to migrate to an SAP Business Suite on SAP HANA solution to start with.

- **Future-proofing**
  The SAP technology platform and making it ready for innovations is a driver for the customers who needs the platform to enable their business process innovation.

- **End-of-life (EOL)**
  EOL issues for SAP ERP versions can be drivers for some of the SAP customers to think of the latest product versions with SAP S/4HANA.

- **Upgrades**
  Upgrades can be important trigger points for many of clients because they can be such cumbersome IT projects.

Inhibitors

Just as there are several triggers for an SAP S/4HANA adoption, there are some deterrents to a fast adoption of SAP S/4HANA. Some companies have decided to adopt only the SAP S/4HANA Finance functionalities, while others opt for the whole scope of the SAP S/4HANA solution.

Behind these choices, the most important consideration is that SAP S/4HANA is a new product that is still evolving. The end state in terms of the functionality for SAP ERP and industry solutions support is yet to be reached for the SAP S/4HANA Enterprise Management solution.

The other factor is that some large clients want to see how other companies of similar size and industry are faring with their SAP S/4HANA solutions before taking the plunge. Because SAP S/4HANA made the foray into the market just since Q1 2015, few companies have completed the SAP S/4HANA implementation and are reaping the benefits already.

In some of the SAP customers who have huge databases, the hardware size limitations and the high costs for the large size can also act as deterrents. Typically, the existing uncompressed OLTP database (non-SAP HANA platform) gets reduced by a factor of 5 to 10 when moved to SAP HANA. Even then, however, the existing database size and its rate of growth may be prohibitive, considering the current constraint in the scale-up and scale-out architecture and hardware availability. Some of these SAP customers are also considering archiving solutions, which take time to implement.

Some clients have an IT strategy to move completely into the cloud and are contemplating a software-as-a-service (SaaS) solution such as SAP S/4HANA Cloud. However, SAP S/4HANA Cloud doesn't have all the functionalities yet.

Thus, several clients are playing a "wait and watch" game—waiting for some more success stories, waiting for the SAP S/4HANA product to

stabilize or at least have a clearly defined road map, or waiting for the entire simplification to be completed—before they embark on the SAP S/4HANA journey. Some clients are also adopting interim steps to prepare for the SAP S/4HANA journey, such as performing the SAP S/4HANA impact assessment on their existing solution and archiving projects. The SAP Business Suite on SAP HANA migration might also be a stepping stone for some businesses.

Decision Factors

When a client wants to do an evaluation of its SAP S/4HANA road map, there are major factors to consider, as shown in Table 6.1. The table shows a sample for a greenfield implementation scenario where the SAP customer is evaluating the three options: SAP Business Suite on any database, SAP Business Suite on SAP HANA, and SAP S/4HANA. (HIGH, MEDIUM, and LOW designate the degree of matching of that product with the customer's high-level requirements.)

Decision Factors	SAP Business Suite on Any Database	SAP Business Suite on SAP HANA	SAP S/4HANA
Functionality requirement	High	High	Medium
Solution stability	High	High	Medium
Costs (implementation, licensing, etc.)	Medium	Medium	High
Infrastructure costs	Medium	Medium	Medium
Innovation (Big Data analytics, IoT, etc.)	Low	Medium	High
Data volumes	Low	High	High

handling			
Speed of implementation	Medium	Medium	High

Table 6.1   Sample Set of Factors for Evaluation of SAP S/4HANA Adoption

This table, of course, gives a simplistic view. In practice, the evaluation will be very different for different clients, and the weighting of different factors will vary with the client's focus or primary driver for such an evaluation. Some clients want to be at the leading edge of innovation in their IT strategy, and they are more willing to take risks, whereas others want to have a more balanced strategy. This also can drive the weight placed on different factors under consideration.

The migration scenarios are even more complex because there needs to be detailed evaluation on the existing solution impact and the impact on the business processes subsequent to the migration to SAP S/4HANA. Details on the migration scenarios are covered in Chapter 9.

Finally, we need to consider that with SAP S/4HANA, the functions of the transactional and analytical systems are getting blurred, and there will be a similar impact on the different departments of the IT supporting the solutions. Thus, an enterprise needs to have an overall SAP HANA adoption strategy, including SAP S/4HANA and other products on SAP HANA based on their landscape or requirement, for example, SAP BW on SAP HANA, native SAP HANA, SAP HANA Cloud Platform for support of IoT, or solution extensions for SAP SuccessFactors or SAP Hybris—the list is long. One thing is clear, however, the adoption of SAP HANA isn't a question of "if" but "when."

6.3   SAP HANA Platform

The SAP HANA platform for real-time analytics and applications makes it possible to combine OLAP and OLTP worlds. This platform provides various capabilities or services and is the core that several SAP products leverage, including SAP S/4HANA. Before expanding into these capabilities, let's spend a little more time discussing the SAP HANA database.

6.3.1   SAP HANA Database

At the core of the SAP HANA platform is the SAP HANA database. The features that make this database the core for other products to leverage are discussed in the following subsections.

In-Memory Storage

The capacity of main memory in servers has been increasing in leaps and bounds over the past few years, and such high memory is also becoming much more affordable. The advantage of in-memory operations on data is the huge speed difference when compared to accessing data from the drive. As an example, in-memory data can be accessed one hundred thousand times faster than data can be accessed from a spinning hard disk. In addition, the main memory is connected to the CPU through a high-speed bus, whereas the hard drives are connected through a chain of buses and controllers.

Columnar Storage and Row Storage

Relational databases organize data in tables that can store the data records in rows or columns. In SAP HANA, most of the tables are *columnar*, except for the system tables. Traditional row databases store

data in a row as one "bundle." Although this leads to very good performance during write operations, its efficiency is less during read operations. If that table has too many columns, and you need to extract the data only from some of these columns, classical row databases still need to read complete rows and then discard the unnecessary data. Because columnar databases store data for each column separately, they can retrieve only data from columns that were really required to deliver the response, avoiding unnecessary read operations.

In summary, the advantages for data selection are the following:

- Only the relevant columns of the table need to be accessed when a query is run.

- Projections are efficient.

- Any column can be an index. Thus, a single column index isn't persisted on the disk; instead, it's generated when the table loads. If it's a multicolumn index, this is persisted in the disk, so manual maintenance of secondary indices is no longer required.

There are certain disadvantages for a column-store table (e.g., insert-updates aren't easy), but these can be circumvented. For example, insert-updates are accelerated using a special table structure with a delta mechanism that minimizes the impact of write performance on columnar tables. However, delta operations such as the delta merge are memory- and CPU-intensive, with spurts of disk I/O load (while persisting the data). When tables become huge, the performance can have impacts. Hence, table sizes need to be kept under control through partitioning.

Note

More details about the delta merge operations are available at *https://help.sap.com/saphelp_hanaplatform/helpdata/en/bd/9ac728bb571*

Compressed Data

In SAP HANA, columnar storage makes different types of data compression possible. For example, the table data are massively *compressed* in a way that the data movements are minimized while not increasing the CPU load for decompressing the data. Each column of the table undergoes this compression, which involves allocating consecutive numbers to distinct column values. This is known as the *dictionary* for each of the distinct columns. Hence, storage of such numbers is typically much smaller and helps to compress the data. A simple example is shown in Figure 6.5 to illustrate a column table and its dictionary.
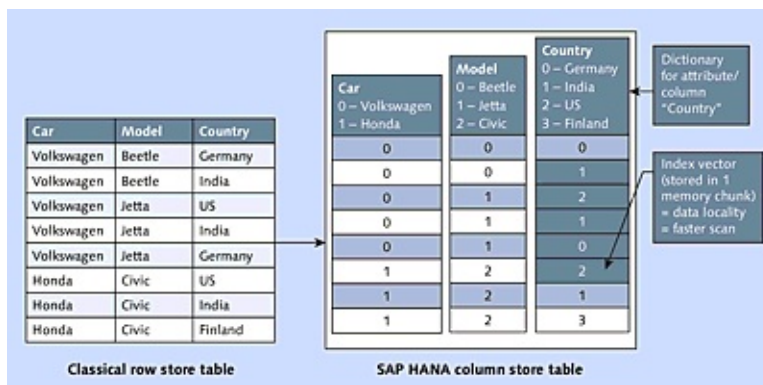
Figure 6.5   Example of Columnar Data Store

Other advanced compression algorithms are also applied on each column. The SAP HANA database determines the suitable algorithm to be applied to each of the columns and reevaluates this algorithm based on the data in the table. Columnar storage together with the data compression make database querying many times faster.

The data requirements of the modern day enterprise applications or data warehouse solutions may be much more than those of single systems provided by hardware vendors. Parallel processing and partitioning overcomes this limitation.

Leverage Massively Parallel Processing

A single processor now has multiple cores or processing units, which increases the processor performance through parallel processing of its different cores. Each core can process each column, and this makes parallel processing simpler and more effective. Systems can be multiprocessors, thereby making more parallel operations possible. This again increases the overall system performance massively.

Leverage Partitioning

Partitioning is used normally in a scale-out architecture environment but can be used for single host environment as well. The data can be divided and placed into clusters of servers forming a distributed database. Alternatively, the individual database tables can be placed on different servers within the cluster. If some of the tables are larger than a single server can hold, it can be split into several partitions into a group of rows per partition (horizontal), while each partition resides on a separate server within the cluster. This feature helps in quickly analyzing large amount of data and handling complex calculations.

The column tables in SAP HANA database are restricted to 2 billion records in an unpartitioned table. If a table crosses this limit, the entire database can actually fail, as we've actually witnessed for a client. In such cases, partitioning is the only way out, unless of course the table contents can be truncated (e.g., log tables whose older data isn't required). The table can be split into partitions containing a set of rows that is determined by algorithms such as hash partitioning or partitioning by a range (e.g., by year). Partitioning, directly and indirectly, helps to increase the performance of the database for reading as well as writing through delta merge operations.

SAP HANA's performance depends on the innovations produced by the processors and the hardware vendors. Columnar structure allows the database to deploy a dedicated processor core for each column (or column partition). This enables databases to use massive parallel

processing for individual queries and leads to significant acceleration compared to processing a query by single core.

For example, as of July 2016, Haswell systems can have up to 144 processor cores per server (8 CPUs each having 18 cores), and the ability to use all of these cores simultaneously can lead to a massive performance boost (up to 144 times faster than single-core processing). At the end of May 2016, Intel released Xeon E7v4 under the Broadwell umbrella where an 8-socket Broadwell server can support up to 8TB of main memory. As of September 2016, Hewlett-Packard has 16-socket servers (with a 16TB RAM limit), and SGI has 20-socket servers (with a 20TB RAM limit). Of course, these specifications are very dynamic. Thus, SAP was able to increase ration of core to main memory for transactional workloads to 1TB per socket (1 socket = 24 cores), thus enabling new scalability limits for SAP HANA customers.

Note

Some examples of SAP HANA on Power performance solutions along with other Power-related information are available at *https://saponpower.wordpress.com*. The performance outcome for the Haswell CPU from Intel and how it's been used in the servers is explained in a blog at *https://blogs.saphana.com/2015/06/29/impact-of-haswell-on-hana/*, while details about the newly released Broadwell servers are explained in the blog at *https://blogs.saphana.com/2016/06/06/new-intel-xeon-broadwell-processor-boosts-sap-hana-scalability-performance-new-highs/*.

6.3.2 Virtualization

The SAP HANA platform (from SPS 05 onward) has supported virtualization technology to host multiple separated SAP HANA instances that run on separate virtual machines (VMs). This virtualization of the

underlying server(s) can be done for SAP S/4HANA. This helps to abstract the hardware layer and increase use of the hardware, thereby reducing TCO.

Figure 6.6 shows a configuration of a Multitenant Database Containers (MDC; explained in Section 6.3.6) on a virtualized environment.
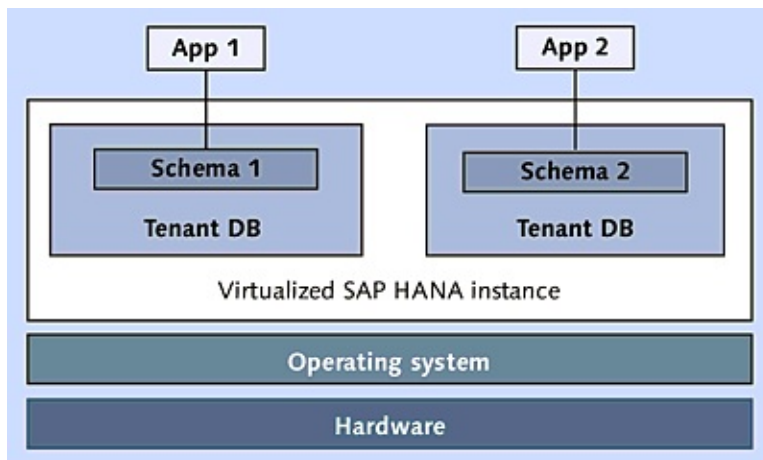
Figure 6.6   Virtualized SAP HANA System

> **Note**
>
> For any virtualization, SAP provides the following guidelines: *http://archive.sap.com/documents/docs/DOC-60312*.
>
> These guidelines should be followed along with the best practices/recommendations of the hypervisor vendor.

The current virtualization options are as follows, as of July 2016, per SAP Note 1788665:

- Software level virtualization options (hardware vendor-independent options):
  - VMware vSphere 5.1 (nonproduction only)
  - VMware vSphere 5.5 (also for production)
    - VM limits: 64 vCPU, 1TB RAM

- Single-VM only – General Availability (GA) (refer to SAP Note 1995460)
- Multi-VM support – GA (refer to SAP Note 2024433)
- SAP BW on SAP HANA scale-out – GA (refer to SAP Note 2157587) (included only for the sake of completeness)
  - VMware vSphere 6.0 (also for production)
    - VM limits: 128 vCPU, 4TB RAM
    - Single-VM only – GA (refer to SAP Note 2315348)
  - KVM or XEN (nonproduction only)
- Hardware vendor-dependent options:
  - SAP HANA on Power – GA (refer to SAP Note 2230704)
  - Hardware-based partitioning
    - HP nPartitions – GA (refer to SAP Note 2103848)
    - Fujitsu PPARs (physical partitioning) – GA (refer to SAP Note 2111714)
    - Lenovo FlexNode – GA (refer to SAP Note 2232700)
  - Others
    - Hitachi LPAR 2.0 – GA (refer to SAP Note 2063057)
    - Huawei FusionSphere 3.1, 5.1 – Controlled Availability (CA) (refer to SAP Notes 2186187 and 2279020)

Keep the following in mind for virtualization:

- As part of GA, SAP supports only scale-up scenarios for SAP S/4HANA, not scale-out.
- Sizing guidelines from SAP and vendor recommendations need to be followed for each VM, with no CPU-memory overprovisioning.
- The "SAP HANA Guidelines for Running Virtualized" file (see previous

note) and the vendor-specific best practice document needs to be followed for configuration and overall setup of the virtualized environment.

- There is a performance impact on the virtualized SAP HANA environment compared to nonvirtualized environment. For example, SAP has mentioned a performance benchmark of < 12% degradation for the majority of tests in a virtual environment against a bare metal deployment, but there were outliers as well.

It's important to check the SAP guidelines for virtualization and the features and constraints available from the specific products used for virtualization because these also constantly evolving.

The concept of virtualization can be applied to the hardware for SAP HANA, which is available as an appliance or through the SAP HANA tailored data center integration (TDI) approach. The SAP HANA journey started with the appliance delivery model in which the entire product was delivered as a preconfigured set of software components on top of preconfigured hardware components supplied by SAP-certified hardware partners. However, with the TDI approach, which again evolved over the years, you have the flexibility of using different hardware components (e.g., storage, network, and servers) from different vendors to integrate SAP HANA into the client's data center (on-premise or cloud). The components used in a TDI approach are shown in Figure 6.7. Restrictions are applicable, including the requirements to use SAP-certified hardware, storage, and configurations.
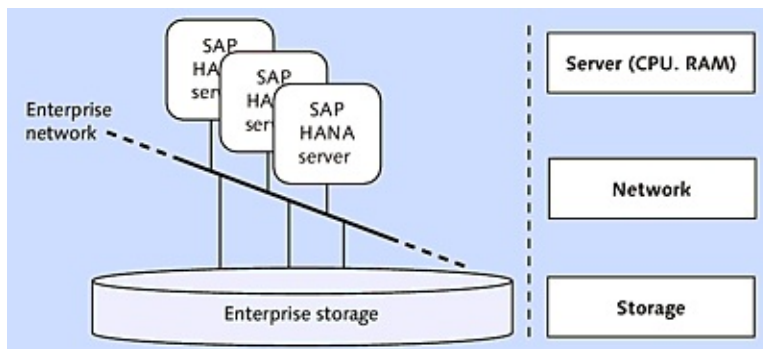
Figure 6.7   Tailored Data Center Integration Components

The TDI model was delivered in the following four phases:

- **Phase 1: Shared Enterprise Storage**
  Customers can reuse their enterprise storage solutions for their SAP
  HANA deployments, but they need to choose from the list of certified
  storage vendors (found at
  *http://global.sap.com/community/ebook/2014-09-02-hana-
  hardware/enEN/enterprise-storage.html*).

- **Phase 2: Network**
  Customers can reuse their existing network solution in their enterprise.
  For example, they can include their networking infrastructure and
  network components in their data center, such as routers, bridges, and
  switches for SAP HANA cluster inter-node and cross-site
  communication. For guidelines regarding the network solutions, see
  SAP Note 1943937 and "SAP HANA TDI – Network Requirements" at
  https://scn.sap.com/docs/DOC-63221.

- **Phase 3: Entry Level SAP HANA E5 Systems**
  Customer have the choice to select the following cheaper CPU model:
  Intel Xeon E5 v2/v3 with more flexibility (restrictions: max. 2 sockets,
  single-node only with no support for scale-out).

- **Phase 4: SAP HANA on Power**
  Whereas the preceding option provides support to customers to
  consider alternative hardware with its own processors, SAP HANA on
  Power is supported only under the TDI model. Currently, the maximum
  memory (RAM) supported for production for scale-up by IBM Power
  models is 9TB RAM/LPAR (logical partition).

Note

More details on the different options and the corresponding features
can be found in at *https://scn.sap.com/docs/DOC-63140* and in the

webinar session recording at *https://scn.sap.com/community/hana-in-memory/blog/2016/05/25/sap-hana-distinguished-engineer-hde-webinar-overview-of-sap-hana-on-premise-deployment-options*.

6.3.3   Scalability

The SAP HANA database can be scaled up or scaled out, and the technique to apply depends on whether SAP S/4HANA, SAP BW on SAP HANA, or native SAP HANA is running. We'll talk more about this after we explain the concepts.

SAP HANA systems require a specific CPU-to-RAM ratio. For SAP Business Suite or SAP S/4HANA, it's 768GB per socket for the production environment. For the latest CPU model (Broadwell, released by Intel in June 2016), it's 1TB RAM per socket, allowing you to reach 8TB RAM on an eight-socket server. The CPU-to-RAM ratio for older CPU generations is much lower.

For scale-up, it's a single host architecture where a single system is built up from as many resources as feasible.

The specific hardware vendors support up to specific levels of memory. For example, there are multiple vendors at the time of writing this book that support different levels of scale-up memory, for example, IBM, Lenovo, Cisco, HP, SGI, Fujitsu, and Hitachi.

The scale-out architecture is created by clustering together smaller SAP HANA systems into a cluster database with shared storage. Thus, it's a multihost environment. This architecture is supported in GA for SAP BW on SAP HANA, which supports a different CPU-to-RAM ratio. Because the size of a single server is limited to 4TB, this is used for SAP Business Suite or SAP S/4HANA applications only for a high-availability configuration, which we'll cover in the next section.

The scalability of the SAP HANA architecture continues to improve with innovations from vendors such as IBM with its Power Systems and its own processors, other hardware companies using Intel processors, and the evolution of the processors themselves. The recommendation is to first scale-up to increase the memory in the single server up to its physical limits and then, for larger systems, scale-out, that is, add more servers in the SAP HANA system. For SAP S/4HANA, the scale-out supported is only for the high-availability scenario with a simple case of two servers, one active and the other standby. Scale-out scenarios with multiple worker nodes to scale memory aren't released for SAP S/4HANA yet (see SAP Note 1825774).

Note

A list of SAP-certified SAP HANA hardware is maintained in the directory at *http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/appliances.html#categories=SoH*.

You can get further information from SAP Notes 2075461 and 1950470.

6.3.4   Recoverability

Recoverability of a database means that in the event of a database failure, the deployment is restore to the point at which the failure occurred. This is one of the most important considerations for a transactional system such as SAP S/4HANA and needs proper planning.

Because the SAP HANA platform uses most of the data in-memory for best performance, in case of a power failure, this data may be lost. However, there is persistent storage as well to protect against such failures. During normal operations, data are stored from the memory to the disk at regular intervals. This is the *savepoint* (see Figure 6.8). Additionally, logs are written for any change in data, after each operation.

The log data are also saved to the disk after each transaction commit. Therefore, in case of a power failure, the database can be restarted like any other database and takes into account this log data after the last savepoint. This helps to maintain the database consistency.

Recoverability, in turn, is closely linked to the term *availability*. Availability indicates the operational continuity of the system and is measured as a reverse function of system downtime, expressed as a percentage. There are additionally two other aspects that may be needed for the SAP HANA database in case of a disk or data center failure: *high availability (HA)* and *disaster recovery (DR)*.
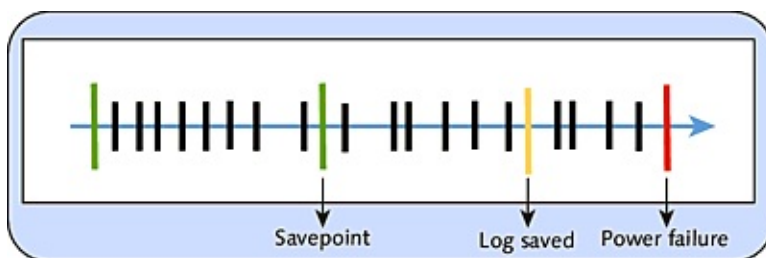
Figure 6.8 Persistence in SAP HANA

SAP states that HA "increases the failure tolerance within one data center by providing a fast switch over to an operational state of the SAP HANA database." HA indicates a set of techniques and plans for business continuity in case of any server failure. DR is the process of recovering operations after a server failure that is due to a site or data center failure.

There are two key performance indicators (KPIs) associated with recovery:

- **Recovery point objective (RPO)**
  RPO refers to the maximum permissible period when the data may be lost between the last backup and the system crash.

- **Recovery time objective (RTO)**
  RTO refers to the maximum possible time elapsed between the system unavailability and the system being operative again.

The following subsections describe the various options for making a system HA and/or DR. These options have different RPOs, RTOs, and costs.

Backup and Recovery (Disaster Recovery)

Backups are necessary for database restore in case of disk failures, to restore the database to an earlier point in time, or for database copy. Backups need to be made for data and log volumes and can be manual or automated. SAP HANA also synchronizes the data backup across multiple nodes and services without manual intervention. All services that require data to be persisted are backed up. Data backup happens when the database is running, and transactions are stopped only for a very short time when the backup is initiated. There are various options to do a data and log backup, which can be configured through SAP HANA Studio:

- Backing up to file systems, for example, to a Network File System (NFS) share (SAP Note 1820529)

- Backing up to a third-party backup server through implementation of the Backint for SAP HANA application programming interface (API) by the SAP-certified third-party agent

- Backing up as a storage snapshot to an external storage

Recovery from these backup options is possible with the following alternatives:

- Recovery to the most recent state using data backup or storage snapshot and using the log backups post for that backup point and entries if still available in the log area

- Recovery to a specific point in time by using the data backup or storage snapshot in that particular point in time and the log backups post for that backup point and entries if still available in the log area

- Recovery using data backup or storage snapshot at a specific time but without log backups for the time thereafter and without any log entries beyond that point

During the recovery, the SAP HANA database is shut down. The progress and the actions can be initiated and checked using SAP HANA Studio. For this option, the costs are comparatively lower, but it has RPO > 0 and a high RTO.

SAP HANA Storage Replication (Disaster Recovery)

This option enables continuous replication of all persisted data, including the data and the redo log of every committed transaction to a remote, networked storage system on a secondary site (see Figure 6.9). Several vendors offer this storage replication option. In some of these SAP-certified solutions, the SAP HANA transaction at the primary site is completed only when the SAP HANA transaction log at the primary site is replicated in the backup site. This is known as synchronous storage replication and can occur only if the two sites are within 100 kilometers distance with a fraction of a millisecond round-trip latency.

If a full system failover is needed, the system administrator attaches a passive system to the secondary storage and also ensures that there is no data corruption from both systems writing to the same storage. The SAP HANA system is then restarted to complete the restore process. This mechanism has an advantage over the backup-restore mechanism because RPO is much less in this case, although there is an additional requirement in terms of network bandwidth and decreased latency between the primary and secondary storage sites. This option has medium costs associated with it with near zero RPO (zero RPO for synchronous replication) and medium RTO.
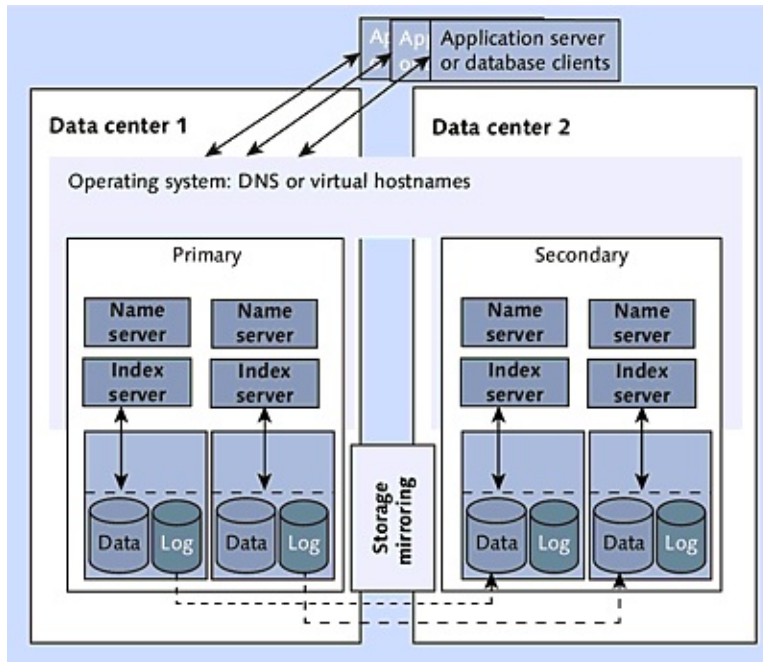
Figure 6.9   Storage Replication

SAP HANA Host Auto-Failover (High Availability)

In this scenario, an existing single-node or scale-out setup is extended by additional server nodes called standby nodes. Although SAP HANA supports multiple standby nodes, it's typical that only one additional node is used. This standby server can take over in case one or more regular hosts become unavailable. If one host fails, the standby host automatically takes over by gaining access to the data and log volumes of the failed host. Thus, the standby server needs access to all the database volumes, which is accomplished by a shared network storage server. Figure 6.10 shows a configuration of host auto-failover.
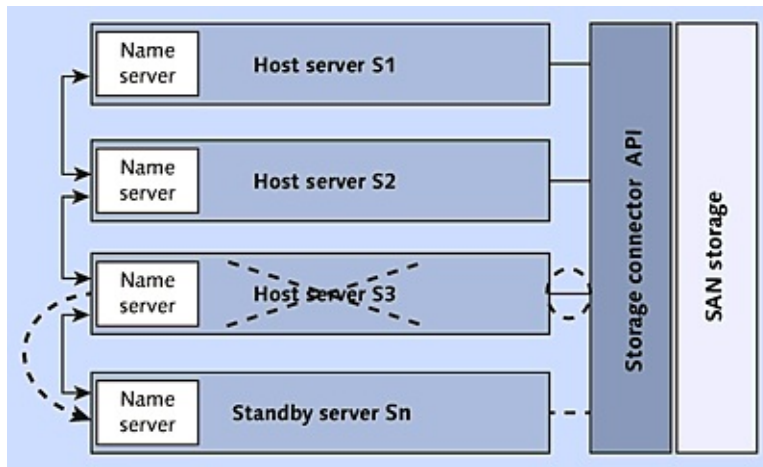
Figure 6.10   SAP HANA Host Auto-Failover

The standby host is connected to this storage either through a distributed file system or using vendor-specific solutions via the SAP storage connector API to dynamically detach and mount networked storage when the failure occurs. Note that all services are moved to the standby server when the failover happens at the host server level. This failover happens automatically without any external cluster manager but doesn't happen in case of a single service failure.

There are some useful techniques to maintain data consistency and to ensure that the primary and standby hosts aren't active at the same time in order to avoid allowing the recovered host and the standby servers to write to the data in parallel.

This option for HA has medium associated costs, zero RPO on committed transactions while in-flight transactions are lost, and medium RTO.

SAP HANA System Replication (High Availability/Disaster Recovery)

System replication uses the N+N mode. For every SAP HANA server with
• number of nodes, there is another similar server with the same number of nodes as the secondary. In this setup, the two databases (primary and secondary) can be located close to each other. Alternatively, the

secondary database can be at a remote location as a DR option as well, but a reliable link is required between the two sites. The configuration is shown in Figure 6.11.
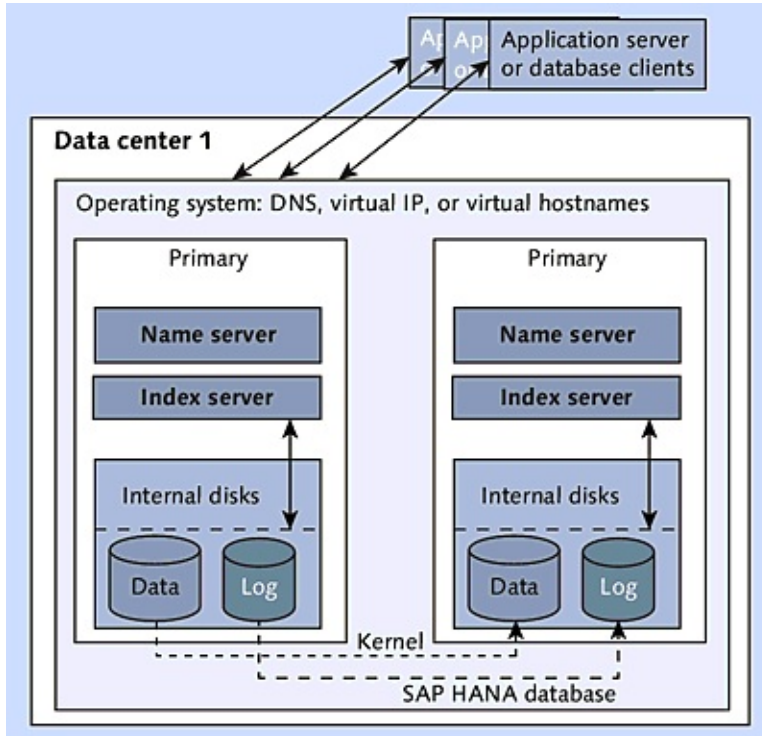
Figure 6.11   SAP HANA System Replication

This option employs the live replication mode. In this mode, the services of the secondary SAP HANA system constantly communicate with that of the primary system, and all the data and logs of every transaction from the primary system are replicated and typically stored in the database in the secondary system with the same system identifier (SID) and instance number. The data commit in the primary can even be set up to be complete only on persisting this replication log at the secondary system.

There are a few options for how the data commit in the primary system can be set up depending on the log transmission and its writing to memory or persisting in storage to be synchronous or asynchronous. The replication modes are the following:

- **Synchronous**

The secondary system sends an acknowledgment only after saving/persisting the data.

- **Synchronous in-memory**
  The secondary system sends an acknowledgement as soon as it receives the data.

- **Asynchronous**
  The primary system doesn't wait for acknowledgement from the secondary system.

There are two operation modes for system replication:

- **Delta shipping**
  To avoid ever-growing logs, data snapshots are shared from the primary system to the secondary system at regular intervals. In addition, the primary system shares status information about the column tables stored in the main memory. The secondary system loads these tables into memory. This is called a preload. In case of a failure, the Cluster Manager initiates live replication mode to full operation for the secondary server. The secondary system, with preloaded column tables, will only load the row tables and replay the last transaction logs to operate as the primary system.

- **Log-replay**
  The secondary system has the feature to instantly replay the log, thereby diminishing the delay in takeover to near zero.

The other consideration in this option is about the connections from the database client that are configured to reach the primary server. There are two options for diverting these connections to the secondary server after the failover. SAP NetWeaver is connecting to SAP HANA via the Database Shared Library (DBSL). One option is to use the virtual IP address to access the database host and the database instance on that host. Alternatively, the Domain Names Service (DNS) can offer virtual

hostnames. This HA option has the highest cost but has the lowest RTO and RPO.

For DR, the secondary system or storage has to be in a remote location.

> **Note**
>
> All the options for HA/DR have their advantages and disadvantages. More information can be found in SAP Note 2057595 "FAQ: SAP HANA High Availability" at *http://service.sap.com/sap/support/notes/2057595* and at *http://scn.sap.com/docs/DOC-59918*.

On-premise deployments of SAP S/4HANA use the standard SAP NetWeaver HA/DR functions. The SAP HANA HA mechanisms along with the SAP NetWeaver ABAP stack's latest features are evolving to provide a zero-downtime maintenance approach.

> **Note**
>
> The detailed steps of the SAP HANA database backup or recovery process are described in the Technical Operations for SAP NetWeaver under the SAP site. For SAP S/4HANA release information, go to *http://help.sap.com/s4hana*.

6.3.5   SAP HANA Operations

SAP provides different tools for doing SAP HANA operations, including installation, ongoing maintenance, monitoring, and lifecycle management. Because these tools are for the SAP HANA database, they are applicable for the SAP S/4HANA landscape as well. The main tools are listed here:

- **SAP HANA Studio**
  This tool is used for SAP HANA development and administration and is

a favorite of system administrator experts. In future SAP road maps, the other web-based tools are more likely to be continued. Currently, however, it complements some of the other tools such as the SAP HANA Cockpit.

- **SAP HANA Cockpit**
A single SAP HANA database is administered and monitored from this web-based cockpit. This cockpit provides an SAP Fiori-like UI that has all the relevant activities or alerts grouped together in a nice UI, as shown in [Figure 6.12](). This cockpit can be accessed via *http://<host>: <port>/sap/hana/admin/cockpit*.
This cockpit provides the basic administration and monitoring capabilities but also provides additional capabilities in terms of managing multitenant instances, including availability, resource usage, and performance for tenant databases. Each tenant database can be started, stopped, and deleted, and information about usage and alerts is also provided.
The cockpit enables you to analyze the database status, including CPU usage and memory consumption for each service as well as analysis of crash dumps. You can also configure and monitor various alerts as part of Alerts apps in the SAP Fiori launchpad.
The cockpit also provides options to perform additional activities in case optional components are installed, such as SAP DB Control Center.
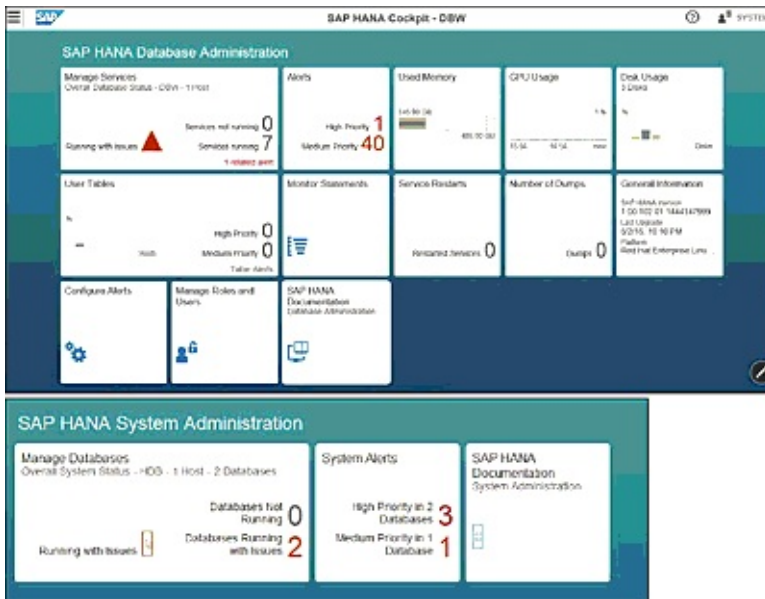
Figure 6.12 SAP HANA Cockpit

- **SAP DB Control Center**
  This web-based tool is used for monitoring the entire landscape of databases, including SAP HANA. This provides an overall status of the different databases in terms of their health, performance, availability, and capacity. It provides alert mechanisms as well against each system. As mentioned earlier, this tool can be accessed from the SAP HANA Cockpit as well.

- **SAP Solution Manager**
  SAP Solution Manager is now an essential part of the SAP landscape in all project phases. SAP Solution Manager provides a multitude of functions in the entire system landscape management and monitoring area. There are several resources for usage and configuration of SAP Solution Manager available from SAP. SAP Solution Manager 7.2 provides support for the SAP Activate methodology (covered in Chapter 10) for the SAP S/4HANA solution implementation.
  SAP Solution Manager 7.1 and onward provides specific monitoring for SAP HANA. Various support packs have added functionality around SAP HANA monitoring as well. The step jump, of course, is in SAP Solution Manager 7.2, which is required for the proper usage of the

SAP Activate methodology (see Chapter 10 for more details) for an SAP S/4HANA, on-premise edition, implementation. SAP Solution Manager 7.2 contains an SAP Fiori UX, following SAP's uniform UI strategy.

SAP Solution Manager supports SAP HANA in all phases of the application management lifecycle (depending on the SAP Solution Manager version), including the following major functions:

- **Build SAP Like a Factory**

  - Central transport mechanism and change control

  - End-to-end test management with a central test plan

  - End-to-end solution documentation, including support for SAP Activate

- **Run SAP Like a Factory**

  - Database administration

  - End-to-end root-cause analysis

  - System monitoring

  - Monitoring of all core operations entities

- **Continuous quality checks**

  - During build, implementation, and configuration checks

  - During run and SAP EarlyWatch Alert

  - Best practices, for example, configuration, performance/sizing, and troubleshooting

Figure 6.13 and Figure 6.14 show how SAP HANA system monitoring can be done from the SAP Solution Manager and an SAP EarlyWatch Report generated from SAP Solution Manager. After you open the SAP Solution Manager Work Centers (run Transaction SM_Workcenter in SAP Solution Manager where all the technical monitoring has been configured), and go to the TECHNICAL MONITORING tab, you have the Alert

Inbox, from which you can choose all the different type of alerts. In this case, the DATABASE ALERTS have been chosen. Similarly, from the TECHNICAL MONITORING tab, you can choose AUTOMATED REPORTING to see the SAP EarlyWatch Alert report. You can choose the report for a solution run for a particular date or date range and see the detailed report as shown in Figure 6.14.
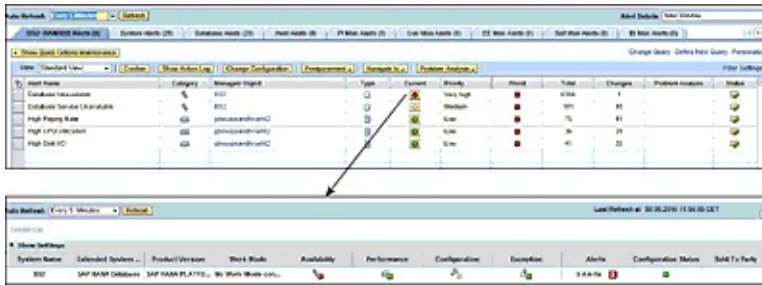
Figure 6.13 Alert Status in SAP Solution Manager
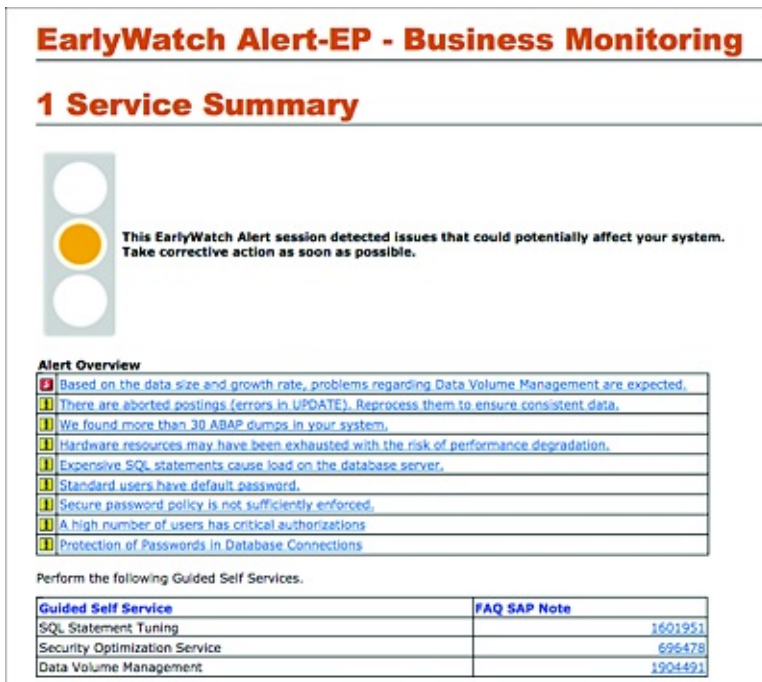
Figure 6.14 Sample SAP EarlyWatch Report

Technical monitoring is used during the run phase, for which SAP has provided many configurable KPIs for each of the SAP HANA databases in the landscape. Some examples are shown in Figure 6.15. In the SAP Solution Manager work centers, under the TECHNICAL MONITORING

tab, choose Sʏꜱᴛᴇᴍ Mᴏɴɪᴛᴏʀɪɴɢ to see a list of databases you can monitor. Choose the SAP HANA database to monitor, and it will show up on the following monitoring screen, along with the details, based on the KPIs configured.
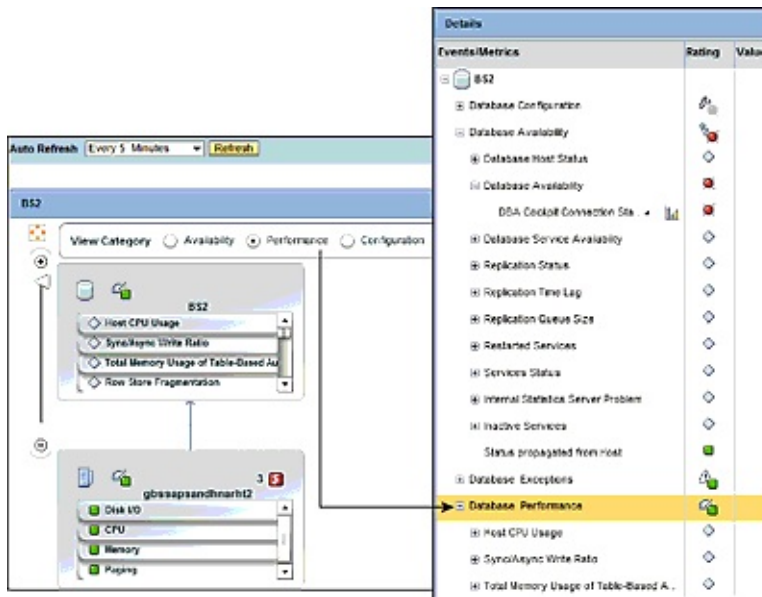
Figure 6.15 Technical Monitoring: SAP HANA Technical KPIs

- **SAP Landscape Management (SAP LaMa) (previously known as SAP Landscape Virtualization Management [SAP LVM])**
  This tool, which is used to simplify and automate centralized management and operations of SAP systems in both the physical and virtualized infrastructures, supports SAP S/4HANA, on-premise edition, provisioning and management (SAP LaMa 2.1). You can access the SAP DB Control Center and cockpit via SAP LaMa. Mass operations for multiple systems/instances can be done through SAP LaMa, including support for system dependencies. In the future release (potentially 3.0), the tool will also support setting up system replication.

Companies that provide virtualization capabilities use similar tools for fast provisioning of instances and operations.

6.3.6   SAP HANA Logical Deployment Options

There are several logical deployment options for the SAP HANA database, such as the Multiple Components One Database (MCOD), Multiple Components One System (MCOS), and Multitenant Database Containers (MDC) scenarios. The step to choosing the right deployment option needs to be planned in advance for any SAP HANA implementation and needs to take into account the support scenarios for that option as provided in the various relevant SAP notes.

In the following list, we'll look at each scenario in turn:

- **MCOD**
  This option entails multiple SAP HANA applications running on a single SAP HANA database as shown in Figure 6.16. SAP supports this option in the productive environment for those packaged applications and scenarios that are enlisted in the "White List for SAP S/4HANA, On-Premise Edition" included in SAP Note 2248291. For example, SAP Master Data Governance (SAP MDG) can be deployed with SAP S/4HANA, on-premise edition 1511 (for SAP S/4HANA 1610, SAP MDG is embedded in SAP S/4HANA), into the same schema supporting access to the same data sources.
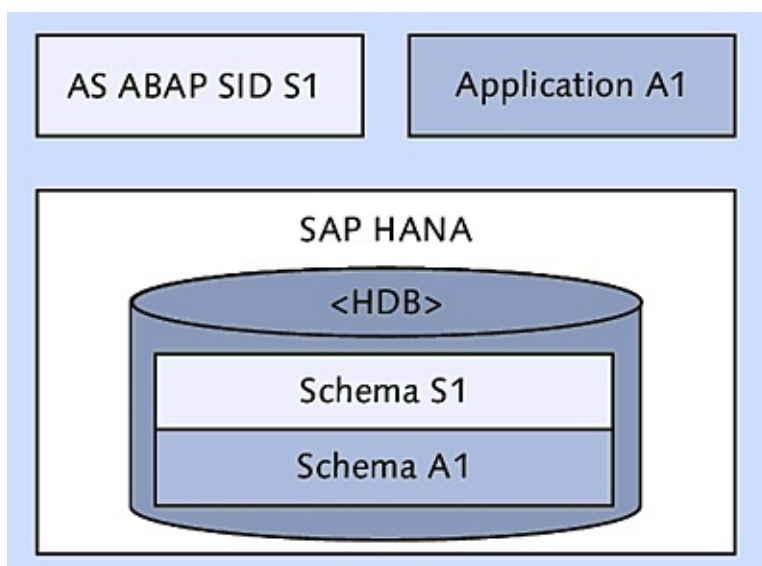
Figure 6.16   MCOD Scenario

The disadvantages in this scenario are the following:

- SAP HANA can't execute backup on a smaller scale than a database. Thus, it's not possible to back up data sets separately for each of the applications deployed. If a data restore is required, both data sets must be recovered to the same time.

- It's not possible to control performance on the data set level.

These same features can be advantageous for the following scenarios:

- If two data sets are closely related, and consistency between the two data sets is a must, this consistency is enforced implicitly, thus the first point above becomes an advantage.

- If there are "intensive" joins between the two data sets, then MCOD might lead to much better performance as both data sets are sharing the same processes, and no cross-process data transfers are required.

- **MCOS**
In this option, multiple SIDs are on a single SAP HANA hardware unit, as shown in Figure 6.17. Per SAP Note 1681092, this deployment is supported for production systems only for a single host or scale-up scenario. It does support nonproductive systems such as development, test, and so on in single-node as well as scale-out scenarios (as mentioned earlier, the scale-out scenario isn't supported for SAP S/4HANA).
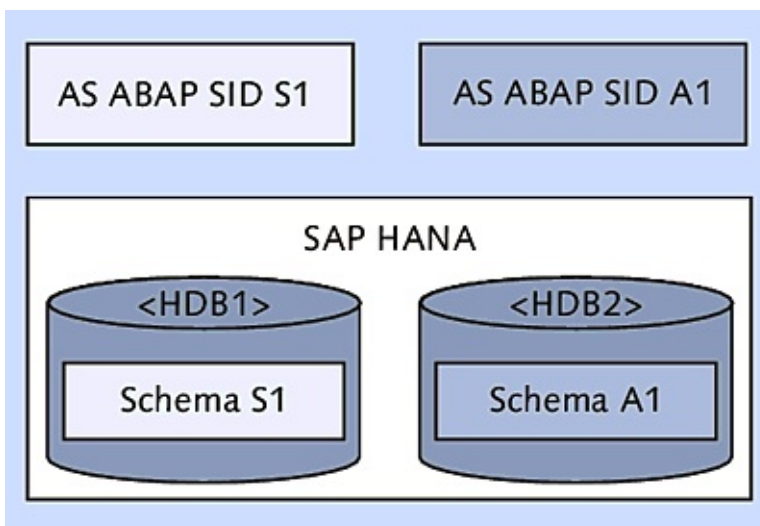
- **MDC**
  This feature has been available in SAP HANA since SPS 09 and allows multiple, isolated instances of the application to be hosted in a single SAP HANA system. In this scenario, there is a central database used for system administration and one or more MDCs, called tenant databases. These tenant databases have their own parameters, backup/restore setup, and separate user management and application data. This configuration is represented by Figure 6.18.
  The administration layer for the central database or system database contains the landscape topology information, system-wide parameter settings, and resource management for all tenant databases, including CPU and memory, as well as owning the complete backup of all databases. While MDC supports the tenant databases being spread across multiple nodes in a scale-out scenario (refer to Section 6.3.3), current constraints make it possible for SAP S/4HANA to be deployed only in a single node in an MDC system. The key relevant notes for this feature are SAP Notes 2096000 and 2104291.
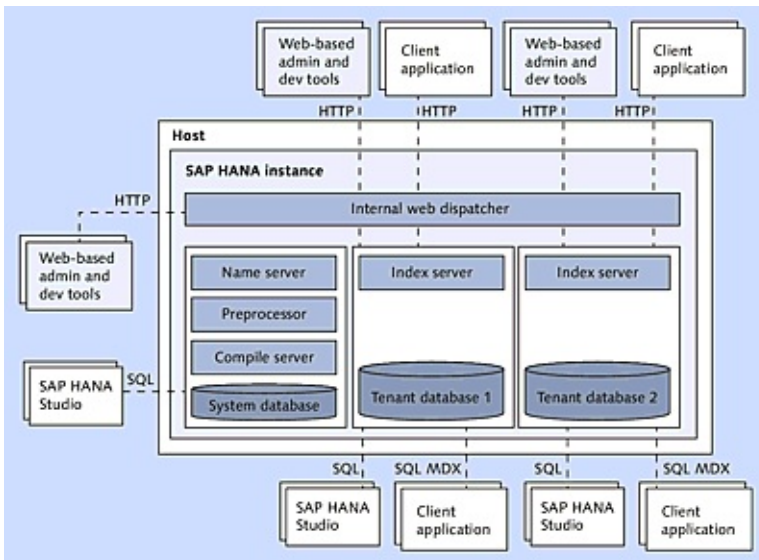
Figure 6.18 MDC Scenario

In all of these options, there are certain considerations with respect to the sizing of the overall hardware. For MDC, for example, the recommendation is to size each of the applications and then use an additive sizing for the overall system. MDC is a new technology, so a practical approach needs to be taken by installing a few applications and carefully monitoring their resource utilization and performance before proceeding to further deployments. The same additive sizing approach needs to be taken for other scenarios as well, such as MCOD.

Furthermore, the potential impact on performance of one application on the other needs to be taken into consideration while planning. Plans for proper stress and volume testing need to be done before going live to monitor performance in each of these scenarios. For an MCOS scenario, SAP recommends using the resource management features of SAP HANA, such as parameters controlling memory limits, influencing CPU utilization, and so on.

6.3.7   SAP HANA Platform Services

The SAP HANA platform provides several built-in services, as depicted in Figure 6.19.
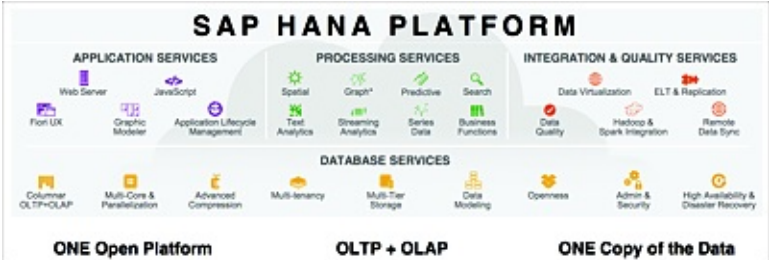
Figure 6.19   SAP HANA Platform Capabilities

Let's walk through each of the categories of the SAP HANA platform services:

- **Application services**
  One of the remarkable aspects of the SAP HANA platform services is that it enables coexistence of the web server and the database in the

same system, reducing data movements. These services provide built-in tools to develop, version control, bundle, transport, and install applications. In addition, there are options to use application servers as well as web servers with JavaScript support and HTML5 UI libraries. This enables deployment of the SAPUI5-based UIs. These application services support several open development standards such as SQL, HTML5, JavaScript, Java Database Connectivity (JDBC), Open Database Connectivity (ODBC), and JavaScript Object Notation (JSON) using Eclipse-based or web-based development environments. It also supports OData services, which are RESTful APIs following open protocols.

- **Processing services**
  These services enable applications dealing with different data types and vastly differing data characteristics. The services can include text analytics, predictive analytics using the Predictive Analytics Library or integrating with R, search, and so on. It has a spatial engine that stores spatial data in similar ways to other data types, works on the different types of spatial data with spatial functions such as area, leverages geo-content such as maps, and integrates with external geo-coding services because it supports open standards compliance (Open Geospatial Consortium).

- **Integration and quality services**
  These services support data replication and data access from various types of database and file systems, both on-premise and in the cloud. Live data streams can be captured to help in adopting IoT scenarios and analysis on the IoT data. Connection to Hadoop through various means (e.g., Spark, Hive, HDFS, and MapReduce) is possible through the integration services. In addition, the integration services enable querying any other data sources such as IBM DB2, Netezza, Oracle, Microsoft SQL Server, Teradata, SAP HANA, SAP Adaptive Server Enterprise (SAP ASE), and SAP IQ through SAP HANA smart data integration (SDI) or SAP HANA smart data access (SDA).

- **Database services**
  These services leverage the capabilities of the SAP HANA database's following core features:

  - As an RDBMS database, it supports atomicity, consistency, isolation, durability (ACID) transactions.

  - OLTP and OLAP data handling enables running transactions and real-time operational reporting on the same set of data on the same system.

  - Complex query handling is possible with huge amounts of data without the need for database tuning or aggregation.

  - Queries are handled at high speeds without the need for indices.

  - Multiprocessing of data allows the same operation to be done across multiple data points.

  - Database supports nonuniform memory access (NUMA), which means that the CPU processes its own memory faster than remote memory. This optimization helps support large nodes and supports several types of deployment models, which were covered in Section 6.3.6.

  - Data modeling is supported.

  - Data are accessible through open standards such as JDBC, ODBC, JSON, and ODATA.

  - The standard security model is supported.

  - Third-party administration tools can be used.

  - SAP HANA database supports various kinds of data lifecycle management. One is dynamic tiering of data where data are stored based on usage, in memory, in disk or in an archiving tool such as SAP IQ. The other is data aging. Data aging is available at an application level for SAP ERP Financials (FI) documents, Unified Journal entries, and material documents in SAP S/4HANA 1511.

More information on data lifecycle management is provided in [Section 6.7](#).

Note

Dynamic tiering isn't generally supported for SAP Business Suite on SAP HANA or for SAP S/4HANA as of SAP HANA SPS 12 (see SAP Note 2140959).

6.4   SAP S/4HANA Security

The security strategy for SAP S/4HANA should be part of the overall landscape security strategy, including authentication and authorization. This includes user provisioning with correct roles so that the right users can perform the relevant role and have the option to access systems through Single Sign-On (SSO). There also needs to be audit logging so that a trace is available for critical user actions. Other aspects of security include encryption, network security, data center security certifications, and so on.

The SAP HANA platform provides unified security options from both the database perspective and the analytics engine perspective, as shown in Figure 6.20.
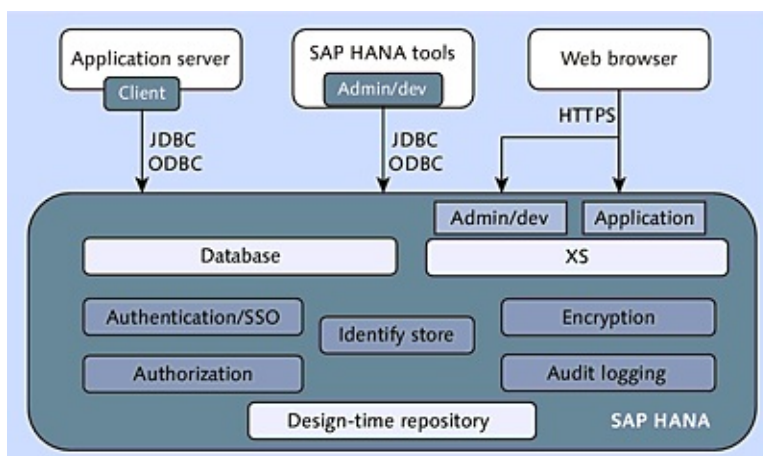
Figure 6.20   SAP HANA Security Model

The key security functions of the SAP HANA database are the following:

- **Authentication and SSO**
  SAP HANA supports basic authentication using username and password for both types of access, either through JDBC/ODBC access from the application server to the SAP HANA database or HTTP access used by web clients directly talking to the SAP HANA XS engine.

SSO can be set using various means that are typically used in SAP environments such as Kerberos, Security Assertion Markup Language (SAML), SAP Logon and assertion tickets, and security certificates (e.g., X.509), depending on the access through web clients, GUI clients, and so on.

- **User and role management through the identity store**

  - For logon, users must exist in the identity store of the SAP HANA database.

  - Roles and privileges can be assigned to users and can be catalog or repository roles.

- **SAP HANA authorization**
  This can include the following privileges:

  - Database access privileges

  - Application privileges

  - Repository privileges

- **Encryption**
  Encryption can be at the communication, data, or data backup levels:

  - Data volume encryption is used to encrypt the data persisted in the database. However, when the data are loaded in memory, they are decrypted. Thus, the data in memory aren't encrypted.

  - For certain applications that need encryption as part of security from an application perspective, the internal encryption service is available, for example, for storing credentials used by SAP HANA for outbound interfaces.

  - Instance Secure Store in File System (SSFS) is used to securely store internal root keys in the file systems.

- **Audit logging**
  This includes logging of critical events for security and compliance, for

example:

- ○ User, role, privilege, and configuration changes

- ○ Data access logging

- ○ Read and write access (tables, views), and execution of procedures

- ○ Firefighter logging, for example, for support cases

On-premise deployments of SAP S/4HANA generally rely on the user management and authentication mechanisms provided with the SAP NetWeaver platform, specifically the SAP NetWeaver AS ABAP and the SAP HANA platform. Therefore, the security recommendations and guidelines for user administration and authentication as described in the SAP NetWeaver AS ABAP Security Guide and SAP HANA platform also apply to SAP S/4HANA.

A few example scenarios and the type of permissions required in each case are shown in <u>Figure 6.21</u>.
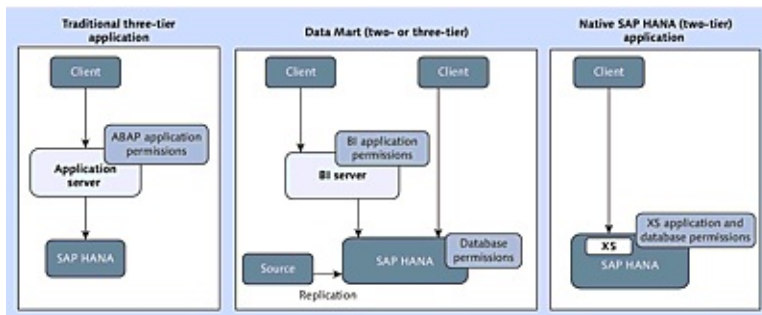
Figure 6.21   SAP HANA User Scenarios

Following are some examples of user provisioning for the different layers of the application:

- **SAP Fiori apps: Usability layer**
  These apps requires user provisioning in the frontend server as well as the backend server. User provisioning for the SAP Fiori apps is done manually in the SAP Gateway, and the corresponding frontend roles are assigned. Depending on the type of SAP Fiori apps used, the roles

need to be assigned in the ABAP frontend, ABAP backend, and SAP HANA database.

- **SAP S/4HANA: Application layer**
  User master data and roles are created in SAP S/4HANA for the end users and IT team. Role assignment needs to be done for the users. Authorizations will be provided to users based on the job roles they will perform in the organization.

- **SAP HANA database: Database layer**
  The user provisioning for the SAP HANA database will be carried out manually. As for the SAP Fiori apps (analytical app and fact sheets app), users may need access (privileges) in SAP HANA database, depending on configuration requirements of the specific SAP Fiori apps.

6.5   SAP S/4HANA Core Data Models

When SAP S/4HANA was first introduced, it had the SAP S/4HANA Finance (then known as SAP Simple Finance) module with a new code base. With SAP S/4HANA 1511, the new code base has extended to cover several business processes in logistics and operations. The new code base was on top of the simplified data models, which had removed the redundant data in terms of the aggregate tables. This simplification of the data models has continued with SAP S/4HANA 1610, including changes in the Sales and Distribution (SD) area.

Before SAP HANA came into the picture, aggregate tables such as table BSEG and table BKPF were required to have faster reporting. Database operations were more complex because every time the transactional tables (header, item, and sometimes subitem) were updated, these aggregate tables had to be updated too. The design of the data model was to boost the performance of the reports while aggregating these data during reporting, which could leverage the aggregate tables instead of the detailed transactional tables.

Now, with the advent of SAP HANA, creating this aggregation in runtime is fast and easy. This simplification is leveraged in the data models that now do away with many of the tables and have a consolidated table for each major area such as financials and logistics (refer to Chapter 3 and Chapter 4).

This simplified data model has quite an impact on the database size as the data volume to be persisted diminishes. There is an impact on custom code as well. The migration effects are discussed in Chapter 9. From an implementation perspective, when writing any custom code, you need to consider mapping the fields from the new combined table such as table ACDOCA in finance or table MATDOC for material documentd, instead of using multiple tables as were used earlier. There are additional considerations in terms of using CDS views or generating CDS views

using the Business Function Library (BFL) for functions implemented on the SAP HANA database layer.

6.6   User Interface and User Experience

We've mentioned that SAP S/4HANA acts as the digital core for your business; one of the premises for being the digital core is to have the processes to be user-centric and accessible through intuitive UIs. This is made possible using SAP Fiori apps, which are SAPUI5 applications built on HTML5 technology (primarily) and can be rendered in any browser on any device—mobile, tablet, or desktop. These applications provide an intuitive UI and a seamless UX for business processes that otherwise would have required clicking through several screens of one or more transactions.

The focus of the SAP Fiori apps is to have improved UX through the following:

- Role-based UIs (the SAP Fiori launchpad can present apps as *tiles*, organized based on a user's role)

- Responsive framework (themes, personalized menus)

- Simplified UI for business processes

- Intuitive interactions

SAP provides a standard set of SAP Fiori apps on various platforms, but most require the SAP HANA database. SAP Fiori apps currently have three main business functions:

- **Transactional apps**
  For transactional processing (for the SAP HANA database or any other database).

- **Analytical apps**
  For analytical capabilities, including dashboards for KPI analytics (only for the SAP HANA database).

- **Fact sheets apps**
  For searching structured or unstructured data, includes contextual

navigation between related objects (requires the SAP HANA database).

Consult SAP's website for a list of all the SAP Fiori apps currently available. SAP has also published a detailed SAP Fiori road map for SAP S/4HANA, on-premise edition, and for SAP S/4HANA Cloud.

Figure 6.22 shows how SAP Fiori apps can be accessed through the SAP Fiori apps reference library (*www.sap.com/fiori-apps-library*). The set of SAP Fiori apps can be filtered by different criteria, one of them being for a particular product version. Within the set of SAP Fiori apps for a particular product version, the apps are also grouped by user role, as shown in Figure 6.22.

The product features and details of the technical implementation are provided for each SAP Fiori app selected, as shown in Figure 6.23.
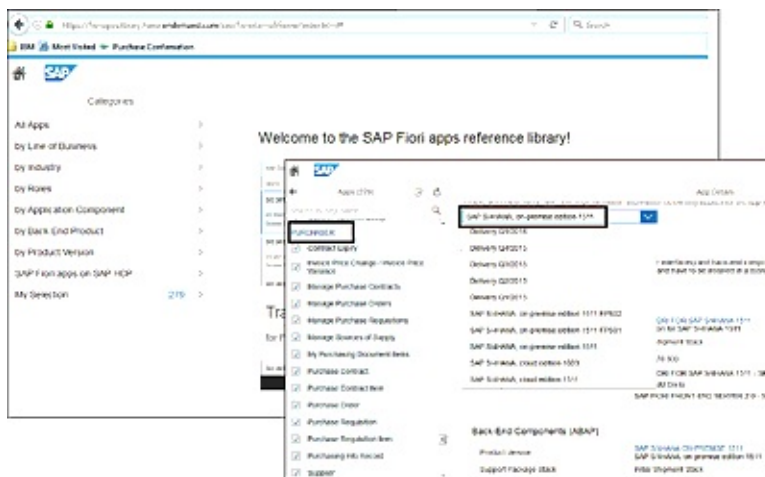
Figure 6.22   SAP Fiori Apps Reference Library
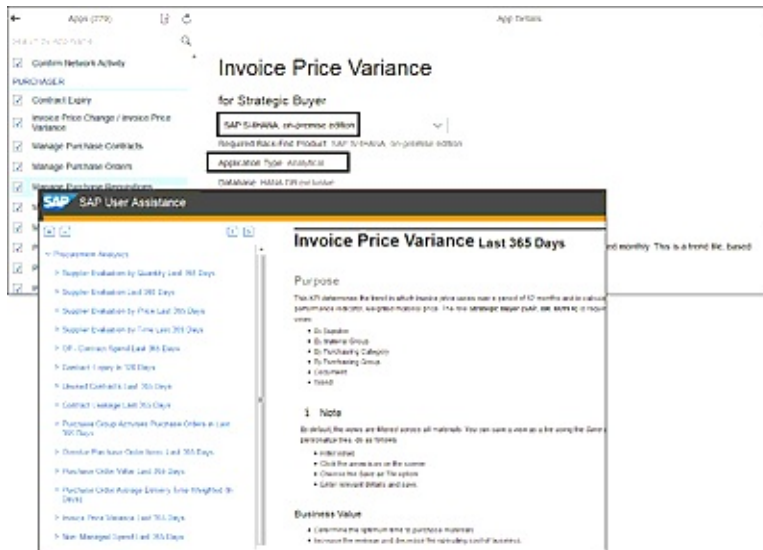
Figure 6.23 SAP Fiori App Details

SAP has created the standard SAP Fiori apps with user-centric designs, and they can all be accessed through the SAP Fiori launchpad. An SAP Fiori app, when accessed from the UI through the SAP Fiori launchpad or through a URL, retrieves data using OData services, which expose the backend data. The OData services are RESTful APIs generated by the SAP Gateway server from the backend Business Application Programming Interfaces (BAPIs) or function modules. A RESTful API is a web service API that follows the Representational State Transfer (REST) architectural style, which follows a few architectural constraints such as stateless, client/server-based, uniform interface, and so on.

Now, with the advent of SAP Fiori, cloud edition, the SAP Fiori launchpad and the frontend components can be hosted in the cloud on the SAP HANA Cloud Platform. Extension to these standard SAP Fiori apps can be made through the SAP HANA Cloud Platform. The SAP Gateway component can still be on-premise or hosted in the cloud via the SAP HANA Cloud Platform. A subset of SAP Fiori apps are currently available within SAP Fiori, cloud edition.

The architecture of an SAP Fiori app, with SAP S/4HANA as the underlying application layer, is shown in Figure 6.24.
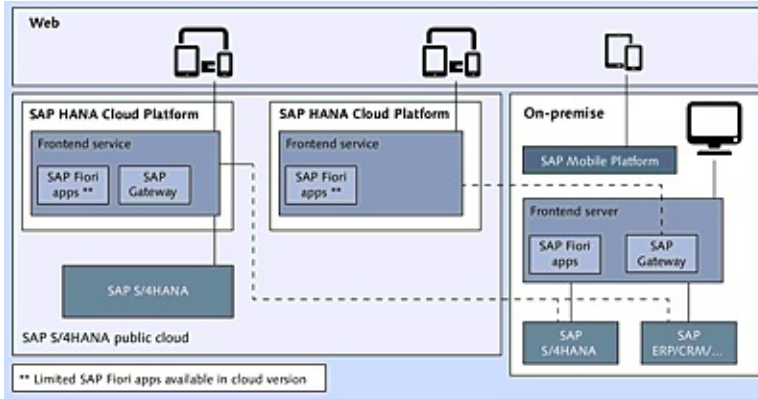
Figure 6.24 SAP Fiori Architecture

With SAP Fiori 2.0, the UX has been improved further. The user can see three areas on the screen after logging in to the SAP Fiori launchpad:

- **Notifications**
  Action items pertaining to that user in that specific role are displayed.

- **Me area**
  User details are provided, including favorites or commonly used apps/app finder.

- **Viewport**
  The main content is displayed in the middle of the screen.

6.7   Data Lifecycle Management

Managing data well now plays an even more important part because SAP HANA database costs are higher and scalability has limitations as mentioned earlier. In addition, business requirements don't call for availability of all data for all time periods in the main memory of SAP HANA.

There are three options for data management:

- To minimize data in SAP HANA through archiving, move data to an external store that can serve as an archiving solution such as SAP IQ.

- For certain use cases, the data need not be stored in SAP HANA at all but rather stored in other solutions such as Hadoop and then accessed through SDA into SAP HANA.

- For data in SAP HANA, the options for data management are the following:

  - Data aging: This is a new concept in SAP HANA that governs data through aging via two concepts: data resident time and business rules. While this option is available to several technical objects such as IDocs, application logs, workflows, and so on, few business objects in SAP S/4HANA Finance support this feature. Data aging is achieved through horizontal table partitioning and is used to separate hot data (current) from cold data (old). To understand how the business rules play a part in this partitioning, think of finance documents that are more than three months old but are still open. If the resident time is set to three months for these documents, because the business rule states that the document status can't be open, these documents can't be moved to the "cold" area. From a data access perspective, this division is transparent to the user when viewed from an SAP Fiori app, for instance.

  - Dynamic data tiering: This is more relevant for the business

warehousing or analytical use cases. Here, data is again divided based on usage into the following:

- ○ Hot data in memory

- ○ Warm data stored in/accessed from disk

- ○ Extended disk-based columnar table

For SAP Business Suite on SAP HANA or SAP S/4HANA, data aging is expected to play an important role as the number of business objects supported gradually increases.

6.8　Summary

In this chapter, we touched on the drivers for the SAP S/4HANA evolution, all the major technical concepts, and the architecture behind the SAP S/4HANA solution, including the SAP HANA platform services and the SAP HANA database, and the various logical deployment options. We also covered SAP S/4HANA as the digital core, including the SAP Fiori frontend and the road map to SAP S/4HANA.

This chapter provides an overview of the extension strategy, as well as the possible extension types, for future SAP solutions. We'll also discuss the SAP HANA Cloud Platform capabilities and their role within the strategy.

7 Extending SAP S/4HANA

In the past, the extension of SAP functionality focused mainly on ABAP as part of the SAP ERP solution; however, with SAP NetWeaver and the service-oriented architecture, Java came into play via the composition environment to build solution extensions on top of the SAP ERP core. With the move to cloud solutions, there is a need for a strong governance to maintain the solution and provide restricted options to extend or customize SAP S/4HANA. The same is true for other cloud-based line of business (LoB) solutions, such as SAP SuccessFactors and SAP Hybris Cloud for Customer.

SAP's approach for SAP S/4HANA is to keep a stable core solution and to provide the possibility to create competitive advantage through custom-built extensions. Therefore, SAP provides end-to-end tools for key users and consultants to make smaller adjustments without worrying about any implications on the maintainability. Aside from this, you can still use the known extension technologies for the SAP S/4HANA, on-premise edition, but the recommendation is to adopt the tools that are available for the SAP S/4HANA Cloud to prepare yourself and leverage the benefits.

You also need to consider the different editions that we mentioned in Chapter 2, as there is also a difference in extending cloud and on-

premise versions (see Figure 7.1).
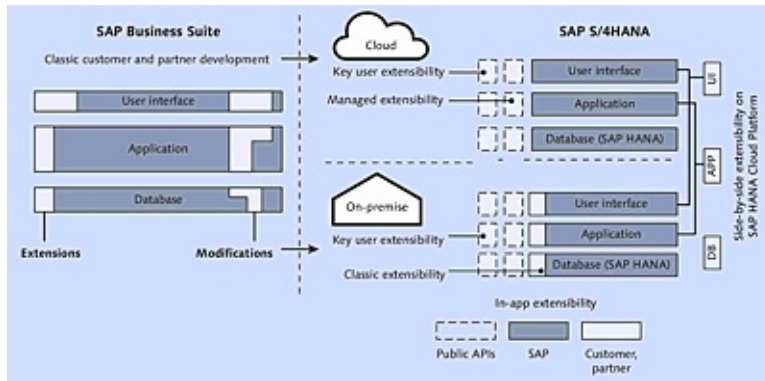
Figure 7.1   Comparison of SAP Business Suite and SAP S/4HANA Extensibility Options

Let's now look at SAP's extensibility strategy before moving on to the SAP HANA Cloud Platform, Internet of Things (IoT), and cognitive analytics.

7.1   Future Extension Strategy for SAP Solutions

Figure 7.2 summarizes the overall extension possibilities that are available. It covers the full spectrum from configuration, adoption, and extension to new application development and integration. All of these different possibilities address the needs of the different user types and skill levels (e.g., key users via *in-app extensions* with new fields or developers performing a business logic *side-by-side extension*).

As you can see, we're talking about a lot of possible extension possibilities, but regarding an extension strategy, it can be classified into two different blocks: *in-app extensibility* through built-in capabilities and *side-by-side extensibility* though the SAP HANA Cloud Platform (SAP HCP). Before we go into the details of the different blocks, let's take a closer look at the technology supported and used for in-app extension and for side-by-side extension to clarify what skills are required.

Figure 7.3 shows that with the side-by-side model, there are further programming languages supported or planned to provide you with the

freedom of choice for your programming language.
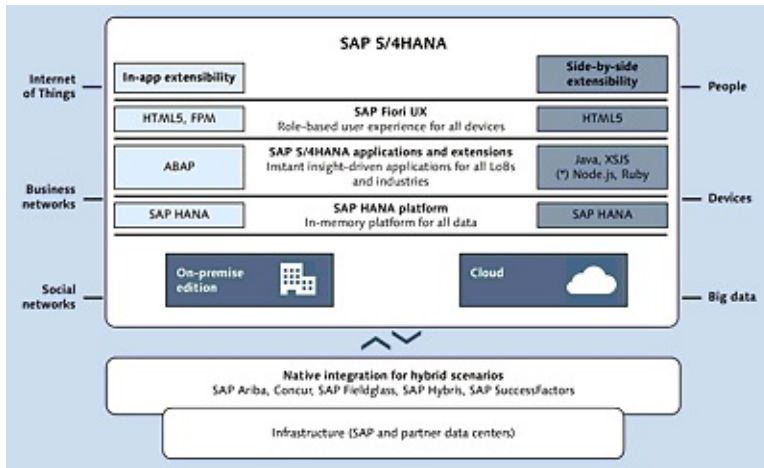
Figure 7.2 Possible Technologies to Adopt or Extend Business Applications
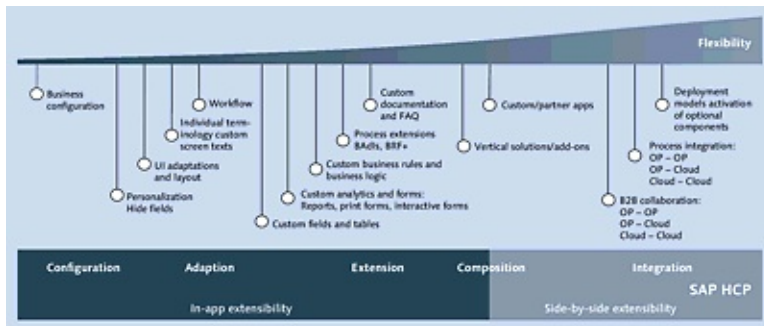
Figure 7.3 Technology Overview for In-App and Side-by-Side Extensions

On the other side, SAP S/4HANA in-app extensibility are classified into three different types (see Figure 7.4):

- Key user extensibility
- Managed extensibility
- Classical extensibility
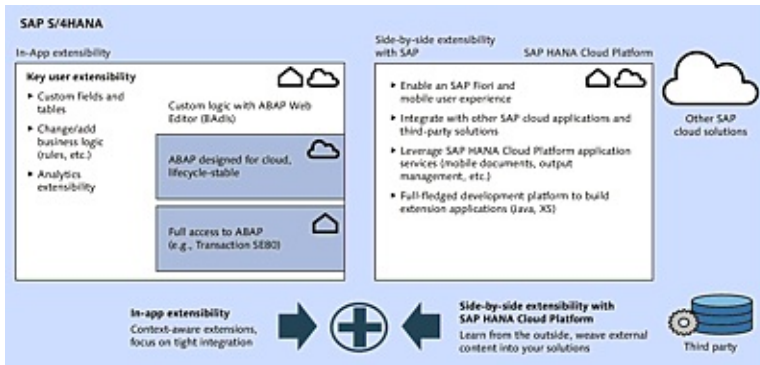
Figure 7.4 Comparison of In-App Extension and Side-by-Side Extension Possibilities

Let's take a closer look at each type of in-app extensibility as well as side-by-side extensibility.

7.1.1 Key User In-App Extensibility

Key user extensibilities address the customers' need for smaller changes, such as a minor modification of an SAP Fiori app (see Figure 7.5). All of these web-based tools are easy to use without technical complexity and follow the SAP Fiori design principles.

Key users can personalize their user interfaces (UIs) by hiding, moving, or adding fields easily. Key users can also use the ABAP Editor to add additional business logic. These web-based tools have the following characteristics:

- Provide a simple way to adjust the application to your needs while sticking to the standard

- Are lifecycle stable so that they continue to work after an upgrade

- Are designed to follow the cloud qualities and to support a pace layered model that is required for modern business applications

- Support both the on-premise and cloud deployment options
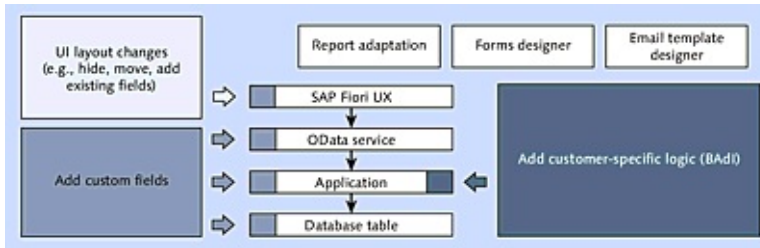
Figure 7.5   Key User Extensibility

7.1.2   Managed Extensibility

To step further in in-app extensibility, there's a need for coded extensibility for the SAP S/4HANA Enterprise Management Cloud; these extensions are built using ABAP because they need a tight integration with the SAP S/4HANA core. SAP provides a development landscape for in-app extensions under a very strong governance model guaranteed to ensure that there is no disruption in the cloud operations. As shown in Figure 7.6, access is provided through whitelisted Application Programming Interfaces (APIs) to ensure a stable lifecycle management of the developed solution. This managed extensibility follows a strong governance process, for example, no modifications allowed, separation of customer and partner developments, and access to SAP objects is only allowed via whitelisted APIs.
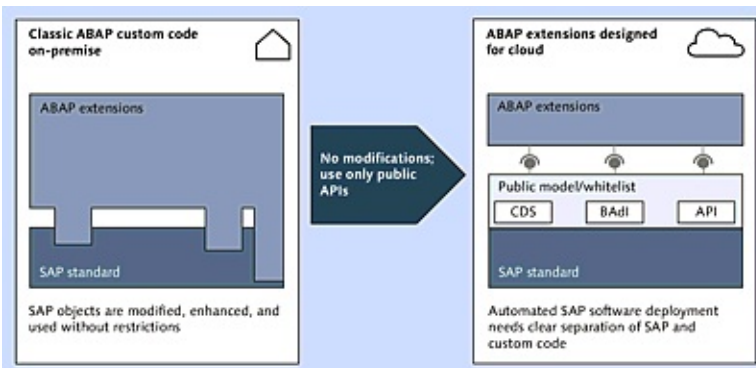
Figure 7.6   Managed Extensibility via Whitelisted APIs

7.1.3   Classic Extensibility

Classic extensibility is only available for on-premise deployments and provides you with the already-available extension possibilities that come with using the ABAP Workbench or Eclipse. Classic extensibility provides you with the freedom to modify SAP S/4HANA objects, but the recommendation is to use managed extensibility to ensure that the solution complies with future needs and that you can benefit from reduced maintenance costs.

7.1.4 Side-by-Side Extensibility

The side-by-side extension is mainly based on the SAP HANA Cloud Platform that we'll describe in Section 7.2. The side-by-side extension applies to on-premise as well as cloud solutions; it can also be applied to any SAP product, especially for the LoB solutions such as SAP SuccessFactors. There is even an extension package available for SAP SuccessFactors. The implementation guide is available at *http://service.sap.com/%7Esapidb/012002523100013621492014E*.

The purpose of the side-by-side extension is to ensure the stability of the core solution while extending the solution with additional custom functionality. It's the default option for SAP S/4HANA extension developments. Some possibilities are as follows:

- Build or add new business processes (e.g., industry solution extension)
- Add new calculations or process engines (e.g., porting of custom developments)
- Build or integrate complete custom or partner solutions with own database
- Build specific functionality for business-to-business (B2B) and business-to-consumer (B2C) users
- Integrate with social networks
- Use business-specific subscription and event filtering

- Integrate with deep technology

The main benefits are having separate lifecycle management and integrating SAP S/4HANA business processes with LoB solutions from SAP.

In Figure 7.7, we highlighted the different side-by-side extensions that we'll explain in more detail.
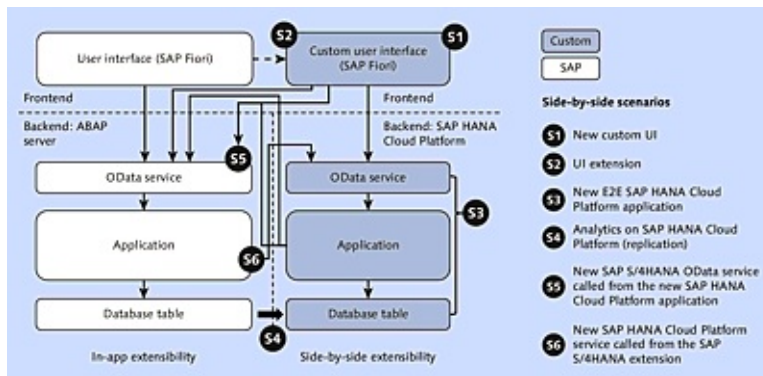
Figure 7.7 Side-by-Side Extension Scenarios

The scenarios in Figure 7.7 are as follows:

- Scenario S1 is an extension of the frontend server with a custom UI consuming existing OData services.

- Scenario S2 demonstrates the possibility of extending the existing UI via SAP HANA Cloud Platform by calling an existing OData service.

- Scenario S3 has no change in SAP S/4HANA while you build a new data structure, business logic, and OData service with a new UI to develop a complete new solution extending SAP S/4HANA.

- Scenario S4 shows data replication for analytics on SAP HANA Cloud Platform.

- Scenario S5 is based on a new SAP S/4HANA OData service that is being consumed by a new custom UI on SAP HANA Cloud Platform.

- Scenario S6 shows that SAP S/4HANA is consuming an SAP HANA Cloud Platform service.

As described in the previous scenarios, SAP HANA Cloud Platform enables you to build and extend UIs for a seamless integration into an existing application and tailor them to your needs or adjust the themes. You also can extend SAP S/4HANA on any level and build your own applications on top of the exposed APIs. To complete the picture, Table 7.1 provides an overview of the programming model, development tools, and the SAP S/4HANA APIs that are available for the different extensibility options, before we get into the overview of the SAP HANA Cloud Platform.

Extension Type		On-Premise or Cloud	Programming Model	Development Tools	SA AP
Side-by-side extensibility with SAP HANA Cloud Platform		Both	- SAP Fiori - Other web techniques - Java - JavaScript - SAP HANA	- SAP Web IDE (Integrated Development Environment) - Related IDE - Eclipse - SAP HANA Studio	f v (s (p A
In-app extensibility	Key user	Both	- SAP Fiori flexibility - Custom fields, logic, reports, and so on - SAP HANA new/ extended Core Data	- SAP Fiori UX adaption mode - SAP Fiori key user tools	f A v c s (u

			Services (CDS) views		
	Managed	Both	- SAP Fiori - ABAP web techniques (restricted) - ABAP (restricted) - SAP HANA	- SAP Web IDE - Eclipse - ABAP Workbench	• F A v c s (s
	Classic	On-premise only	- SAP Fiori - Other ABAP UI techniques - ABAP - SAP HANA	- SAP Web IDE - Eclipse - ABAP Workbench	• F F A v c s • N r

Table 7.1   Programming Model, Tools, and APIs for SAP S/4HANA Extensions

7.2   SAP HANA Cloud Platform

Referring to the official definition, the SAP HANA Cloud Platform is an open platform-as-a-service (PaaS) that provides unique in-memory database and application services. It enables you to rapidly develop new applications or extend existing ones. Its purpose is to extend SAP applications in minutes, all in the cloud with the following three use cases:

- **New cloud solution build**
  The purpose is to leverage the SAP HANA capabilities toward, for example, advanced analytics and IoT and to build up applications that can live side by side with an existing SAP S/4HANA or LoB solution.

- **Cloud extension**
  This extension is mainly focused on extending existing cloud solutions (e.g., SAP SuccessFactors, SAP Hybris Cloud for Customer, and SAP S/4HANA Cloud; further products will be supported depending on the available road map). It helps you use a standard software-as-a-service (SaaS) solution and differentiate your business from your competition by building or enabling unique processes. It's a seamless integration and the same look and feel as in the core application, but it's built as a side-by-side scenario. Benefits from SAP HANA Cloud Platform include the prepacked integration and solution extension packages that are available for the different products.

- **On-premise extension**
  This extension aims at keeping a stable core (SAP and non-SAP, including SAP Business Suite and SAP S/4HANA, on premise edition). It supports your ability to leverage mobile services or deploy SAP Fiori in the cloud.
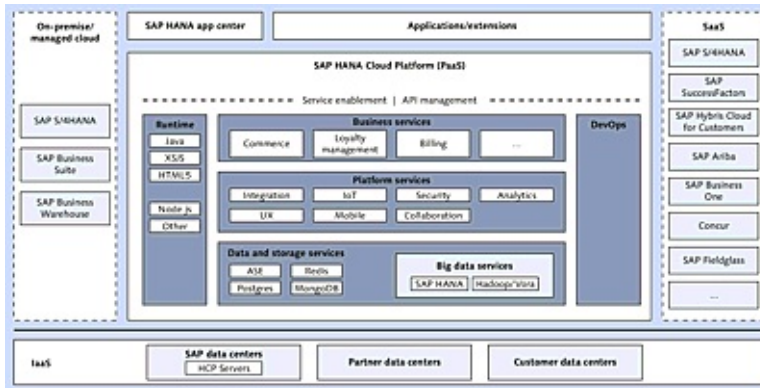
Figure 7.8   SAP HANA Cloud Platform Overview

As shown in Figure 7.8, SAP HANA Cloud Platform is the central platform that acts as the glue between the elements of the SAP portfolio and provides the functionality to build, extend, or integrate applications. SAP HANA Cloud Platform enables you to develop applications with the following different programming models:

- Java

- SAP HANA

- HTML5

- SAPUI5

It will likely even be extended to Ruby and Node.js in the future. SAP HANA Cloud Platform also provides you with a runtime container and a set of services for your use. You are also able to integrate into SAP and non-SAP systems and to take advantage of real-time memory capabilities with the persistence in SAP HANA. When working with SAP HANA Cloud Platform, several tools are available:

- **ADT**
  This tool is used to develop and deploy applications and to perform operations such as user management, logging, and so on.

- **SAP HANA Web-Based Development Workbench**
  This tool is also called the SAP Web IDE for the SAP Fiori and SAPUI5 developments. The SAP Web IDE is part of the design-time tools that

help you be more efficient. This web-based development supports the end-to-end application development for SAP Fiori and SAPUI5 apps. With its layout editor (drag-and-drop tools), wizards, and templates, you can create starter applications with only a few clicks, and no further installation is required.

- **SAP HANA Cloud Platform cockpit**
  This central part of the SAP HANA Cloud Platform is a web-based frontend that provides you with the capability to manage all your account-related resources and extension applications.

SAP HANA Cloud Platform also provides you with a rich set of services that can be leveraged for building new applications or extending existing applications. These services range from simply connectivity or identity services up to mobile or IoT services. The services are classified into three different categories:

- **Data and storage services**
  An example of this service is the SAP document service that provides an enterprise cloud content repository for unstructured and semi structured data and is based on the OASIS (Organization for the Advancement of Structured Information Standards) content management interoperability services.

- **Platform services**
  An example of this service is using the SAP HANA cloud connector to extend on-premise solutions (see Figure 7.9), which enables an easy integration of the on-premise data with the SAP HANA Cloud Platform.
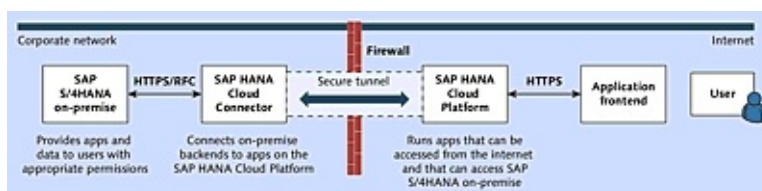
Figure 7.9   Integrating SAP S/4HANA with the SAP HANA Cloud Connector

This extension enables you to consume and build applications on top

of on-premise solutions.

- **Business services**
An example of this service is SAP Hybris-as-a-service (YaaS) on the SAP HANA Cloud Platform, which allows developers to create, offer, and sell business service packages based on a micro-service-centric programming model. Customers can leverage these services for extending existing and new front-office solutions.

An overview of the available services is provided in Table 7.2.

Service	Area	Type	Detail
Data and storage services		• SAP HANA persistence service • AP Adaptive Server Enterprise (ASE) persistence service • Document service	
Platform services	Integration	• SAP HANA cloud connector • SAP HANA Cloud Platform, integration service • SAP API Management • SAP API Hub	
	User experience	• SAP HANA Cloud, portal service • SAP Fiori, cloud edition • SAP HANA Cloud Platform, form service by Adobe	
	Analytics	• SAP BusinessObjects Cloud • Predictive services	
		• SAP HANA	• Spatial/geographical information Dbsystem

			(GIS) • SAP Predictive Analytics • Text analysis, mining, and search • Series data
	Collaboration		• SAP Jam • Gamification Service • SAP Document Center
	Security		• SAP Cloud Identity
	Mobile		• Mobile services
	IoT		• IoT services • Remote data sync
Business services			• SAP Hybris-as-a-service

Table 7.2 Overview of the SAP HANA Cloud Platform Services

7.3   Internet of Things and Cognitive Analytics

IoT services are designed to facilitate and support the implementation of IoT applications. These services provide interfaces for registering devices and their specific data types, sending and storing data to a database running on SAP HANA Cloud Platform, and providing easy access to the data stored. They support replication to and synchronization with remote databases into a consolidated SAP HANA database in the cloud. For example, you can consolidate sensor data from a remote database and build an analytical application on top for analytics and monitoring. In the context of IoT, SAP Hana Cloud Platform provides the capabilities to process high-volume data from any kind of machine, device, or sensor and then combine this information with the transactional data from the system of record or with additional information from social media, for example. Following are the key features for IoT services:

- **Text analysis**
  Extract and process unstructured text data from various files with support for up to 31 languages. This allows you to identify a sentiment in seven different levels (e.g., strong positive, minor problem, etc.) in a tweet and analyze social media data. This is done by using language-based, full-text search text indexing and fuzzy search.

- **Geospatial processing**
  Store, process, manipulate, share, and retrieve spatial data by using SAP HANA.

- **Operational intelligence**
  Manage operational risk with end-to-end process visibility and better analytics supported by decision support and real-time insights.

- **Series data processing**
  Measure data and forecast trends (e.g., utilities and smart metering) with native series data storage and high-volume processing.

- **Graph engine modeling**

Discover, manage, and analyze complex relationships for proximity- and location-based analytics.

- **Multitenant architecture**
  Logically isolate databases while sharing underlying system resources to optimize efficiency.

To extend IoT to manage and process IoT data, a set of services is available via SAP HANA Cloud Platform to provide you with full control of your IoT lifecycle:

- **Remote device management**
  Manage the device from onboarding to decommissioning. Receive device information, configure devices remotely, and send commands to devices.

- **Message management services**
  Support various transport protocols and messaging formats to send, receive, and store IoT data in the persistence layer of SAP HANA Cloud Platform.

- **Application enablement**
  Apply functionalities for remote device management and message management in your applications through APIs.

SAP HANA Cloud Platform can also be leveraged to build cognitive solutions in multiple ways. Before we go into these options, let's briefly recap what characterizes a solution as cognitive:

- **Understanding**
  It understands all types and sources of data, both structured and unstructured with context, at astonishing speeds and volumes.

- **Reasoning**
  It's able to form hypotheses, make considered arguments, and prioritize recommendations to test the hypothesis and help humans make better decisions.

- **Learning**
  It continuously ingests and accumulates data and insight from every interaction; once trained by experts, it then uses feedback to iteratively develop over time with no programming intervention.

The SAP HANA Cloud Platform offers ways to support solutions in realizing each of these criteria. Understanding all types of data can be accomplished by leveraging the SAP HANA Cloud Platform IoT service to connect devices and sense the world or by performing text analysis using the built-in SAP HANA text analytics functionality. Of course, all other methods of analyzing business data using SAP HANA are also available. Although no computer vision service is yet available, SAP HANA Cloud Platform makes it easy to tap into the API economy and leverage its connectivity service to integrate with, for example, IBM's Watson Developer Cloud, to identify objects within an image.

Forming hypotheses isn't supported out of the box in SAP HANA Cloud Platform. However, SAP HANA offers the powerful Predictive Analytics Library, which the developer can use to build models for testing hypotheses and training the cognitive solution. These models can be layered; for example, an SAP HANA Cloud Platform solution might evaluate a hypothesis in a health care scenario, such as "Patient condition is worsening," based on an IoT stream of medical devices that signal an increase in temperature combined with textual analysis of the diagnosis. The solution then correlates with its medical knowledge that temperature is a critical factor in the condition diagnosed.

Because SAP HANA Cloud Platform is an ideal single place to gather data, it's easy to have solutions continually learn from new data that are fed into retraining the hypothesis model. SAP HANA Cloud Platform makes it easy to develop SAP Fiori apps that allow users to give feedback on the recommendations and support they received from their cognitive solutions. The cognitive solution on SAP HANA Cloud Platform can then periodically retrain itself.

In summary, SAP HANA Cloud Platform offers all the building blocks to develop compelling cognitive solutions. Integration between these building blocks is expected to deepen over time and provide a more integrated development model. Starting early in evaluating and test-driving the respective technologies may well give you a head start on the digital journey.

7.4   Summary

In this chapter, discussed the extension possibilities of future SAP solutions and covered how SAP S/4HANA can be extended via in-app and side-by-side extensions. We also took a detailed look at the strategy and purpose of both extension possibilities. We outlined possible side-by-side scenarios to provide you with the different options that are available via SAP HANA Cloud Platform, and we provided a high-level overview. Finally, we described how IoT and cognitive fit in as fundamental pieces of the digital value chain.

This chapter introduces the SAP S/4HANA deployment options—on-premise, public cloud, private cloud—and outlines their relative merits and demerits to help you choose the right deployment model and the right cloud/cloud service providers.

8   Deployment Options

In [Chapter 2](#), we briefly introduced the different versions of SAP S/4HANA. In this chapter, we'll take a closer look at the different deployments options. As of the November 2015 SAP S/4HANA release, there are two main options:

- SAP S/4HANA, deployed on-premise (often called the on-premise edition)

- SAP S/4HANA Cloud

There are further variants of SAP S/4HANA Cloud, including those released in August 2016. For the on-premise version of SAP S/4HANA, there are various options to deploy the solution. This chapter discusses each of the deployment options available as of September 2016.

To choose the SAP S/4HANA version and deployment that is best for your organization, it's important to know about these options so you can optimize the overall IT landscape, minimize the initial costs of the SAP S/4HANA deployment, and have a balanced cost structure throughout the lifecycle of the landscape.

Before we go deep into the options and highlight the advantages and disadvantages of each option, let's take a quick look at the cloud concepts and why they are important today. This will help you interpret

the different terms correctly when we discuss the deployment options for the cloud.

8.1   Cloud Concepts

We'll refer to the Cloud Computing Reference Architecture (currently at CCRA 4.0) published by IBM to help us navigate through the common adoption patterns for cloud. Figure 8.1 gives the overview of this reference architecture.
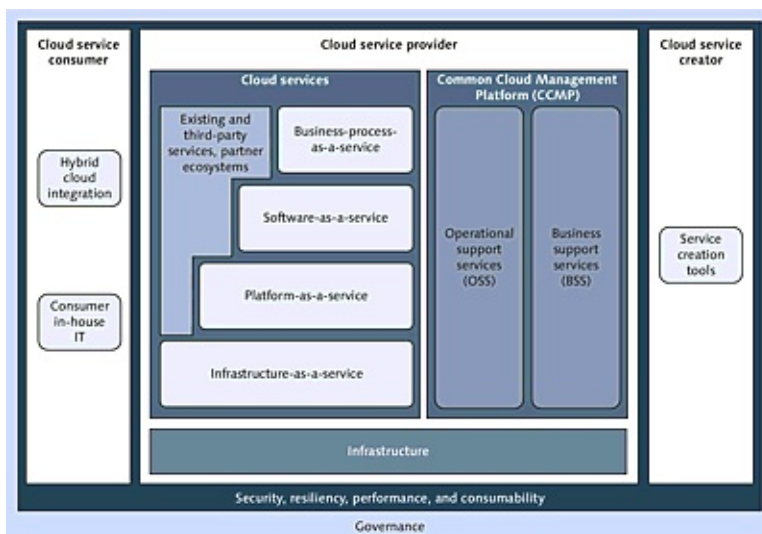
Figure 8.1   Cloud Computing Reference Architecture Overview

Expanding on the concepts introduced in Chapter 1, Section 1.3.1, we find the following:

- **Infrastructure-as-a-service (IaaS)**
  IaaS is an offering by which IT landscapes can be hosted in the cloud using the computational resources such as servers as well as storage and networks owned by the service providers. The customers can get their requisite quantity of infrastructure provisioned very fast and on-demand. Typically, there are web-based user interfaces (UIs) where customers can put in their requirements and self-provision the infrastructure. API access to the infrastructure may also be offered as an option. Simply speaking, this service provides the place to run the

customer's applications. For example, many customers' IT landscapes use IBM data centers.

- **Platform-as-a-service (PaaS)**
  PaaS includes a composable and integrated application development platform that allows you to model multitiered application infrastructure (middleware) patterns, expose them as services into a self-service catalog, automate their deployment, and meter the resources used by this service. This service typically includes application platform, integration, business process management, and database services. Thus, PaaS provides a place for customers to build their applications without the cost of procuring an infrastructure or installing/upgrading the latest product suite needed for the application. An example is the SAP HANA Cloud Platform.

- **Software-as-a-service (SaaS)**
  SaaS is the software that is owned, delivered, and managed remotely by one or more providers. The software provider delivers standard software based on a set of common code and data definitions. This software has components that are configurable to suit customers' requirements and typically will have some enhancement points and some APIs to connect with other solutions. The software is provisioned for the contracted customers at any time on a pay-for-use basis or as a subscription based on usage metrics. There are several SaaS solutions today, including SAP SuccessFactors, Concur, and the SAP S/4HANA Cloud, public option.

- **Business-process-as-a-service (BPaaS)**
  Gartner defines BPaaS as "the delivery of business process outsourcing (BPO) services that are sourced from the cloud and constructed for multitenancy." These services are often automated and include human intervention, which is catered to by a shared pool of human resources. The pricing models are consumption-based or subscription-based commercial terms. As a cloud service, the BPaaS model is accessed via web-based interfaces.

After choosing to put their infrastructure on the cloud, customers need to choose whether they want a private cloud, a public cloud, or a hybrid option:

- **Private cloud**

  The cloud infrastructure provides options for scalability, flexibility, provisioning, automation, and monitoring but is dedicated for a particular customer. The cloud vendor provides the infrastructure dedicated to the customer either on client premises or in the cloud vendor's data center, but it's dedicated to the specific customer and behind the company's firewall.

- **Public cloud**

  The cloud computing services are provided outside the organization via the Internet whereby the IT resources are available and accessible through the Internet in the public domain.

- **Hybrid cloud**

  This is a combination of some of the options, for example, private cloud and public cloud deployments or a public cloud and on-premise deployments linked together. There are several use cases for the hybrid cloud scenario.

There are also variants in the IaaS space with different kinds of management services on top of the infrastructure. More details about the types of service are covered in Section 8.2.1 and Section 8.3 of this chapter.

8.2   SAP S/4HANA Versions

SAP S/4HANA Enterprise Management is available in two major flavors: on-premise and cloud. From a functionality perspective, there are some divisions in the different versions available for the cloud version, such as the SAP S/4HANA Marketing Cloud or the SAP S/4HANA Project Services Cloud, but we'll be focusing on the SAP S/4HANA Enterprise Management Cloud in this section, which covers scenarios from logistics, financials, and project management.

Let's now dive into the SAP S/4HANA, on-premise edition, before moving on to SAP S/4HANA Cloud and the hybrid of the two. In the following section, we'll provide criteria for choosing between your different deployment options.

8.2.1   SAP S/4HANA, Deployed On-Premise

The SAP S/4HANA, on-premise edition, is the entire SAP ERP scope with simplifications in several core areas. This has already been covered in earlier chapters, including an overview in Chapter 2, and discussion of finance (FI) and logistics functionality in Chapter 3 and Chapter 4, respectively. For the on-premise edition, the release cycle for new functionality is on an annual basis and can be deployed on-premise or on cloud with the IaaS model.

The first decision for the client is to choose the right SAP S/4HANA product version: on-premise SAP S/4HANA or SAP S/4HANA Cloud. When making this decision, the client should consider the following primary aspects:

- **Licensing model**
  The SAP S/4HANA, on-premise edition, follows the traditional licensing model. For SAP S/4HANA Cloud, the pricing follows subscription-based licensing, per the SaaS model.

- **Range of functionality**

  So far, the on-premise version has the complete set of functions from SAP Business Suite/SAP ERP, although not all of them use simplified code or the SAP Fiori frontend. SAP S/4HANA Cloud covers specific business processes for marketing line of business (LoB) and the professional services industry, while SAP S/4HANA Enterprise Management covers scenarios for a digital core, including FI, Controlling (CO), Procurement, Sales and Distribution (SD), Manufacturing, Plant Maintenance (PM), Project System (PS), and SAP Project Lifecycle Management (PLM). The scope of functions for SAP S/4HANA Cloud will be enhanced on a quarterly basis. Therefore, a customer who needs the full-blown SAP ERP functionality for its business beyond what is provided by SAP S/4HANA Cloud needs to opt for the on-premise version or wait for SAP S/4HANA Cloud to reach the state where it can cater to these functionalities.

- **Standardization versus flexibility**

  The on-premise version provides complete flexibility to do any customization to the standard solution, as is required by the customer's business processes. SAP S/4HANA Cloud, on the other hand, provides limited ability for customization. Thus, this edition is suited to those organizations that have the strategy to adopt standardized processes. Thus, they can adhere to the functionalities provided by SAP S/4HANA Cloud.

- **IT strategy in terms of usage of SaaS**

  The IT strategy for some of the major organizations is to adopt a SaaS model for all their IT solutions, even their ERP solutions. This might potentially drive them to adopt SAP S/4HANA on-premise if the first premise in terms of functionality is met.

- **Infrastructure and operations**

  For the on-premise edition, the client has complete control of the infrastructure, deployment, and maintenance schedule. For SAP S/4HANA Cloud, SAP provides the system and any service-level

agreements around the nonfunctional requirement. They also have to test the delta functions every quarter for a fixed number of days before the updates are applied. Thus, the customer has no control over accepting the versions upgrade. This has some advantage in terms of less maintenance, but companies need to plan for the resource and effort for this continuous testing every quarter.

- **Implementation approach and time lines**
  The implementation for SAP S/4HANA Cloud is much faster due to the standardized process configurations, which include SAP Best Practices for implementation. Both new and existing SAP ERP customers need to only do data migration, which is aided by migration tools and templates for different data objects. Deep technical skills aren't needed. For the on-premise implementation—both for the migration scenario and the new implementation scenario—the technical knowledge and skills are mandatory for the team because there will be customer-specific scenarios and considerable customization. The time lines for the SAP S/4HANA adoption are also longer.

- **Costs**
  Costs are affected by several factors, including the reduced implementation time lines. However, because SAP S/4HANA Cloud is a SaaS model, the product licensing costs and the infrastructure and operational costs decrease. Because SAP S/4HANA Cloud has fewer customization capabilities, it also has the advantage of less maintenance overhead. Apart from the licensing model, the infrastructure investment and maintenance overhead can also be tackled through an IaaS adopted for the on-premise edition.

There can be certain constraints as well in terms of SAP S/4HANA Cloud adoption. Following are the three main constraints:

- Regulatory compliance might compel the data to be on-premise, or the data might not be able to be taken outside the country, requiring in-country hosting of the data center.

- Organizations have security concerns about the data being in the cloud, in the public domain, beyond the organization's firewall.

- The size of the database may be too large for the currently available cloud options for SAP HANA.

The second concern is gradually getting changed to certain precautionary steps the customer should take, and, of course, the cloud providers have to follow standard security processes to be certified for productive usage by customers. Apart from the standard security features related to user authorization and authentication, data security and privacy controls in SAP products are available irrespective of being on-premise or in the cloud. From a physical security perspective, SAP data centers comply with the latest telecommunications industry standards, such as ANSI/TIA/EIA-942 Tier III or higher.

The summary of what the SaaS, PaaS, and IaaS offerings mean for the customer is shown in [Table 8.1](#).

IaaS	PaaS	SaaS	Service Model	Control over Cloud Service
		Applications	SaaS: Consumed by end user, delivered through internet	- Limited user-specific configuration and customization - No control over software release and update - No control over underlying platform and infrastructure

	Operating system and middleware runtime	**Operating system and middleware runtime**	PaaS: Application deployed on managed services	- Control over application deployed - Control over application-specific configuration on hosting environment - No control over underlying infrastructure
Server, storage, and network	**Server, storage, and network**	**Server, storage, and network**	IaaS: Computing resources available at lowest infrastructure component level	- Control over application, operating system, and updates - Limited control over network - No control over underlying physical infrastructure

Table 8.1   SaaS, PaaS, and IaaS Options Summary

After choosing the relevant product version, there are more decisions to be made. The on-premise version can be deployed on the cloud or on-premise with options for multiple deployment models (the terms were explained in greater detail in Chapter 6):

- **Multiple Components One System (MCOS)**

In the same SAP HANA server, multiple SAP HANA databases along with the System ID (SID) can be configured (e.g., development and quality environments).

- **Multiple Components One Database (MCOD)**
  Multiple SAP components are running on the same SAP HANA database.

- **SAP HANA Multitenant Database Containers (MDC)**
  Multiple tenant databases are isolated in the same SAP HANA system.

- **Virtualization using smaller virtual machines (VMs)**
  Smaller VMs are used within the SAP HANA system, or logical partitioning (LPar) is used.

Figure 8.2 shows the decision tree for choosing the SAP S/4HANA deployment.
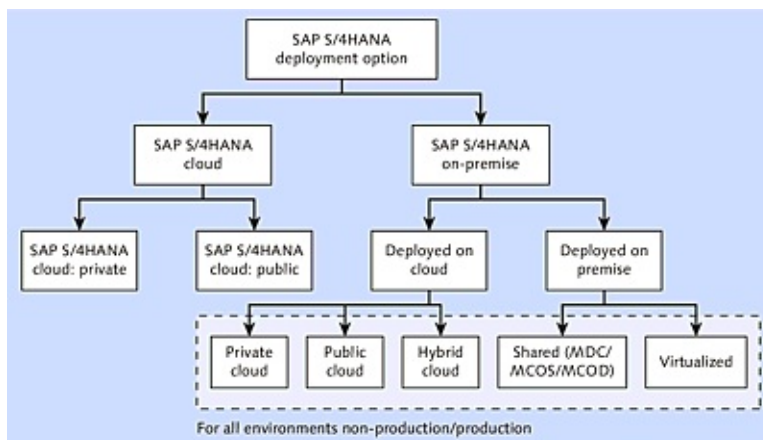
Figure 8.2   Decision Tree for SAP S/4HANA Deployment

There can even be a combination or a stacking option for these deployment models. Some options are provided by the specific hardware, including the processor. For example, IBM Power machines with its proprietary processors can provide an MDC on top of a VM (virtual machine).

The customer's SAP HANA-related existing infrastructure setup, the database size requirements, and the nonfunctional requirements all affect

the choice of deployment models for SAP S/4HANA. For example, your choice may be influenced by the following:

- If there are other applications that use the SAP HANA database, you might look at combining and sharing the infrastructure to minimize costs.

- If the database size is too large, then the resource sharing options won't work out, at least for the productive environment. You might look at sharing the nonproductive environments, using one of the options (e.g., MDC/MCOD/MCOS) and virtualization or a combination of these options. The restrictions for such deployment options must be adhered to, as explained in Chapter 6. For example, there are products that can be deployed as MCOD for production, as per the whitelist provided in SAP Note 1661202. These restrictions don't apply if each application is deployed on its own tenant database, but they do apply to deployments inside a given tenant database (in a MDC scenario).

Note

There are additional SAP notes for the different deployment scenarios (e.g. SAP Notes 2096000, 1681092, 2248291) and the SAP HANA Master Guide should be referred to while deciding the right deployment option for a combination of applications (*http://help.sap.com/hana/SAP_HANA_Master_Guide_en.pdf*).

The deployment option can also be chosen based on SAP recommendations and considerations about the advantages and disadvantage of that option. For example, SAP recommends using MDC for all the MCOS scenarios where it fits and also for MCOD because MDC supports most of the MCOD scenarios. On the other hand, all the SAP HANA applications deployed using MDC will share the same SAP HANA database. As a result, any SAP HANA database upgrade will impact all the applications at the same time. In addition, the High

Availability/Disaster Recovery (HA/DR) configuration will impact all the tenant databases because they are part of the same SAP HANA database.

Another example is that SAP supports multiple SAP HANA databases on the same system (the MCOS scenario), even for the production environment, but only for scale-up or single-host scenarios. For this option, sizing has to be done carefully, and proper volume testing is important before going live because contention for the system resources by the different components using the same system may lead to poor performance in production (see SAP Note 1681092). Your choice may also be influenced by the following:

- The underlying infrastructure from existing vendors and the scalability options for those hardware. Depending on their maximum available size, the workload can be virtualized so that proper resource sharing happens.

- Nonfunctional requirements (NFRs) play an important role on the choice of deployment model. Some examples are listed here:

  - Responsiveness: This may determine whether any cloud deployment is an option for the productive environment. For high responsiveness, on-premise is the preferred option.

  - HA/recovery time objective (RTO)/recovery point objective (RPO): Certain options are better from a HA requirement point of view. If cloud providers can't cater to availability, say, more than 99.5%, or if such Service Level Agreements (SLAs) could have high cost impact, having the system on-premise might be the best choice. Another example of a cost-optimized HA option occurs when the system on which the secondary server is running can be shared with the nonproductive instances.

  - Disaster Recovery (DR): The option to have the DR set up in the cloud while the workload runs on-premise is a cost effective one.

Alternatively, your cloud partner should be able to provide and maintain a DR solution, if the actual solution is also hosted on cloud.

For an organization that wants to use IaaS for the on-premise deployment of SAP S/4HANA, there are several options along with the management functions on top of these infrastructure services. The cloud vendors normally offer unmanaged IaaS, managed IaaS, or managed PaaS. The different type of services are shown in Figure 8.3.
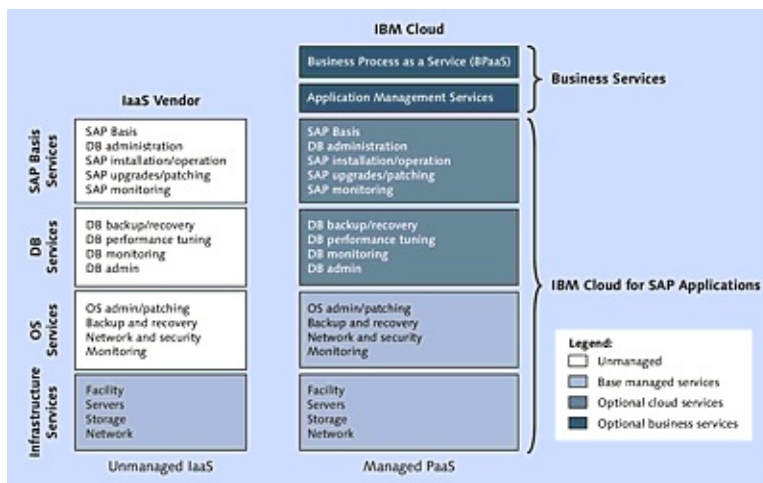
Figure 8.3   Service Options for IaaS and PaaS: Managed and Unmanaged

8.2.2   SAP S/4HANA Cloud

This version of SAP S/4HANA is equivalent to a SaaS model and is maintained and operated by SAP in SAP's infrastructure. SAP S/4HANA Cloud is again available in two flavors:

- Public version

- Private version

SAP S/4HANA Cloud, public option, has limited flexibility in terms of customization. It doesn't allow modification of standard objects but allows limited extension. SAP S/4HANA Cloud, private option, allows a similar level of modification but more flexibility in terms of usage. For example, for the public version, the processes are only accessible through SAP

Fiori apps. Thus, the challenge lies in the fact that functionalities available on simplified code without an SAP Fiori app won't be available on the public cloud. However, for the private version of the same product, these other processes are accessible through SAP GUIs.

The snapshot of major processes available in SAP S/4HANA Cloud is covered in Chapter 2. Table 8.2 provides an overview for the different cloud editions; there are features and functions added an enhanced with each quarterly release. The 1608 version included line of business (LoB) solutions as part of SAP S/4HANA Enterprise Management Cloud.

	SAP S/4HANA Enterprise Management Cloud	SAP S/4HANA Professional Services Cloud	SAP S/4HANA Marketing Cloud
Features	Edition for main ERP scenarios: • Streamlined procure-to-pay • Accelerated plan-to-product • Optimized order-to-cash • Manufacturing (production planning and execution) • HR connectivity • Core finance	Edition for the professional services industry: • Project services • Streamlined procure-to-pay • Sales order processing • Various analytics • Core human resources • Core finance (subset of SAP S/4HANA	Edition for the marketing line of business now full scope of SAP Hybris Marketing: • Consumer and customer • Analytics and segmentation • Campaign management • Marketing recommendation, planning, and executive dashboard

		Enterprise Management Cloud)	
Features (Cont.)	• Project services • Advanced ATP • Contains LoB cloud solutions		• Offer management with loyalty
Countries supported	17 supported country versions	US, DE, AU, CA, CN, UK, HU, NL, SG, BE	Country independent
Languages	EN, DE, FR, ES, RU, CN, JA, PT, NL, HU	EN, DE, FR, ES, RU, CN, JA, PT, NL, HU	EN, DE, FR, ES, RU, CN, JA, PT, NL, HU
Integrations	SAP Ariba, SAP Hybris, SAP Hybris Cloud for Customer, and SAP SuccessFactors	SAP Ariba and SAP SuccessFactors	SAP Hybris, SAP Hybris Cloud for Customer

Table 8.2 Overview of SAP S/4HANA Cloud Features

Note

More details regarding the features for each release can be found at *http://help.sap.com/s4hana*.

However, before we discuss the private and public cloud options in detail, let's first take a look at some items you should consider before deciding if your landscape and your business are ready for SAP S/4HANA Cloud.

Initial Considerations

You may start by asking yourself the following questions:

- Are all types of workload cloud ready?

- How do we analyze the workload to check for cloud readiness?

There are methods to analyze the workload that cloud providers such as IBM or Microsoft can use to help organizations determine the feasibility. Some of the examples of the workload traits that determine their readiness for cloud adoption are shown in Table 8.3.

Not Ready for Cloud	Possibly Ready for Cloud	Ready for Cloud
- Sensitive data - High degree of customization - Not virtualized software - Complex processes and transactions - Regulatory constraints - Complex software licensing - Tight integration with other on-premise systems	- Information intensive - Isolated workloads - Mature workloads - Non-production systems - Batch processing	- Analytics - Infrastructure storage - Industry applications - Disaster recovery - Development, test, and training environments - Infrastructure compute - Business processes (e.g., CRM, HR, etc.) - Industry vertical application - Web hosted apps - Collaboration - Office applications

Table 8.3   Workload Cloud Readiness Analysis Sample

What about cloud adoption for SAP ERP, which is, for many organizations, the core transactional system supporting mission-critical

business processes? Enterprise software such as SAP ERP is often at the core of the organization's business processes. Although these solutions don't see the type of seasonal variability experienced by other solutions, such as e-commerce sites, there are still demands for periodic scalability (e.g., testing environment for a project duration). Many of the other business drivers also hold good for these ERP solutions. There are some additional factors as shown in Figure 8.4, which show how the standard non-differentiating processes can be moved to the cloud while differentiating solutions requiring heavy customization stays on-premise or in a private cloud. The other influencing factor is the regulatory compliance applicable for the organization, including country-specific rules.

The trend shows quite a move toward a hybrid adoption pattern for solutions such as SAP ERP. Before we discuss the hybrid model, however, we need to look at both the private and public cloud.
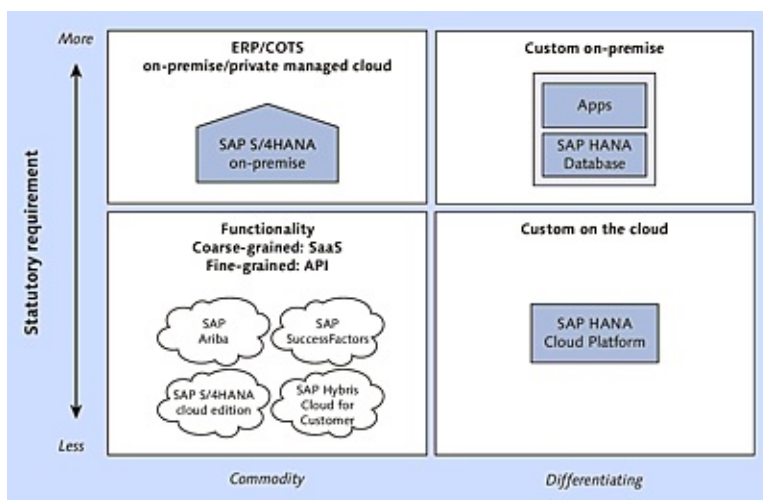
Figure 8.4 Cloud Decision Influencers for SAP ERP Solutions

Private Cloud

The advantages of private cloud deployment are as follows:

- The same level of security is used as with on-premise because the environment is set up only for one customer and isn't shared.

- While initial investment is required to build the infrastructure, the advantage is in the ability to effectively use that infrastructure (e.g., rapid provisioning, etc.) and reuse existing hardware.

- This is a good option especially for an IT landscape that has a large number of systems and requires high-volume transactions with close integration with other systems.

- A few partners, such as IBM and HP, offer services to build a private cloud environment.

From an SAP S/4HANA perspective, this is just different model, but the same rules apply as for on-premise. In addition, the private cloud needs to use SAP-supported hardware and supported virtualization techniques.

Public Cloud

The advantages of a public cloud deployment are as follows:

- Cost savings is one of the major advantages for the public cloud option. There's no need to invest on infrastructure, and no upfront initial investment for capital expenditure (capex) is required; rather, it's a pay-for-usage model.

- This is a good model for all customers (even startups or individuals) unless there are other concerns or constraints as mentioned earlier.

- Many public cloud offerings are available for SAP S/4HANA from SAP as well as partners such as IBM, Amazon Web Services (AWS), and Microsoft Azure.

From the SAP S/4HANA point of view, the cloud service needs to have official support status from SAP. From an overall perspective, however, the management requirement for the cloud infrastructure, the customer's responsibility, and the cloud vendor's responsibility should be clearly determined.

8.2.3 Hybrid Model

As mentioned earlier, all workloads aren't the right fit for the cloud. More often than not, organizations have to take a middle path and choose a hybrid model to optimize the cost and time benefits versus other considerations. In addition, while an organization can have a road map to take all the applications to cloud, this can be a multiyear journey.

For SAP S/4HANA adoption for cloud, some organizations want to have the nonproduction on the cloud but the production on-premise. For some others, they want their SAP Business Warehouse (SAP BW) on the SAP HANA system in the cloud but want their SAP S/4HANA either on-premise or on a private cloud because critical business processes may have responsiveness requirements that need a data center in a physically closer location or may require a high-bandwidth connectivity. This will have a cost implication and may act as a deterrent to be on the cloud. Figure 8.5 shows examples of the different scenarios where the environments of an SAP solution can be deployed all on-premise, on the cloud, or using a hybrid model.
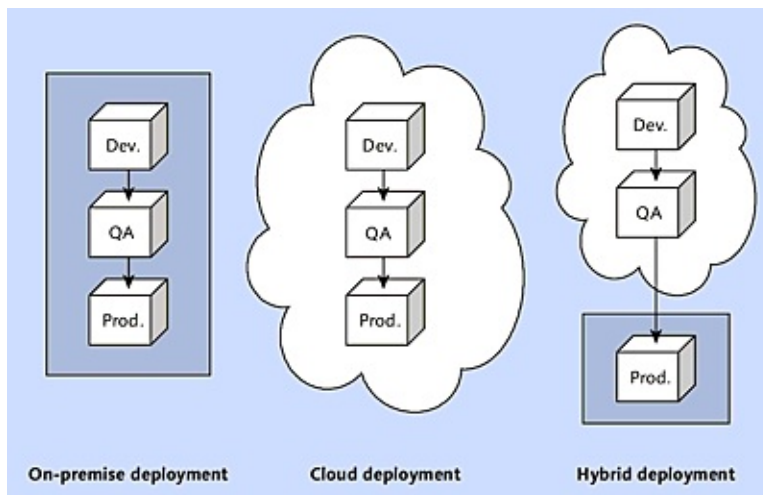
Figure 8.5   Example of a Hybrid Cloud Scenario

There can be several other use cases for hybrid cloud scenarios. The following list is a representative set and not exhaustive:

- Integration of legacy and new landscape

- Have the systems of engagement on the cloud while the system of record remains on premise, for example, SAP Fiori or SAP Gateway on SAP HANA Cloud Platform, which connects to a backend SAP S/4HANA, on-premise

- Offload the variable load, for example, a testing server or an upgrade project requiring a parallel landscape to the cloud

- For a IT landscape with multiple SAP instances, the smaller instances (which should be closer to standard SAP solutions) can move to SAP S/4HANA Cloud, while larger ones with more customization can be on-premise. There can be several such combinations of the two-tier ERP landscape, including the possibility to combine SAP S/4HANA solutions and non-SAP HANA SAP ERP solutions.

8.3   Cloud Vendor

The IT division of an organization that is adopting SAP S/4HANA needs to have an overall understanding of the business requirements. This understanding will lead to choosing the type of cloud adoption (private, public, or hybrid with cloud and on-premise) and the SAP HANA-based products that need to be deployed together with SAP S/4HANA, now or in the near future. These decisions will give the IT department an idea of what to look for in the cloud vendor. A single service provider might offer a business-centric SLA that is flexible, simple, and cost effective, with an ability to respond to growth opportunities. Some of the major factors that must be kept in mind while choosing the cloud vendor are as follows:

- **Security, privacy, and compliance**
  Infrastructure should meet industry compliance like ISO 20000, 270001 and 9001, TIA Tire III, SOC1 (SSAE-16), and PCI DSS compliant. You should feel confident that you can trust the cloud provide with your data.

- **Global presence**
  Look for data centers and network points of presence (POP) of the cloud vendor across the globe for full control over data sovereignty and to minimise latency.

- **Scalability**
  A more scalable environment designed specifically for enterprise use with the ability to help better secure client customized images and instances. Robust portfolio of time-tested, enterprise-class solutions including software, hardware and services.

- **Reliability and high-availability**
  Infrastructure should have redundancy and reliability built in, meaning that you are protected from the most common causes of application outage.

- **Support and service**

You should find out what support and services are before selecting a vendor. If you need extra support and services from vendors in order to make sure the enterprise technology solutions run well, this should be taken into consideration.

- **Cost effective**

  Cloud services as OPEX makes infrastructure costs more predictable and offers organizations better cost control. Look for cost effective, always-on instances, with the flexibility to spin up more as and when need.

- **Thought leadership**

  The cloud vendor should architect and provide offerings based on IT Infrastructure Library (ITIL) best practices and industry-leading migration services to facilitate client transformation to cloud. The vendor should have expertise and best practices managing and operating security-rich enterprise data centers around the world.

There are some additional aspects that can be considered as well. Accelerators will help provide the required instances faster. For example, SAP HANA Enterprise Cloud, SAP's private cloud solution, has APIs and other integration adapters that help connect with on-premise SAP systems. SAP also has System Landscape Optimization (SLO) services for data migration to the cloud.

IBM has startup bundles/packages for SAP S/4HANA that enable clients to quickly get SAP HANA proof of concept (PoC) and test environments up and running in the IBM Cloud. Setting up the PoC instance can be done quickly, in as little as three days. SAP also provides PoC environments on their public cloud for an SAP S/4HANA trial or demo through the SAP Cloud Application Library (*sap.cal.com*).

8.4   Integration

The IT landscape with SAP HANA is typically a hybrid one, with some components on the cloud, possibly some cloud-based SaaS solutions, and some on-premise components. There might be different deployment options for the different environments as well. Business processes can run between the SAP S/4HANA core and other solutions such as the SaaS-based SAP SuccessFactors, SAP Hybris, SAP Hybris Cloud for Customer, and so on.

Thus, one of the challenges in this kind of environment is the integration aspect. Depending on the use case, multiple integration technology requirements might be in use. The different integration scenarios in a typical hybrid cloud landscape are shown in Figure 8.6.
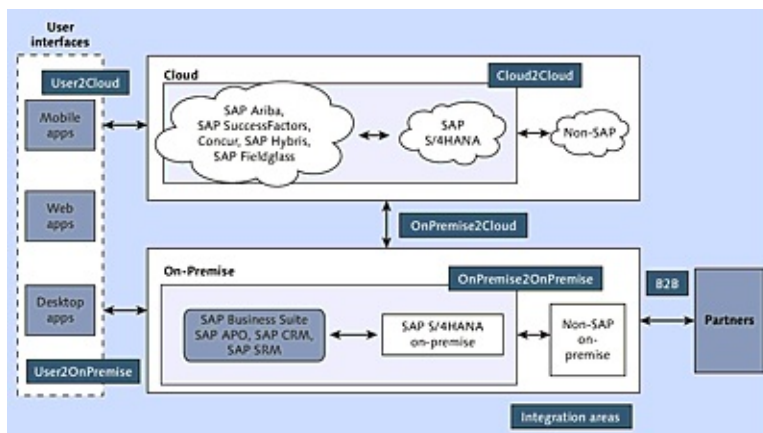
Figure 8.6   Integration Scenarios for SAP S/4HANA

For SAP S/4HANA Cloud, the required customer integration scenarios are deployed, configured, and activated in the cloud instances provisioned by SAP, or SAP provides self-configuration UIs so customers can configure the solution. The content is integrated with SAP cloud solutions such as SAP SuccessFactors Employee Central, SAP Ariba, SAP Hybris Marketing, SAP Jam, and SAP Financial Services Network, as well as third-party integration with Vertex for tax calculation. If there is a requirement to build new integration scenarios, SAP HANA Cloud

Platform provides the extension platform for SAP S/4HANA where new capabilities of integration can be created using the whitelisted APIs.

SAP S/4HANA, on premise edition, hosted on-premise or on a cloud platform such as the SAP HANA Enterprise Cloud, can be integrated with SAP's cloud solutions through standard integration content delivered by SAP either through SAP Process Orchestration (SAP PO) or SAP HANA Cloud Integration. SAP HANA Cloud Integration is SAP's cloud integration middleware and is a SaaS product. Any other integration tool provided by a third party can also be used if they have the right kind of connectors for on-premise-to-cloud and cloud-to-cloud integration. For example, Dell Boomi can connect to several SaaS products like SAP SuccessFactors or Salesforce to SAP. Prior to SAP S/4HANA 1511, the integration components required for the S/4HANA system had to be installed as add-ons. SAP S/4HANA 1610 contains the integration components for many of the cloud solutions like SAP Ariba and Concur.

Web Services or OData services enabled through SAP Gateway can also be used for integration. Some of the integration can be using Rest API calls from S/4HANA to the cloud solutions like Concur so that both for getting data from that solution or into the solution, is initiated from S/4HANA. For data movements, SAP Data Services, SAP Landscape Transformation (SAP LT), or SAP HANA smart data integration (SDI) can be used.

8.5   Summary

In this chapter, we talked about the cloud imperatives and how they are applied to the SAP environment. We covered the various deployment options for the two different editions or flavors of the SAP S/4HANA product.

When deciding on the flavor of SAP S/4HANA, especially the cloud deployment, you must keep in mind how it relates to the greater scheme of the IT landscape and IT strategy, as well as how it relates to the other SAP HANA products already in the landscape or in the adoption road map. Migration services to facilitate client transformation to the cloud also need to be considered to migrate current landscapes seamlessly on the cloud space. There are many variables to consider when choosing the right deployment strategy, but this should ideally be looked at from a business perspective as well as an IT perspective to achieve immediate and long-term business goals.

In Chapter 9, we will take a look at the options for adopting SAP S/4HANA, from all-new implementations to migration approaches.

SAP has introduced a lot of uncertainty into the marketplace, and SAP customers are wondering what path to adopt. Although the move to SAP HANA is no longer associated with, if customers should go but more when they should go, the level of complexity around how to get there remains.

9 Adopting SAP S/4HANA

With the release of SAP S/4HANA, SAP is providing a digital core to leverage the latest technologies ranging from big data and analytics to integration with cloud applications. SAP aims to improve user experience (UX) by increasing the use of mobile applications with simplified user interfaces (UIs) based on SAP Fiori. This transformation, with SAP S/4HANA as the digital core, integrates with the latest technologies, such as the Internet of Things (IoT), to fundamentally change the way we do business today.

In this chapter, we'll help you map out your deployment path, including the technical steps and associated restrictions. We'll help you determine whether a new installation or a system conversion is the right option for you and provide additional information regarding the steps you may be able to take today to get ready for SAP S/4HANA.

This chapter outlines the technical steps for adopting SAP S/4HANA. Due to the impact of digital transformation on the global IT market, every organization that uses SAP should be considering an SAP HANA implementation strategy. Moving to SAP S/4HANA is the foundation of digital transformation, but this transformation can be confusing and disruptive. With different transformation paths to SAP S/4HANA (see

), defining your own SAP S/4HANA transformation strategy is critical for success.

Which of the three transformation options you choose—system conversion, landscape transformation, or new implementation—will depend on your objectives. The following three elements will influence your decision:

- What is your starting point? Is this an SAP or non-SAP system?

- What pain points are you trying to address with SAP S/4HANA?

- What time to value do you need? How quickly do you need to benefit from the SAP S/4HANA solution?
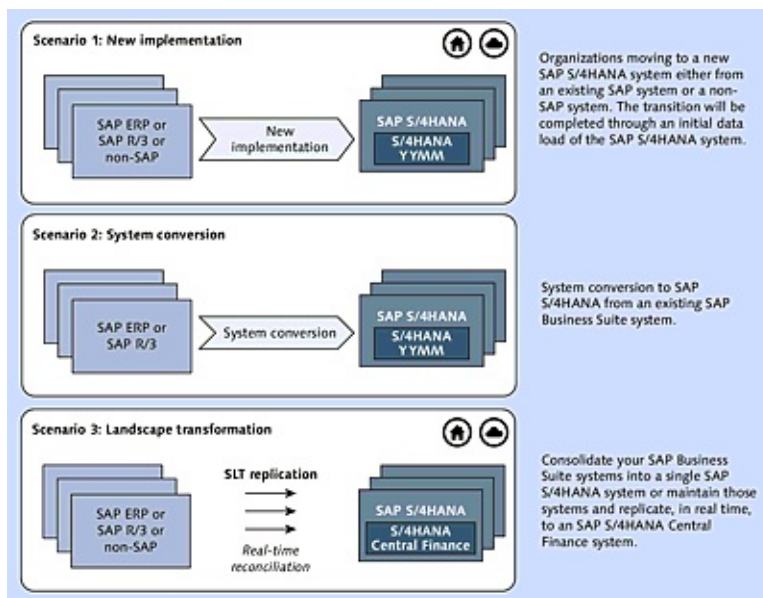
Figure 9.1   SAP S/4HANA Transformation from Current State

Throughout this chapter, we'll focus on the first two transformation options: a new implementation and a system conversion. We'll address the key technical and functional considerations to be taken into account before moving to SAP S/4HANA. You'll need to decide whether to convert your current SAP landscape to SAP S/4HANA or perform a new implementation that will consist of migrating your data from your legacy system to a new SAP S/4HANA system. Moving to SAP S/4HANA is an

opportunity to redefine and improve your current business processes. The new implementation adoption scenario may provide more flexibility to perform business process reengineering.

An alternative option is to deploy SAP S/4HANA as a Central Finance system, which allows you to centralize all your financial data into one system in real time. The source systems can be SAP or non-SAP systems. This scenario is ideal for SAP customers looking to centralize their finance functions but can't achieve standardization in their existing systems due to a lack of global governance.

Central Finance will provide you with a consolidated view leveraging the Universal Journal; however, currently, Central Finance replication is limited to the SAP General Ledger, with expansion expected in future releases. Central Finance also has a separate SAP S/4HANA license.

After looking into the adoption scenarios for new implementations and system conversions, we'll discuss some of the prerequisites and considerations prior to converting your SAP system to SAP S/4HANA, including an overview on the tools and techniques that are available to make your SAP S/4HANA transformation project a success.

9.1   New Implementation Options and Approach

A new implementation is one of the three options provided by SAP to move to SAP S/4HANA. This scenario is valid for existing SAP customers as well as new SAP customers. This scenario requires the implementation of a new SAP S/4HANA system with an initial data load.

As you learned in Chapter 8, there are two deployment options for new implementations: SAP S/4HANA on-premise or in the cloud. In this section, we'll only be looking at the SAP S/4HANA, on-premise edition, for new implementations. We'll start with a brief look at the Business Scenario Recommendations report, before providing you with some tips for getting started, performing sizing, and implementation.

9.1.1 Business Scenario Recommendations

The implementation of a new SAP S/4HANA system is the opportunity to reassess your business processes and identify where the simplifications provided by SAP S/4HANA can support your business objectives.

To understand the business benefits that are available when moving from an existing SAP system, you can leverage SAP's Business Scenario Recommendations (BSR) report. The detailed report output provides a set of recommendations for new simplified business scenarios as part of SAP S/4HANA, including benefits associated with the new SAP Fiori UX. It also provides recommendations on how you can benefit from the new SAP HANA in-memory platform to speed up your business transactions (see Figure 9.2).

This report runs using production usage statistics that allow SAP to provide a tailored output specific to your business and organization requirements.

If you're interested in running the BSR report, additional information is available at *https://www.s4hana.com*.
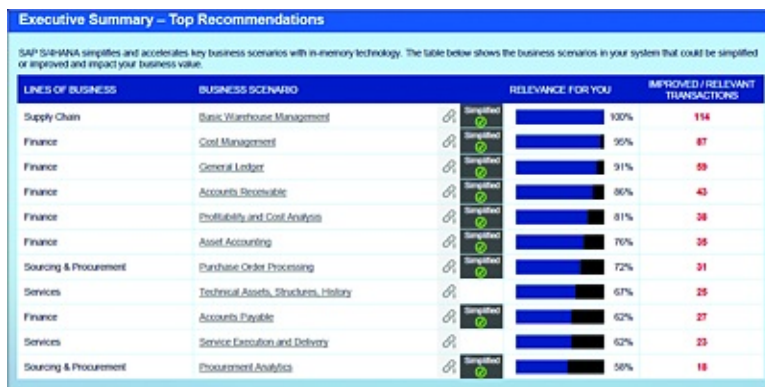
Figure 9.2   Sample Output from SAP Business Scenarios Recommendations

9.1.2 Getting Started

As with other SAP applications, SAP has made available installation guides for SAP S/4HANA that provide a list of the necessary tools and

documentation for your new installation. These guides also provide the follow-up activities required after the installation and, of course, a system landscape and product overview for the version of SAP S/4HANA you're planning to install. Access these guides at *http://help.sap.com/s4hana* to help support the installation process.

9.1.3   Sizing Requirements

Getting the sizing right for SAP HANA can be challenging. For those of you unfamiliar with the term, *sizing* refers to establishing the right hardware requirements for an SAP system, such as physical memory, I/O capacity, and CPU power. Getting this right is important to ensure that you can meet your business needs while trying to keep a low total cost of ownership (TCO). SAP provides the *Quick Sizer tool* to size SAP HANA correctly and ensure that the business requirements can be met after project go-live. Although the questions asked during the Quick Sizer assessment may seem time-consuming and sometimes excessive, it's important to complete all of these steps accurately to avoid future sizing issues during the production start. SAP also provides some sample configurations that can help define your SAP HANA sizing.

9.1.4   SAP S/4HANA Implementation Guidelines

Similar to other IT implementation projects, SAP S/4HANA implementation can be split into three main project phases:

1. **Plan**
   Plan the scope of the migration effort, and identify the key business scenarios.

2. **Install**
   Install the SAP HANA database and SAP S/4HANA application.

3. **Import**
   Import and migrate the data from the legacy environments.

The BSR can help identify the business scenarios and associated business case for SAP S/4HANA relevant to your organization; however, you should make a detailed assessment of the current business processes, the existing pain points, and areas of improvement through a series of workshops.

The output of these workshops will start to feed the target architecture required to support the SAP S/4HANA implementation. In addition, you'll start to understand the scope of data migration work that will be required to move the master and transactional data from your legacy systems to the new SAP S/4HANA environment.

Each organization will have a set of business requirements that need to be met following these workshops. Figure 9.3 provides an overview of how the SAP S/4HANA architecture should be set up to support these requirements. This will be true regardless of whether your goal is to improve the UX via SAP Fiori apps, to provide more flexibility for the workforce by leveraging SAP Mobile Platform (SMP), or even to enhance reporting requirements where the SAP HANA Core Data Services (CDS) views can be leveraged.
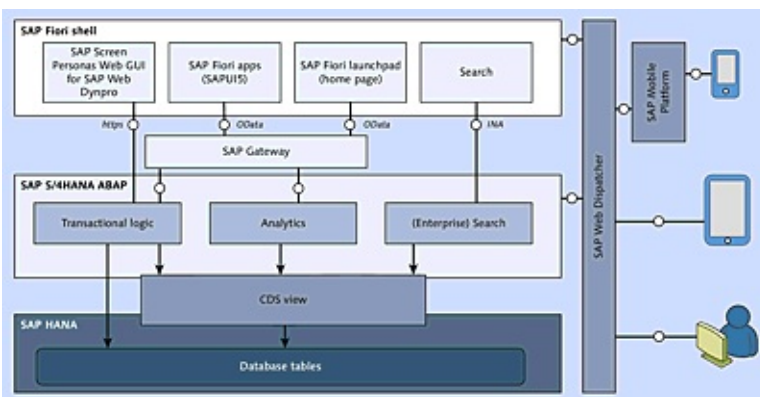
Figure 9.3　High-Level Stack Architecture of SAP S/4HANA

In addition to getting the architecture right, a key part of the new implementation will be defining the right data migration strategy to ensure that the data moved from the legacy system to the new SAP S/4HANA system is in good condition, that is, cleansed, relevant, and timely.

To accelerate the data migration process, SAP recommends using SAP Data Services for any data migration requirements to SAP S/4HANA. You can still use the Legacy System Migration Workbench (LSMW) tools to perform the migration, although these tools will no longer be enhanced or developed by SAP going forward.

SAP Data Services come with ready-made data migration templates that can be used to kick-start the data migration process. Additional cleansing functionality is also available to support business user review during the migration process. The loads can be simulated and take into account system field settings and configuration, allowing the data migration team to quickly identify issues without impacting the SAP system and having to reverse data out after it has been posted.

The SAP S/4HANA new implementation scenario is a good way to start from scratch, especially if you want to benefit from SAP S/4HANA functionalities while heavily reengineering your business processes. Alternatively, you may want to remove all the old custom code you've been carrying around for years and no longer use, or you may want to take the opportunity to realign your data governance and quality to leverage SAP S/4HANA as the core to your digital transformation journey.

However, if you've been heavily investing in the SAP ERP environment for many years or even recently implemented an SAP ERP environment that is fit for purpose, a new implementation may not be the right option. The SAP S/4HANA conversion scenario will be more suitable for your requirements, as you'll see in the following section.

9.2   System Conversion Options and Approach

This section addresses the conversion options and approach to SAP S/4HANA for organizations that are already using SAP and want to move from their classic SAP Business Suite system to SAP S/4HANA. The system conversion scenario is only applicable for SAP customers who are already using a previous SAP ERP version and want to move to on-premise SAP S/4HANA. It's not possible to perform a system conversion to SAP S/4HANA Cloud.

Note

The section assumes that a migration scenario is the logical progression for you. If you're considering a new implementation, refer to Section 9.1.

We'll cover the adoption road map based on your current starting point by taking into account the SAP system upgrade and conversion scenarios; what to expect from code HANA-tization, including SAP HANA code optimization; and how to perform the migration of data from the old data structures to the new simplified structures.

SAP provides a clear road map and sequence to move to SAP S/4HANA, on-premise edition, while adopting the system conversion transformation scenario (see Figure 9.4). Preparation is key when converting to SAP S/4HANA, and a set of tools and accelerators are available to download via SAP Notes to assess the impact of the move to SAP S/4HANA and determine whether this transformation scenario is an option for you. The tools and related SAP Notes are provided in Section 9.2.3. Given that some functionalities aren't currently supported, or are supported with restrictions, by SAP S/4HANA, a system conversion may not always be possible.
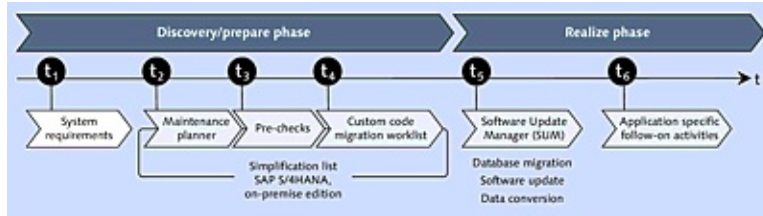
Figure 9.4   On-Premise SAP S/4HANA: System Conversion Sequence

9.2.1   Scenarios

Depending on your current SAP landscape, there are various SAP S/4HANA adoption scenarios for the on-premise edition. You may convert in one step from the following:

- SAP ERP 6.0 any EHP on a non-SAP HANA database

- SAP Business Suite powered by SAP HANA

We'll look at each of the adoption scenarios mentioned and evaluate the most suitable option based on your current starting point in the following sections.

9.2.2   Adoption Paths

Depending on your current landscape, a number of paths will help you get to an end state of SAP S/4HANA. However, it can be challenging to understand which conversion path is the correct one for your organization. Assuming a conversion scenario is the logical progression for customers who are running on SAP ERP 6.0 on any non-SAP HANA database, the objective is to move to either SAP Business Suite on SAP HANA or SAP S/4HANA.

For SAP customers who decide to move to SAP Business Suite on SAP HANA as an interim step, enabling the SAP S/4HANA innovations, such as SAP S/4HANA Finance or SAP S/4HANA's logistics functionality (e.g., SAP S/4HANA Material Management and Operations, discussed in Chapter 4) is the next step. Dependent on the existing SAP ERP version

in your SAP landscape, there are different approaches to perform the conversion from an SAP ERP 6.0 system running on a non-SAP HANA database to the SAP S/4HANA end state.

With the release of SAP S/4HANA 1605, SAP has created two SAP S/4HANA adoption paths (see Figure 9.5) for SAP customers. SAP S/4HANA Finance 1605 contains the finance-only simplifications, whereas SAP S/4HANA 1511 and 1610 contain the full SAP S/4HANA Enterprise Management solution. Please note that 1610 contains SAP S/4HANA Finance 1605 by default as part of its code line; SAP S/4HANA 1511 does not.
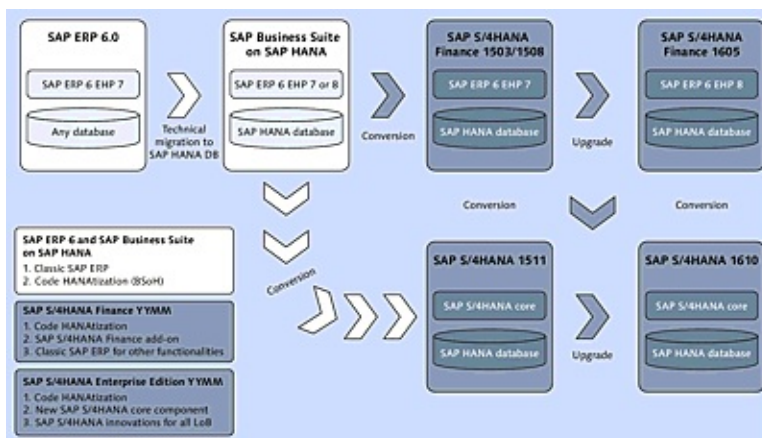
Figure 9.5 System Conversion Scenarios for SAP S/4HANA

SAP S/4HANA Finance 1605 is an enhancement of the previous SAP S/4HANA Finance version 1503. Although SAP S/4HANA 1605 was released after SAP S/4HANA 1511, it's not possible to move from SAP S/4HANA 1511 to SAP S/4HANA Finance 1605.

- SAP S/4HANA Finance (versions 1503 and 1605)
- SAP S/4HANA Enterprise Management (version 1511 and version 1610)

Based on the business case, your organization will need to assess whether SAP S/4HANA Finance or SAP S/4HANA Enterprise Management is the right option. SAP S/4HANA Finance can be used as a

stepping stone to benefit from some of the SAP S/4HANA functionality while reducing the change impact associated with the overall move to SAP S/4HANA Enterprise Management. Although this may seem like an attractive approach, SAP customers that are looking to benefit from the SAP S/4HANA's logistics functionality and the other SAP S/4HANA simplifications in the near future will still have to undertake a second system conversion to benefit from these features.

With all of these different scenarios, it's hard to define which option may be best for you. The decision will need to be backed by a business case, but if you're currently running SAP ERP 6.0, it's technically possible to migrate in one step to SAP S/4HANA, assuming the downtime window is acceptable for your organization.

The following subsections describe the two most common system conversion options available based on the SAP ERP release you are currently running on: two-step approach and one-step approach.

Two-Step Approach: Source Release Lower Than SAP ERP 6.0 on Any Database

If you're currently running your SAP ERP environment on a version lower than SAP ERP 6.0, and you want to pursue the system conversion route, you'll need to upgrade your existing SAP system to a release that will allow you to perform the system conversion, in one step, using the Database Migration Option (DMO) of Software Update Manager (SUM). If your SAP system isn't yet Unicode compatible, you can perform the Unicode conversion as part of the first upgrade phase because this is mandatory requirement to migrate to SAP S/4HANA.

You can perform the Unicode conversion at a later stage, however, if your target SAP S/4HANA version will be running on AS ABAP 7.5, the DMO won't be able to handle the Unicode conversion at the same time.

Therefore, you should complete the Unicode conversion as early as possible.

The recommended target version for the first step in a two-step approach is to move to SAP ERP 6.0 EHP 7 or above and perform the Unicode conversion at the same time. If you have a non-Unicode system, it isn't possible to move directly to SAP ERP 6.0 EHP 8, given that EHP 8 runs on SAP NetWeaver 7.5, and the system requires a Unicode source system, as previously mentioned.

One-Step Approach: Source Release SAP ERP 6.0 or Higher on Any Database

If your SAP system currently runs on SAP ERP 6.0, performing the EHP upgrade and the technical database migration to SAP HANA can be combined, again assuming the downtime window is acceptable for the business.

If the downtime window isn't achievable, you should consider downtime optimization. Various options are detailed in Section 9.6. The alternative option is to separate these two activities. As a first step, you can perform the upgrade and SAP HANA database migration by taking your current SAP ERP system to SAP Business Suite on SAP HANA.

The second activity consists of converting your system from SAP Business Suite on SAP HANA to SAP S/4HANA. This activity transfers your data from the old data structures to the new simplified structures, allowing your organization to benefit from the new simplified processes available within SAP S/4HANA. A small upgrade is also included as part of the system conversion.

9.2.3   Tools for System Conversion

The conversion to SAP S/4HANA is split into two main areas (see [Figure 9.6](#)):

- The technical conversion that consists of installing the new SAP software and/or migrating to the SAP HANA database

- The functional conversion that requires a clear understanding of the simplification list, performing the conversion pre-checks, and assessing the impact that SAP S/4HANA may have on your custom code and enhancements.

In this section, we'll look at how these tools can support the conversion and what outputs they provide.
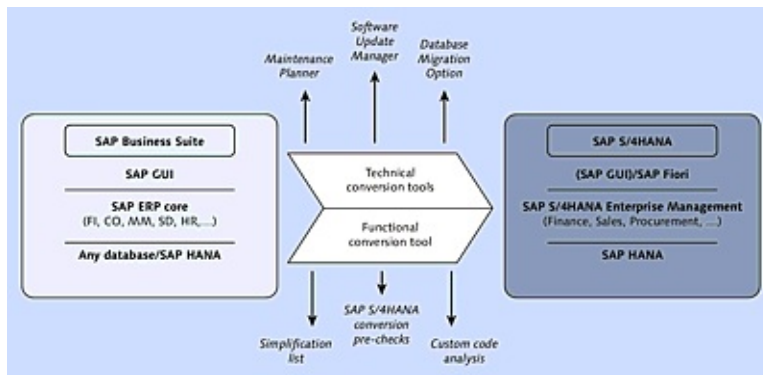
Figure 9.6   System Conversion Tasks for SAP S/4HANA

Technical Conversion Tools

SAP has been supporting its system upgrades and migrations for many years. This has given them the opportunity to build a well-established set of tools to support these types of transformation projects. Although SAP S/4HANA introduces additional complexity associated with the simplifications introduced with the new code line, the technical migration remains fairly straightforward and relies on tools that many of you have used in the past.

Maintenance Planner

Most SAP technical architects or Basis consultants are familiar with SAP's Maintenance Optimizer; however, this is no longer directly used for the system conversions to SAP S/4HANA. Maintenance planner is now the prerequisite to executing the system conversion to SAP S/4HANA.

The maintenance planner is the successor of Maintenance Optimizer and is hosted by SAP to help SAP customers manage their landscape transformation changes. The maintenance planner also generates the stack XML that used to be obtained via the Maintenance Optimizer.

Before the conversion to SAP S/4HANA starts, the maintenance planner checks the system with regard to add-ons, business functions, or even industry solutions. If any restrictions are identified, the maintenance planner stops the conversion from moving ahead. You don't have to wait to start the system conversion project before running the maintenance planner. This should be run as part of the preparation phase to identify any issues as early as possible. Any remediation items can be managed before the SAP S/4HANA conversion project starts, if the system conversion is still a viable option based on the results provided.

Software Update Manager

Similar to SAP upgrades, SUM is used in the conversion to SAP S/4HANA, on-premise edition. As you'll see in Section 9.3.2, the latest version of SUM must be used.

You'll need to run the maintenance planner before running SUM, as explained in the previous section.

Database Migration Option

For those of you already familiar with SAP Business Suite on SAP HANA and have already undertaken the migration to an SAP HANA database, DMO will be familiar.

DMO is what allows SAP customers to move from SAP ERP 6.0 to SAP S/4HANA in one step. In combination with SUM, DMO performs the database migration from any database to SAP HANA. The combination of both tools is referred to as the DMO of SUM.

The DMO of SUM will be used for SAP customers moving to SAP S/4HANA who are running SAP ERP 6.0 on any database. For SAP customers who are already using SAP Business Suite on an SAP HANA database, only SUM is required to move to SAP S/4HANA.

The technical conversion is only one part of the overall conversion process that is required as part of the SAP S/4HANA conversion journey. Additional functional checks must be completed to assess the impact of the new SAP S/4HANA code line and simplifications items on your existing SAP environment.

Functional Conversion Tools

This is the area where the conversion becomes challenging, but SAP has made good progress and provides additional tool sets to support the SAP S/4HANA conversion. Although multiple tools are available, don't underestimate the time and effort required to get the solution right. Multiple challenges can be expected along the way.

Planning is key to a successful SAP S/4HANA conversion, and the following tools below can help get you started at an early stage.

Simplification List for SAP S/4HANA

The *simplification list* is a document provided by SAP that helps SAP customers understand the impact of the simplifications associated with SAP S/4HANA. Hence, the simplification list facilitates the planning and effort estimation associated with an SAP S/4HANA conversion project.

In this list, SAP describes the functional impact that SAP S/4HANA has on the individual transactions and the associated solutions. In certain cases, solutions may have been merged or simplified with a new architecture compared to the source systems from which you're performing the conversion.

The document also provides a set of recommendations on how to adjust your custom code based on a series of SAP Notes provided within the document.

Prechecks for SAP S/4HANA

As part of the system conversion, SUM runs a set of prechecks to ensure that all the activities required to convert to SAP S/4HANA have been completed. If any activities haven't been carried out, SUM stops the conversion process.

To provide additional time and flexibility to carry out these prechecks, SAP has provided the precheck report as a standalone executable that you can complete prior to starting the SAP S/4HANA conversion. Again, similar to the simplification list, this report helps plan the activities and efforts associated with the move to SAP S/4HANA.

Note

Report R_S4_PRE_TRANSITION_CHECKS is available within SAP Note 2182725 (S4TC Delivery of the SAP S/4HANA System Conversion Checks). This SAP Note needs to be implemented in your source system, as well as the SAP Notes mentioned in the manual activities of the same document.

You can run the report as often as needed in simulation mode without creating any logs. With the simulation mode inactive, the report logs are saved in the application log and can be displayed at a later stage if required. Figure 9.7 provides a sample output of SAP precheck report R_S4_PRE_TRANSITION_CHECKS. At this point, you analyze the output and take action accordingly. The green lights (squares) don't require any specific action, but you must address red lights (circles) before moving forward with the SAP S/4HANA conversion.
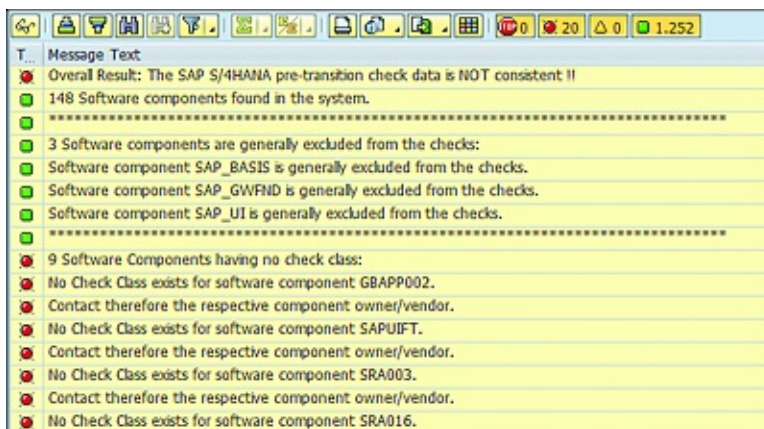
Figure 9.7 Sample Output for Report R_S4_PRE_TRANSITION_CHECKS

After you've addressed all the precheck issues, you can move ahead with the conversion to SAP S/4HANA.

Simplification Database for SAP S/4HANA

With the release of SAP S/4HANA 1511, SAP has created the *simplification database*, which is based on the same concept as the simplification list. The simplification database will be updated for each

SAP S/4HANA Enterprise Management version (e.g., SAP S/4HANA 1610). The simplification database helps identify the simplification impact SAP S/4HANA has on the existing custom code running in your system.

The simplifications are downloaded in a ZIP file from the SAP Marketplace and need to be imported into an SAP NetWeaver 7.5 system.

Note

Information on how to download the simplification database is available in SAP Note 2241080 (Custom Code Check Content for SAP S/4HANA, On-Premise Edition).

To understand how these simplification items impact your existing SAP system, an extraction of your custom code is required in the source system that you plan to convert to SAP S/4HANA.

After the custom code extraction program has been run, the ZIP files generated from the output need to be loaded into the SAP NetWeaver 7.5 evaluation system where you previously imported the simplification database.

When the load is complete, report SYCM allows you to select the ZIP file that contains the extract of your custom code and run this against the simplification database. An example of the extraction process and output is shown in Figure 9.8.

The output of the report is also referred to as the *custom code migration worklist*.
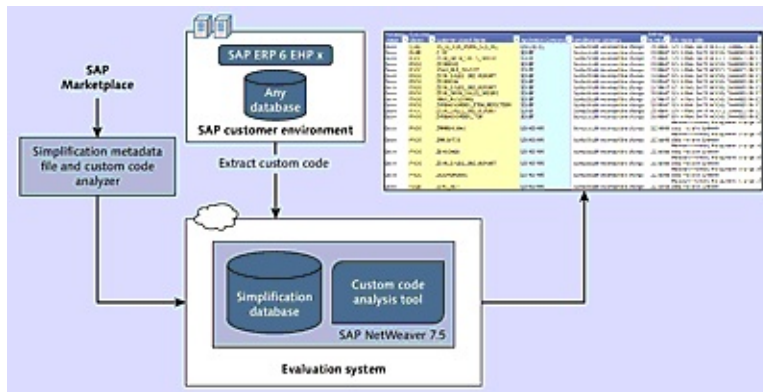
Figure 9.8 SAP S/4HANA Custom Code Migration Worklist

Similar to the simplification list, the output from the custom code migration worklist report will provide you with a series of SAP Notes explaining how to adjust your custom code. In addition, drilldown functionality is available to analyze which code line is impacted in the custom program and which functional area the simplification is associated to. This list of tools will help you understand the impact of SAP S/4HANA on your custom code but won't replace areas covered as part of the Code Inspector, which we'll discuss in the following section regarding code remediation, HANA-tization, and optimization.

9.2.4 Code Remediation, HANA-tization, and Optimization

As part of the move to SAP S/4HANA, code adjustments will be required; the amount of adjustments will vary based on the volume of custom code and the source version you're converting from. These code adjustments fall into three main categories: code remediation, code HANA-tization, and code optimization.

Code remediation is required following an SAP upgrade. The upgrade contains code changes and introduces new functionality that can impact the existing ABAP code in your SAP system. Certain features may also become obsolete and may need to be replaced as part of the code remediation process.

Standard SAP code should work as normal; however, custom code may need to be remediated to ensure that it's still working as expected. Code remediation may be required due to additional fields added in a primary key of a table associated with a sequence of screen changes in a batch data communication (BDC) program, obsolete function modules, or even prior changes to SAP programs using access keys that conflict with the new upgrade code.

Similar to SAP upgrades in the past, adjustments with Transaction SPDD and Transaction SPAU will also be required as part of your move to SAP S/4HANA. The adjustments are required when existing SAP standard objects are overwritten with the objects delivered as part of the higher SAP version you're converting to. During the SAP S/4HANA conversion, the developer responsible for the code remediation adjustments can decide, in agreement with the business, to retain or overwrite the objects based on any adjustments that may have been made in the previous SAP releases.

As mentioned, these adjustments are split into two categories: Transaction SPDD and Transaction SPAU. Transaction SPDD adjustments refer to the list of all modified Data Dictionary (DDIC) objects, tables, data elements, and so on. Any adjustments required to these objects can be addressed within Transaction SPDD.

Transaction SPAU adjustments refer to note corrections and modification with or without the modification assistant. The developer needs to decide whether to adopt these modifications or reset them to the original statuses. All objects then need to be activated after the change.

Whether you're running SAP Business Suite on SAP HANA or SAP S/4HANA, an additional type of adjustment is required to allow the ABAP code to run on the SAP HANA database. This is referred to as code HANA-tization and is required to make sure the code is compatible with the SAP HANA database. Previously, most of the code that consumed a lot of the system resources was managed within the application layer.

However, to benefit from the in-memory architecture available within the SAP HANA database, the code needs to be adjusted.

With the conversion to SAP S/4HANA, the ABAP code adjustments can be split into two categories:

- **HANA-tization**
  Represents the mandatory adjustments required to run the existing ABAP code on an SAP HANA database.

- **Code optimization**
  Refers to the modification in the ABAP code to make it optimal and run faster to benefit from the SAP HANA functionalities. SAP HANA code optimization leverages items such as SAP HANA modeling with code pushdown that delegates the data-intense calculations to the database layer.

SAP provides a set of standard tools to help with code analysis for HANA-tization. The Code Inspector (see Figure 9.9) and ABAP Test Cockpit identify the existing SAP code that needs to be HANA-tized. SAP provides a set of variants within these tools that help identify the mandatory requirements associated with code HANA-tization.

The Code Inspector performs the code analysis based on the selected variant that contains the list of SAP development objects. The CHECK VARIANT area of the screen contains the information to perform the analysis, for example, "FUNCTIONAL_DB" in the NAME field in Figure 9.9. The OBJECT SET area defines the ABAP objects where the HANA-tization inspection needs to be performed.

Note

You should use the FUNCTIONAL_DB variant in the Code Inspector. This check variant is delivered with SAP Note 1935918 (Downport Code Inspector Check Variants for HANA Migration), and it helps initiate the HANA-tization process.

Figure 9.9 SAP Code Inspector Screen Selection

The FUNCTIONAL_DB variant contains checks that are mandatory for the analysis of ABAP custom code required as part of the move to SAP HANA.

The HANA-tization requirements are classified into seven categories: Native SQL, database hints, location of ABAP Database Connectivity (ADBC) usages, location of special ABAP Dictionary function modules, database operations on pool and cluster tables, problematic SELECT/OPEN CURSOR by statements and depooling/declustering, and location of non-robust ABAP code. A few examples of these categories are described in detail in the following list:

- **Native SQL**
  Native SQL refers to the custom code that uses Native SQL statements specific to an underlying database. Native SQL bypasses the synchronization of the SAP table buffers and can potentially cause data inconsistencies. An example of a native SQL statement is given in Listing 9.1.

```
EXEC SQL
  SELECT WERKS,ALAND,WKREG,WKCOU
    INTO :w_vbrp
    FROM vbrp
  WHERE VBELN = :lv_vblen
ENDEXEC.
```

Listing 9.1 Example of a Native SQL statement

The adjustments for Native SQL as part of the HANA-tization process means that they have to be rewritten as Open SQL in ABAP. These corrections can be made either before or during the migration project to the SAP HANA database.

- **Database hints**
  Database hints contain specific database code. In <u>Figure 9.10</u>, the database hint refers to an Oracle database and should only be used in exceptional cases. This can force the underlying database to work in a way different from what is expected as part of the standard SAP functionality.

```
215          where a~buffered   = 'X'
216            and b~ddlanguage = 'EN'
217            and c~fieldname  = 'CLIENT'
218      %_hints oracle 'merge join'.
```

Figure 9.10 Example of a Database Oracle Hint

The adjustments for database hints are straightforward. These can be commented out, but this activity can only be completed after the migration to SAP Business Suite on SAP HANA or after SAP S/4HANA has been completed.

- **Database operations on pool and cluster tables**
  Database operations on pool and cluster tables refers to the ABAP code having direct access to the physical pool. After depooling/declustering, these accesses become hard errors. An example of a database operation on pool and cluster tables is shown in <u>Figure 9.11</u>. After depooling/declustering is complete, the logical table is converted to a transparent table; however, the physical pool or

cluster is still there but remains empty. This allows you to benefit from the SAP HANA analytical capabilities.

```
42
43    * 3. DOKCLU
44          DELETE from DOKCLU
45            WHERE  ID = 'TX'
46                AND  OBJECT = 'ZLOGIN_SCREEN_INFO'
47                AND  LANGU = 'E' AND TYP = 'E'.
48
```

Figure 9.11   Example of Database Operation on a Pool and Cluster Table (Table Clusters)

Per SAP's ABAP best practices, database operations should be avoided on these physical tables but not on logical tables.
The adjustments for database operations on pool and cluster tables require a rewrite of the code avoiding database operations. These corrections can be completed prior to the SAP HANA migration start.

- **Problematic by statements and depooling/declustering**
  Depooling/declustering requires a search for SELECT and OPEN CURSOR statements for pool or cluster tables where no ORDER BY clause is specified. This becomes an issue when the order of the returned database entries changes if the database table is modified into a transparent table. An example of a depooling/declustering is shown in Figure 9.12.

```
65          SELECT * FROM MSKU into table it_msku
66              WHERE MATNR = MATNR
67              AND    KUNNR = KUNNR
68              AND    SOBKZ = KONSIKUNDE.
69      elseif werks ne ' ' and matnr eq ' '.
```

Figure 9.12   Example of Depooling/Declustering

Per SAP's ABAP best practices, results should be sorted when the result is stored manually in an internal table. These corrections can be done prior to the start of the SAP HANA migration.

In the previous examples, we've captured a few areas that require adjustments to run on the SAP HANA database platform. These issues

will be flagged by the Code Inspector and classified into three categories (see [Figure 9.13](#)):

- Errors (red)

- Warnings (yellow)

- Information (green)

Tests	Error	Warn...	Infor...
List of Checks	94	97	1320
Security Checks	0	0	0
Robust Programming	94	97	1320
Search DB Operations in Pool/Cluster Tables	0	0	0
Search problematic statements for result of SELECT/OPEN CURSOR without ORDER BY	94	97	1320
Errors	94	0	0
Warnings	0	97	0
Information	0	0	1320
Search Functs.	0	0	0

Figure 9.13   Sample of SAP Code Inspector Output

Sometimes these modifications will be mandatory, such as the errors in [Figure 9.13](#), whereas others will just be recommendations.

For the SAP conversion scenarios described in [Section 9.2.1](#), modernization and optimization of the remaining custom code is a separate activity, possibly driven by other business change requirements or transformational requirements. For new implementations, SAP S/4HANA-enabled custom code is the default.

Note

For SAP HANA code remediation best practices and considerations, additional information can be found in SAP Note 1912445 (ABAP Custom Code Migration for SAP HANA - Recommendations and Code Inspector Variants for SAP HANA Migration).

9.2.5   Application-Specific Conversion Steps

In addition to the assessments that are completed with the simplification list, the simplification database, and the SAP S/4HANA prechecks, some

application-specific conversion activities are required to complete the data conversion to SAP S/4HANA after the installation of the software.

The activities required for each of these applications will vary based on the target SAP S/4HANA version you're converting to. For example, if you're converting to SAP S/4HANA Finance 1605, only the FI activities will be required. The SAP S/4HANA finance and logistics activities will apply if you've decided to convert your system to SAP S/4HANA 1511 or SAP S/4HANA 1610.

SAP S/4HANA Finance Data Conversion

The SAP S/4HANA Finance data conversion process is tied closely to the overall SAP S/4HANA system conversion and can't be executed in isolation.

Prior to performing the application-specific follow-on activities, it's important to ensure that the steps already addressed in this chapter have been completed, as follows:

1. Complete the system prechecks to ensure that SAP S/4HANA Finance can be installed.

2. Execute the functional prechecks to ensure the completeness of the financial data.

3. Assess and perform any adjustments to custom programs that may be required to ensure a smooth execution of the finance function after go-live.

In addition to these checks, you must have completed the system reconciliation between the different finance applications. This will ensure the data will be merged into the Universal Journal (table ACDOCA) without any issues. Month-end activities for the previous period also must be completed prior to starting the data migration from the old data structures to the new ones that are available with SAP S/4HANA.

Additional migration and configuration requirements are required for the following FI functions:

- SAP General Ledger (new G/L)

- New Asset Accounting (new FI-AA)

- SAP Cash Management powered by SAP HANA

After the configuration steps are completed for these items, the execution of the data conversion can proceed from the old data structures to the new ones.

SAP S/4HANA Logistics Data Conversion

Similar to what is required in the SAP S/4HANA Finance application-specific conversion activities, SAP S/4HANA's logistics functionality requires some additional steps as well, although these steps aren't as manually demanding.

During the SAP S/4HANA logistics preparation, you must complete the activities that are included as part of the prechecks. For example, a conversion to the new data structure for the material number is required as the material number changes from 18 to 40 characters when moving to SAP S/4HANA.

In addition to the material number extension adjustments, a fundamental change in SAP S/4HANA logistics functionality is the introduction of the mandatory business partner approach. This requires additional Customizing settings to be completed and checks to be performed to ensure customer and supplier integration is complete, as all customers and vendors are set up as business partners in SAP S/4HANA Enterprise Management.

The detailed step-by-step conversion requirements are available within the target conversion guides for the associated target SAP S/4HANA version. This includes the associated FPS that you've decided to convert.

These documents are available on the SAP help forum at *http://help.sap.com/s4hana*.

9.3 SAP S/4HANA Conversion Prerequisites

A direct conversion path to SAP S/4HANA isn't currently available for all SAP customers. A series of prerequisites needs to be met before it is possible to convert to SAP S/4HANA. Based on the business functions, SAP add-ons, or industry solutions that are currently installed in your SAP ERP environment, some features may not be supported. You either have to remove these features (e.g., an SAP add-on) or perform a new implementation without these functionalities if you want to move to SAP S/4HANA and can't afford to wait for them to be made available in a future release of the SAP S/4HANA.

The following sections highlight some of the considerations you may want to take into account before undertaking your SAP S/4HANA conversion journey, the prerequisites that must be met to convert to SAP S/4HANA, and an overview of some of the restrictions based on the functionality that is currently in use in your SAP system.

9.3.1 SAP S/4HANA Transformation Considerations

You must address a number of considerations during the technical conversion to SAP S/4HANA. The conversion approach must be adjusted depending on the business' ability to accommodate system outages and the overall project time lines.

The prerequisites required to convert to SAP S/4HANA should not only focus on the mandatory requirements but also ensure that your SAP environment is in the best possible shape prior to the conversion start. This reduces the overall project risk and ensures a smooth transition to SAP S/4HANA.

Some of the considerations to factor into your SAP S/4HANA conversion scenario are listed here:

- **Migration time lines**

Given the disruptive nature of the SAP S/4HANA conversion, it's important to consider when is the right time for your business to make the move. The usual go-live dates should be avoided, such as key business sales cycles and financial month-end or year-end close.

- **Custom code**
As part of the conversion to SAP S/4HANA, many code changes are applied to your SAP system. Although most code will work normally after the conversion, some of your custom code may require mandatory changes to ensure a smooth transition. This also includes database-dependent code. The SAP HANA code remediation is also referred to as HANA-tization. (See Section 9.2.4 for more details.)

- **Technical and functional implications**
Before moving to SAP S/4HANA, it's also important to understand the current functional limitations the conversion may have on your SAP system. For example, if you aren't currently using the new G/L in SAP ERP, it's possible to convert to SAP S/4HANA, but you won't benefit from the new G/L functionalities, such as parallel accounting and document splitting. If you want to use these functionalities, you will first need to migrate to the new G/L, and then perform the SAP S/4HANA conversion.

> **Note**
>
> It is important to ensure that all your current systems are patched to the minimum level prior to starting the system conversion. The minimum requirements to move to SAP S/4HANA, on-premise edition, are listed in this section.

With the latest release of SAP S/4HANA Enterprise Management (remember this is often called on-premise edition), there has been a considerable enhancement to the functional scope, with key additional features mainly in logistics areas. These additional features have led to a

change in technical prerequisites needed to run SAP S/4HANA, on-premise edition.

This has also led to an adjustment in the technical architecture of SAP S/4HANA, on-premise edition. The architecture now consists of the following (see Figure 9.14):

- SAP S/4HANA core components
- SAP NetWeaver 7.5
- SAP HANA database
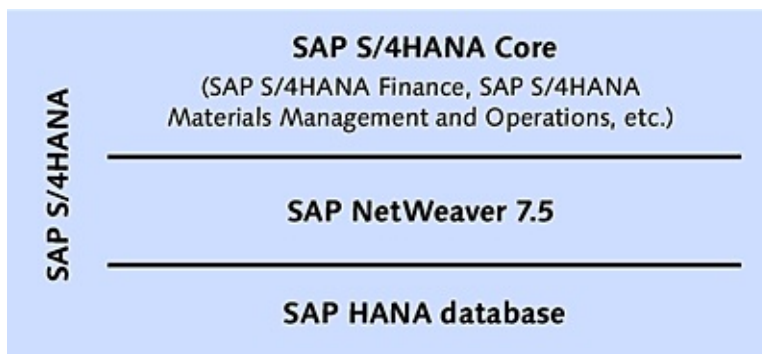
Figure 9.14   SAP S/4HANA, On-Premise Base Technology

9.3.2   SAP S/4HANA On-Premise Application Prerequisites

While preparing to convert your SAP ERP system to SAP S/4HANA, you need to ensure that you're using the correct version of the Software Provisioning Manager (SWPM) for the installation and SUM, with or without DMO for the conversion. It's important to use the latest patch level of SWPM and SUM that are available on the Software Logistics Toolset (SL Toolset).

Before you start using the SUM tool, make sure that you have the latest version of the corresponding guides:

- Conversion Guide: Converting SAP Systems into SAP S/4HANA Using SUM SP15
- SUM Guide: Updating SAP Systems Using Software Update Manager

1.0 SP15

- DMO Guide: DMO of SUM 1.0 SP15

Note

SAP Note 2233962 (Conversion Related Information) provides the latest information on converting to SAP S/4HANA using SUM SP 15. Be sure to read this SAP Note prior to starting the tool.

Additionally, there are different installation requirements based on the SAP S/4HANA, on-premise edition that you want to convert to.

Note

SAP Note 2189824 (SAP S/4HANA, On-Premise Edition 1511: Release Information Note) provides the latest information on SAP S/4HANA 1511, installation requirements. Be sure to read this SAP Note prior to starting the migration process.

Note

On-premise deployment of SAP S/4HANA includes the component version ST-A/PI. If this component version isn't installed in your SAP environment, you'll need to use the add-on installation tool. If these add-ons are available, you need to make sure they are up-to date. Use report RTCCTOOL, per SAP Note 69455, to ensure that the newest versions of add-ons ST-PI and ST-A/PI are implemented.

For all SAP ERP conversions to SAP S/4HANA 1511, from an existing source release, you'll need to ensure that your software level isn't higher than the following:

- SAP ERP 6.0 SP Stack 27

- SAP EHP 2 for SAP ERP 6.0 SP Stack 17

- SAP EHP 3 for SAP ERP 6.0 SP Stack 16

- SAP EHP 4 for SAP ERP 6.0 SP Stack 17

- SAP EHP 5 for SAP ERP 6.0 SP Stack 14

- SAP EHP 6 for SAP ERP 6.0 SP Stack 16

- SAP EHP 6 for SAP ERP 6.0, version for SAP HANA SP Stack 09

- SAP EHP 7 for SAP ERP 6.0 SP Stack 10

- SAP S/4HANA Finance add-on 1.0 for SAP Business Suite powered by SAP HANA SP Stack 07

- SAP S/4HANA Finance, on-premise edition 1503 SP Stack 03

In addition, the minimum required database revision of SAP HANA is 102.2. SAP recommends implementing the highest SAP HANA revision available to get the latest fixes, unless stated otherwise.

9.3.3 SAP S/4HANA On-Premise Functional Restrictions

Prior to moving to on-premise SAP S/4HANA, it's important to understand the impact of the new SAP S/4HANA solution on your existing processes and to check if it's possible to convert based on the functionalities within your existing SAP system. The list of restrictions linked to moving to SAP S/4HANA is continuously changing with the release of additional FPSs.

Note

See SAP Note 2214213 (SAP S/4HANA, On-Premise Edition 1511: Restriction Note) to get the latest information related to restrictions for SAP S/4HANA 1511.

For SAP S/4HANA 1610, see SAP Note 2368645 - SAP S/4HANA, On Premise Edition 1610 SP00: Restriction Note.

In the following sections, we'll explore limitations of SAP S/4HANA, as it relates to industry-specific functionality, finance, and logistics. We'll close the section with a brief overview of some of the technical limitations.

Industry Limitations

While SAP continues to enhance its solution with additional industries supported in SAP S/4HANA, on-premise edition, several restrictions need to be checked prior to performing the migration. Table 9.1 contains a list of industries that are supported by SAP S/4HANA, on-premise edition.

Supported Industries	Supported Industries with Restrictions
Wholesale	Consumer Products (restricted use, SAP Note 2355560 - SAP S/4HANA, on premise 1610: Consumer Products: Restriction Note)
Life Sciences	Aerospace & Defense (restricted use, SAP Note 2234353)
High-Tech	Automotive (restricted use, SAP Note 2228672)
Industrial Machinery & Components (IM&C)	Mill Products (restricted use, SAP Note 2229398)
Chemicals	Utilities (restricted use, SAP Note 2227874)
Mining	Banking (restricted use, SAP Note 2211665)
Insurance	Public Sector (restricted use, SAP Note 2228940)
Engineering Construction & Operations (EC&O)	Defense and Security (restricted use, SAP Note 2339505 - SAP S/4HANA 1610, Defense & Security: Restriction Note)
Professional	Oil & Gas (restricted use, SAP Note 2349061 -

Services	SAP S/4HANA Oil and Gas 1610: Restriction Note)
Telecommunication	
Sports & Entertainments	
Transportation and Logistics	
Contract Accounts Receivable and Payable (FI-CA)	
Higher Education and Research	Available with SAP S/4HANA, on-premise edition FPS 01

Table 9.1 Supported and Restricted Industry Solutions with On-Premise SAP S/4HANA

In addition to the current restrictions of industry solutions with SAP S/4HANA, several adjustments have been made to simplify the data model and business process within the finance and logistics areas. This has led to certain features being removed, impacting the conversion possibilities of SAP S/4HANA, deployed on-premise.

Finance Limitations

The restrictions in SAP S/4HANA, on-premise edition 1511, are the same as SAP S/4HANA Finance, on-premise edition 1503.

One of the biggest changes in SAP S/4HANA Finance is the merge of the Financials (FI) and Controlling (CO) modules into the Universal Journal (table ACDOCA). The parallel valuations in all areas are now provided via parallel ledgers. This means that the existing solutions prior to SAP S/4HANA, which were based on parallel delta versions for actuals in CO, need to be adapted.

Consequently, the multiple valuation of cost of goods manufactured (COGM) functionality that provides parallel valuations in CO, according to multiple accounting principles and the functionality linked to transfer pricing valuating the transfer of goods or services in profit centers, profit center groups, or legal valuations, is no longer supported. If you're using any of these functionalities, it's currently not possible to migrate to SAP S/4HANA, on-premise edition 1511.

The limitations to SAP S/4HANA Finance have changed with the release of SAP S/4HANA Finance 1605 and SAP S/4HANA Enterprise Management 1610. The major change is that transfer prices, which valuate the good or service according to legal, group, or profit center reporting, are now supported. The multiple valuation of COGM functionality providing parallel valuations in the CO module is still not yet supported with SAP S/4HANA Finance 1605 or lower SAP S/4HANA Finance versions.

> **Note**
>
> Additional information on release restrictions associated with SAP S/4HANA 1605 are available in SAP Note 2267147 (Release Restrictions for SAP S/4HANA Finance 1605).

Logistics Limitations

Similar to the FI and CO modules, a simplification of the Sales and Distribution (SD) and Material Management (MM) modules has led to a certain number of restrictions within SAP S/4HANA Finance, on-premise edition 1511.

First, the material number length has changed in SAP S/4HANA, on-premise edition 1511, and has been extended from 18 characters to 40 characters. Therefore, restrictions have been introduced on the following:

- Archived data

- Application Linking and Enabling (ALE) generation for Business Application Programming Interfaces (BAPIs)

- Customer and supplier material numbers

- Logistics Information System (LIS)

- Integration with other SAP products

In addition to these, if you're using Long Material Number (LAMA) in Discrete Industry Mill Products (DIMP), it's not possible to migrate to SAP S/4HANA, on-premise edition 1511.

Note

If you're using the extended material number, before migrating to SAP S/4HANA, on-premise edition 1511, further information on the restrictions can be found in SAP Note 2233100 (Collection of Restrictions Related to MFLE).

SAP S/4HANA provides enhanced functionalities around material packaging, which creates restrictions for packaging material with more than 35 characters in combination with returnable packaging logistics:

- **Electronic Data Interchange (EDI) processing of returnable packaging account statement requests (message type ACCSTAREQ)**
  The IDoc type ACCSTA01 allows supplier and customer material numbers for packaging materials of up to 35 characters to be transmitted.

- **EDI processing of returnable packaging account statements (message type ACCSTA)**
  The IDoc type ACCSTA01 allows supplier and customer material numbers for packaging materials of up to 35 characters to be

transmitted.

With SAP S/4HANA's logistics functionality, the business partner approach has become mandatory and is restricted to 85 supplier and customer fields (released with SAP S/4HANA, on-premise edition 1511 FPS 00). Additional fields were released with SAP S/4HANA, on-premise edition 1511 FPS 01.

> **Note**
>
> The fields available are listed in SAP Note 2214213 (SAP S/4HANA, On-Premise Edition 1511: Restriction Note) and are available in tables `LFA1`, `LFM1`, `LFM2`, `LFZA`, `KNZA`, `KNA1`, and `KNVV`. Other customer and supplier fields outside of these tables can't be maintained within this release.

Combined Finance and Logistics Limitations

The tools that support an automated migration from Accounts Receivable Accounting (FI-AR) Credit Management to SAP Credit Management can't be used in SAP S/4HANA, on-premise edition 1511. In SAP S/4HANA, this can also affect the functionality of SAP Credit Management itself after conversion from SAP ERP. This means that the standard SD functionality (sales order, outbound delivery) won't work if a credit check is executed. If you're already using SAP Credit Management in your current SAP ERP system, you won't be affected by this change.

Technical Limitations

Before migrating to SAP S/4HANA, you'll need to ensure that your add-ons are compatible with SAP S/4HANA. For standard SAP add-ons, Table 9.2 provides the name, component version, and software

components that are compatible with SAP S/4HANA, on-premise edition 1511.

Name	Component Version	Software Component
SAP Access Control	SAP ACCESS CONTROL 10.1	GRCPIERP V1100_700
		GRCPINW V1100_731
SAP Capital Yield Tax Management	SAP CYT MGMT FOR BANKING 8.0	CYT 800
SAP Decision Service Management	DECISION SERVICE MGMT. 1.0	DECSERMG 100
SAP Electronic Invoicing for Brazil (SAP Nota Fiscal Eletronica)	SAP NFE 10.0	SLL-NFE 900
SAP for Public Sector	SAP IS-PS-XT 6.00	IS-PS-XT 600
SAP Fraud Management	SAP ASSURANCE & COMPLIANCE 1.2	SAPFRA 120
SAP Landscape Virtualization Management	SAP LANDSCAPE VIRT MGT ENT 2.1	PCAI_ENT 100
SAP Manufacturing Integration and Intelligence	SAP MII 15.1	OEE_ERP 150
SAP Process Control	SAP PC 10.1 FOR SAP NW	POASBC 100_731
	SAP PROCESS CONTROL 10.1	GRCPIERP V1100_700
		GRCPINW V1100_700

SAP Risk Management	SAP RISK MANAGEMENT 10.1	GRCFND_A V1100
SAP Tax Declaration Framework for Brazil	TAX MNGMT FRAMEWORK BR 1.0	TMFLOCBR 100

Table 9.2 Compatible SAP Add-Ons with SAP S/4HANA, On-Premise Edition 1511

For SAP standard custom-development add-ons, a list isn't yet available. SAP recommends contacting them at least three months before starting your SAP S/4HANA implementation to allow sufficient time for any adjustments if required. For supplier and partner add-ons, you'll need to check with them directly to see if their add-on has been released with SAP S/4HANA.

The list in Table 9.2 shows the current add-ons. If your add-on has been incorporated into the SAP S/4HANA solution, it will be considered as part of the SAP S/4HANA Enterprise Management functionality and will no longer be considered an add-on.

Because SAP S/4HANA isn't supported with any other code-page configuration than Unicode, all SAP systems currently running on multiple or single code-page configurations need to be converted to Unicode. Based on the current level of your existing source release, the Unicode conversion can be combined as part of the migration using the DMO of SUM. Any language-related issues must be addressed prior to the migration start.

Note

If you're looking to convert your existing SAP system to SAP NetWeaver 7.50, the source system also needs to be a Unicode system. Therefore, any SAP environments that currently run a non-Unicode system will need to perform a two-step approach to get to the end state of SAP S/4HANA running on SAP NetWeaver 7.5.

Additionally, although SAP has removed dual stack deployments with SAP NetWeaver 7.4, it's also one of the technical prerequisites prior to converting to SAP S/4HANA. Based on the current level of your existing source release, you may need to factor this into your conversion scenario. The AS Java component needs to be separated from the AS ABAP stack and deployed as a standalone system.

Note

With the latest release of SAP S/4HANA 1610, some of the restrictions associated to SAP S/4HANA on-premise edition 1511 are likely to change.

These restriction will be update in SAP Note 2368645 – SAP S/4HANA, On Premise Edition 1610 SP00: Restriction Note.

9.4   Housekeeping Activities

If you're considering a conversion to SAP S/4HANA, it's a prime opportunity to ensure that your existing SAP ERP is in a good state to convert to SAP S/4HANA. Volume of data, amount of custom code, and code quality are all factors that can disrupt your conversion to SAP S/4HANA. It's never too late to get your house in order, and we recommend that you start working on your housekeeping activities today to prepare your SAP ERP system for its conversion to SAP S/4HANA.

Because you can't limit or assign a time dependency to the amount of data migrated during the SAP S/4HANA conversion, it's important to ensure that you migrate only the relevant and required data. This is even more relevant for the SAP systems that have been running for several years, and where there is no existing archiving strategy. Without archiving or data cleansing, all the data will be migrated to SAP S/4HANA, creating data issues during the conversion process. Archiving and cleansing your data not only avoids these data inconsistencies during your project but also reduces the system downtime during the cutover weekend.

Therefore, a detailed analysis of the data in the system that you plan to convert to SAP S/4HANA helps identify where inconsistencies and issues might arise and where you can reduce the database size. Consider performing the following:

- **Cleansing activities**
  Certain types of data that may not be relevant for archiving can be deleted soon after they are created. Data such as spool data, job logs, background jobs, and so on fall into this category. In a productive environment, jobs should be deleted on a regular basis.

- **Archiving activities**
  As the best practice approach, SAP standard data archiving is a free functionality to perform data management in an SAP system. You can

use SAP data archiving to safely remove data from the database and store it in an attached archive.

In addition, SAP Information Lifecycle Management (SAP ILM) can be licensed to improve data retention management (archived in an SAP ILM-aware storage) by managing its deletion based on defined retention policies.

To reduce the system downtime and optimize memory costs and hardware sizing, data archiving is a key part of the conversion to SAP S/4HANA. However, without an existing archiving strategy, it can be a challenge to delete or archive obsolete data from tables that show the largest growth in data volume in accordance with legal requirements and corporate policies. An appropriate data archiving project should be started as soon as possible.

Note

SAP Notes 679456 (Reducing Data Volume before Unicode Conversion) and 1422822 (I18n Table Process Information) provide useful hints regarding which tables might be candidates for a size reduction that reduces data volume before a Unicode conversion.

Note

SAP Note 1659622 (SMIGR_BIG_ROW_STORE_TABS: Determine Tables from Database) provides the ABAP report SMIGR_BIG_ROW_STORE_TABS to identify large tables that will be stored as row store tables in SAP HANA. The small memory footprint of the row store is beneficial to minimize the database startup time.

With a conversion to SAP S/4HANA, although your data footprint is meant to shrink due to the reorganization and column store compression with SAP HANA, it's important to only convert the relevant data to in-

memory storage. The price difference between in-memory and disk capacity is substantial.

The files archived before the system conversion are still supported and accessible after the system conversion to SAP S/4HANA.

9.5 System Conversion Considerations

Prior to starting the conversion to SAP S/4HANA, you need to assess a few considerations to ensure that this is the best transformation path for your organization. Given the three paths that are available (refer to Figure 9.1)—new implementation, system conversion, and landscape transformation—it's important to understand the benefits and challenges of choosing one option over another.

Although SAP provides three transformation paths, there are really only two main implementation options available, often referred to as *greenfield* for new implementations or *brownfield* for system conversions.

Within a greenfield approach, you have to start a fresh implementation from scratch, which covers the new implementation and landscape transformation scenarios that entail a data migration from an existing or multiple SAP ERP or non-SAP ERP systems.

Alternatively, you may decide to convert your existing SAP ERP system, which allows you to keep your configuration, custom development, and data. In this section, we'll compare and contrast the two implementation options to help you decide which will work best for your organization.

9.5.1 Greenfield Implementation

The move to SAP S/4HANA is a great opportunity to simplify certain business processes and ways of working in your organization and redesign the way you do business. If this is something that you're considering, and you have a high level of business process reengineering, a greenfield implementation may be the right option for your organization. Although starting with a new implementation may seem a bit daunting, SAP provides a set of accelerators based on SAP Activate that provides configuration packs and best practices to set up

the new system and complete the data migration required to get the new system up and running.

You must also take into consideration your current release level. SAP S/4HANA, on-premise edition, currently runs on SAP NetWeaver 7.5 on an SAP HANA database. For some organizations on older releases such as SAP R/3 4.6c, a new implementation to SAP S/4HANA could be the perfect option to get back to the latest release while avoiding the challenges faced during the upgrade process and conversion to SAP S/4HANA. For organizations on SAP ERP 6.0, a one-step approach is available for system conversion, but a greenfield approach may still be preferable due to business considerations.

Custom code should also be factored into the decision on whether to choose a greenfield of brownfield implementation. In an average SAP ERP system, between 25% and 75% of custom code isn't used and up to 50% of modifications are considered obsolete. Adapting the code to SAP S/4HANA can be very time-consuming and results in few benefits.

For a greenfield implementation, this is a good opportunity to start again by leveraging SAP best practices and standard functionality. SAP Activate supports these activities (more information on SAP Activate is available in Chapter 10). Any custom code that is still required can be leveraged from the legacy system and adapted on the fly to be incorporated into the new SAP S/4HANA system.

In certain cases, specific functionalities and features, such as industry solutions or SAP add-ons, may no longer be available or required. If clear business benefits have been identified that are driving the immediate move to SAP S/4HANA, it may be an opportunity to consider redesigning some of the existing business processes and start with a new implementation rather than waiting for the technology restrictions to be resolved. For functional restrictions, see Section 9.3.3; report R_S4_PRE_TRANSITION_CHECKS, discussed in Section 9.2.3 will let you know if any of your current functionality will be impacted.

Finally, you must consider the impact on your data with a greenfield implementation:

- You'll have more flexibility to cleanse your data during the implementation if you decide to go down the new implementation route. It is an opportunity to restore data quality as a key part of your organization's governance procedures.

- If the effort and time associated with cleansing the data in your systems seems excessive to make your SAP environment "conversion ready," again, a new implementation may be the best option for you because it provides greater flexibility around data cleansing during the migration process. You'll also be able to define the amount of data you want to move to the new SAP S/4HANA system. This option can considerably reduce the effort associated with the move to SAP S/4HANA based on the volume of data that requires cleansing.

- If you have a large volume of data, and don't want to undergo a data archiving project, you may want to follow the new implementation route and perform your data migration on a select set of data based on your future business and system requirements.

9.5.2   Brownfield Implementation

A system conversion will provide you with less flexibility to enhance your business processes compared to a greenfield implementation; however, you'll still benefit from the simplifications SAP provides as part of the move to SAP S/4HANA. This can be a difficult decision to make, especially for customers who have spent many years investing in their existing SAP ERP environment; for others, it will be a no-brainer.

On the subject of release level, as mentioned earlier in Section 9.2, a one-step approach is available for customers currently running SAP ERP 6.0, with or without an enhancement pack. Older releases may choose to

go with a step-by-step approach, moving to SAP ERP 6.0 EHP 7 or above and then to SAP S/4HANA.

If the majority of your custom code is still in use (unlike in the average SAP ERP system, as you saw in the previous section), a brownfield implementation may be the correct approach for your organization. Under these circumstances, you can pursue a system conversion and implement a small code-cleansing project prior to the conversion start to help reduce the system code base and return to SAP's standard functionality. This also reduces the TCO of your SAP system further down the line.

Functionality restrictions linked to industry solutions or SAP add-ons not yet supported by SAP S/4HANA can be problematic if you're using these functionalities within your existing SAP environment and looking to convert your existing SAP system to SAP S/4HANA. You may want to delay your system conversion until they are made available. In the meantime. SAP has started to provide the possibility to remove some additional add-ons that will help with the transition to SAP S/4HANA.

Note

More information regarding currently unsupported industry solutions and add-ons is available in SAP Note 2011192 (Uninstalling ABAP Add-Ons).

Note

SAP also provide compatibility packages that allow SAP customers a limited use right to run classic SAP ERP solutions on an SAP S/4HANA installation. The use right currently expires on December 31, 2025.

Additional information and scope matrix on SAP compatibility packages for SAP S/4HANA can be found in SAP Note 2269324 - Compatibility

Scope Matrix for SAP S/4HANA on-premise.

Finally, you must consider the impact on your data with a brownfield implementation:

- The system conversion requires a high level of data quality and requires you to perform some cleansing activities during the conversion project if you want to successfully migrate your data from the old data structures to the new SAP S/4HANA data structures.

- If you've been running your SAP ERP system for multiple years and have undertaken many upgrades, the system conversion process will be more complicated. In this case, allocating the right amount of time and effort to data cleansing is key. This data cleansing can be initiated as part of the system conversion phase during the sandbox conversion. You can address any challenges or issues that occur and relate to data during the sandbox conversion. More importantly, these adjustments and cleansing activities need to be replicated accordingly into the production environment to ensure that the data issues don't occur when performing the same activities on the other environments post-refresh—especially in production.

- While performing a system conversion, there is no way to limit the amount of data that will be moved from the old data structures to the new ones. If you've been running your SAP systems with no data archiving policy for several years, this can add up to a lot of data! The amount of data in your system impacts the downtime required to perform the system conversion, in addition to other factors such as number of company codes for batch parallelization. To alleviate this, you must introduce a data archiving project prior to starting your system conversion to reduce data volumes.

Both greenfield and brownfield implementations have their benefits and downsides in regard to time, effort, and speed to implementing SAP S/4HANA. However, because organizations will have invested differently

in their existing SAP environments, this will be a key part of the decision making.

9.6   Tools and Techniques for Minimizing Downtime

While the functional enablement of the SAP S/4HANA solution can be included in the same change window as the technical upgrade and database migration, you might want to keep the activities separate due to complexity, risk, and increased downtime requirements.

If two downtimes aren't acceptable, you have a few options to help minimize the system downtime during the cutover weekend. However, the SAP S/4HANA road map is still a work in progress, and downtime optimization solutions are only available for certain SAP S/4HANA versions currently (e.g., Near Zero Downtime is only available for SAP S/4HANA Finance).

9.6.1   Data Volume Management

As mentioned in Section 9.4, it's important to maintain low data volumes via data archiving or by removing unnecessary data that may not require archiving. This is valid prior to moving to SAP S/4HANA but should also be considered as part of your best practices throughout the Application Lifecycle Management (ALM) of your SAP and IT landscapes.

Data Volume Management (DVM) may not be specific to SAP S/4HANA, but it will support and help you manage your system data efficiently by reducing your data footprint. You not only reduce your system's complexity and cost but also avoid long downtime windows that the business can rarely afford and which continually delay these types of projects.

Before undertaking your conversion to SAP S/4HANA, you want to run your database as slim as possible to ensure minimized downtime. DVM can help you get rid of the unnecessary data while ensuring that the relevant information is available to maintain your business processes.

DVM and the DVM work center run on SAP Solution Manager 7.1 SP 05.

9.6.2   Optimizing Database Migration Option Performance

Several options exist to optimize the performance and minimize the downtime associated with the DMO. Once again, similar to DVM, these improvements aren't specific to SAP S/4HANA and can also be applied on an SAP Business Suite on SAP HANA migration.

Note

More information on how to optimize downtime with DMO is available at *http://bit.ly/1Ub9OWK* on the SAP Community Network.

Use the benchmarking tool to assess the migration time lines for your SAP system to help you identify the optimal number of `R3load` processes and optimize table splitting.

If the overall performance of DMO still isn't sufficient to complete the SAP HANA migration within the expected downtime, you can enable the migration of selected application tables during the DMO uptime.

Note

SAP Note 2153242 (Estimation of Table Sizes and Downtime for SUM DMO with SLT) provides report RSDMODBSIZE, which helps optimize the downtime by finding the largest tables in SAP and giving an estimation of their transfer time.

9.6.3   Near Zero Downtime

With a later version of SAP S/4HANA Finance 1503 FPS 02, it's the Near Zero Downtime (NZDT) approach that allows SAP customers to reduce

the system downtime from potentially days to only several hours.

The standard SAP S/4HANA Finance migration steps required during a conversion project are listed in Figure 9.15.
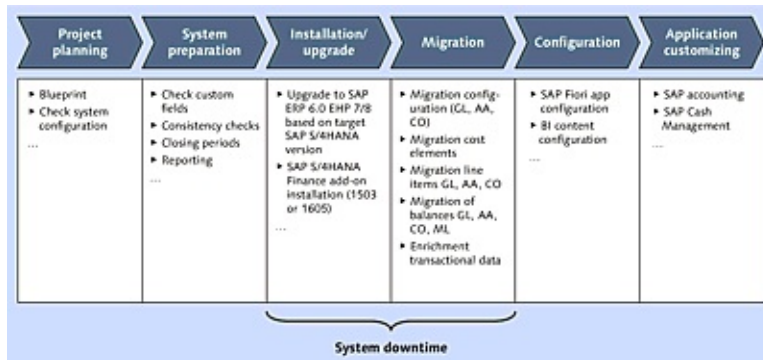
Figure 9.15 Standard Conversion Process for SAP S/4HANA Finance

Based on the database size, the SAP ERP source version (e.g., SAP ERP 6.0, EhP 7), the number of company codes, and so on, the activities associated with the system business downtime can vary considerably. To mitigate this risk and avoid a two-step upgrade and migration approach, SAP provides NZDT as part of the System Landscape Optimization (SLO) services. The NZDT version available for SAP S/4HANA Finance works in a similar way to how it was used in the past, capturing log tables that are replicated at a later stage (Figure 9.16).

Note

NZDT is currently only available for SAP S/4HANA Finance, on-premise edition, within the SAP S/4HANA versions available.
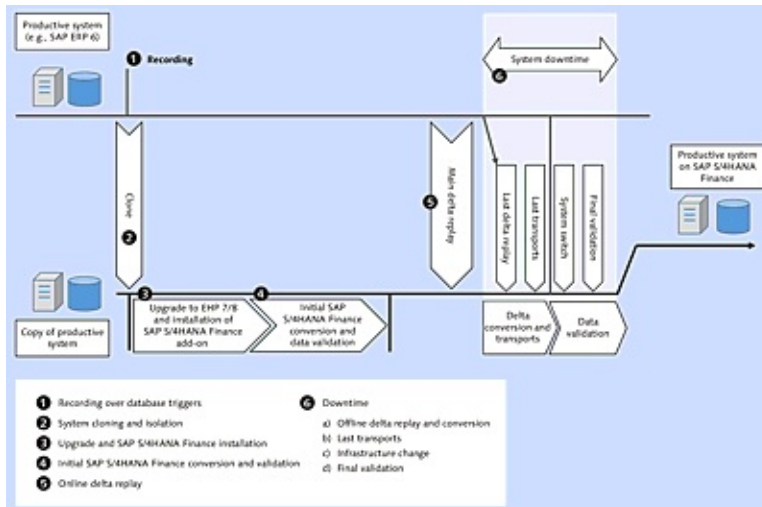
Figure 9.16 SAP S/4HANA Finance, On-Premise Edition, Downtime Reduction with NZDT

All of the SAP S/4HANA Finance prechecks, consistency checks, closing activities, and reporting snapshots need to be completed in the production environment. After these steps are finalized, a clone of the production system is created, and the recording phase associated with the NZDT process can start.

> **Note**
>
> Similar to all other upgrade and conversion projects, the precheck and consistency check activities are performed across the entire landscape prior to executing the same steps in the productive environment as part of the cutover activities.

During the recording phase, business activities are restricted and a "hard freeze" is put in place:

- Hard freeze: General (FI/CO/AA)
  - No archiving
  - No Customizing changes
  - No changes in the repository

- No postings in closed periods
- Asset account specific
  - No data transfer for asset data (Transaction AS91)
  - No asset depreciation postings with old depreciation report RABUCH
  - No asset deactivations via asset transfer posting or full/complete retirement
  - No year-end closing activities via FI-AA (Transactions AJRW, AJAB)

All new records posted in the production system during the recording phase are captured in log tables and replicated during the downtime window. With the current SAP S/4HANA Finance conversion steps, you can't select a time line to define the amount of data that is transferred. NZDT allows customers to migrate only the delta postings captured during the recording phase during the business downtime window, hence considerably shortening the downtime window. All other activities are migrated while the production system is still up running.

9.7   Summary

Adopting SAP S/4HANA is clearly complex and requires a thorough assessment to understand which transformation path is right for you. Multiple considerations need to be assessed to understand whether a greenfield or brownfield implementation is the right choice for your business. The adoption scenario needs to be aligned with your expected outcome and the benefits you're looking to achieve with SAP S/4HANA. SAP S/4HANA is clearly the way forward if you want to continue to use SAP and benefit from the latest innovations. You can start performing some of the housekeeping activities straight away to reduce your overall project time lines and aim for a smooth transition to SAP S/4HANA.

In the next chapter, we will explain how SAP Activate can support each one of the SAP S/4HANA adoption scenarios. We will review the new SAP framework that supports SAP S/4HANA implementation projects and we will cover all aspects of the solution from agile methodology.

SAP Activate is a framework based on an agile methodology that helps simplify the adoption of SAP S/4HANA whether it's for a new implementation, system conversion, or landscape transformation.

10   Using SAP Activate

SAP Activate is SAP's new framework for SAP S/4HANA. SAP Activate is more than just a method; it provides a series of SAP Best Practices and a guided configuration that comes with the SAP Activate methodology to accelerate project delivery and lower implementation costs for SAP S/4HANA projects.

Throughout this chapter, we'll take you through an overview of SAP Activate, including how it's used and which aspects are most suited to the different types of projects you may be considering. We'll also perform a deep dive into some of the tools and accelerators SAP Activate provides to support your project delivery. We'll then look at demonstrating how the methodology and framework can help accelerate the end-to-end project execution for your organization.

10.1   SAP Activate Overview

SAP Activate is a combination of methodology, SAP Best Practices, and the guided configuration packs that have been specifically designed for SAP S/4HANA (Figure 10.1).

The level of adoption of the SAP Activate framework will vary for each transformation scenario. You may choose to use only the methodology with templates and accelerators if you're performing a system

conversion, whereas you can use the full suite, including SAP Best Practices and guided configuration, for a new implementation. This is also true for the deployment scenario you decide to consider, be it SAP S/4HANA Cloud or SAP S/4HANA deployed on-premise.
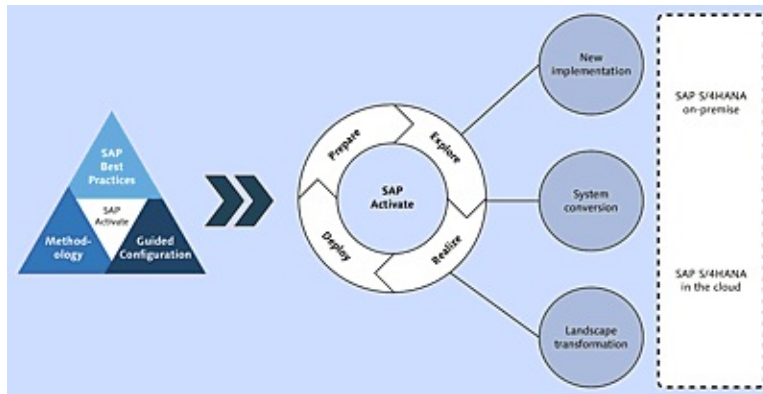
Figure 10.1   SAP Activate Overview and Deployment Options

Although primarily aimed at SAP S/4HANA, SAP Activate can also be used for implementation projects such as SAP Business Suite for SAP ERP, SAP Customer Relationship Management (SAP CRM), SAP Supply Chain Management (SAP SCM), and so on. Additionally, you can use it for some of the SAP cloud solutions such as SAP SuccessFactors, SAP Hybris Cloud for Customer, and SAP Ariba.

SAP Activate is a flexible framework, given that it supports different starting points and different adoption and deployment scenarios based on the type of SAP S/4HANA scenario you're looking to implement. As noted earlier, this can be a new implementation, a system conversion, or even a landscape transformation.

For those of you familiar with SAP's ASAP methodology, SAP Activate is the successor to ASAP. Although SAP will continue to provide access to the last version of ASAP 8 methodology, it will no longer provide enhancements to its functionality. The focus moving forward is clearly SAP Activate.

The SAP Activate framework also comes with a set of functionalities ready to support your SAP S/4HANA project. Based on the adoption scenario, certain features may not be available within the SAP Activate framework. These restrictions also vary for on-premise and cloud deployments. Table 10.1 highlights what features of SAP Activate are available per adoption and per deployment scenario.

		New Implementation	System Conversion	Landscape Transformation
Scenarios Characteristics		Data migration to SAP S/4HANA	Technical conversion from SAP ERP to SAP S/4HANA	IT transformation (consolidation carve out) of SAP systems a Central Finance scenario
Target Audience		New or existing customers	Existing customers	New or existing customers
Deployment Option				
SAP Activate	SAP Best Practices	Yes	Migration and cloud integration	Migration and cloud integration, ready-to-run business processes based on use cases
	SAP Activate methodology	Yes	Yes	Yes
	SAP guided configuration	Yes	No	Applicable if ready-to-run business

				processes are used

Table 10.1 How SAP Activate Supports the SAP S/4HANA Adoption Scenarios

As explained in Table 10.1, under the deployment option, the SAP Activate framework is split into three key areas (see Figure 10.2):

- SAP Best Practices

- Tools for guided configuration

- Methodology
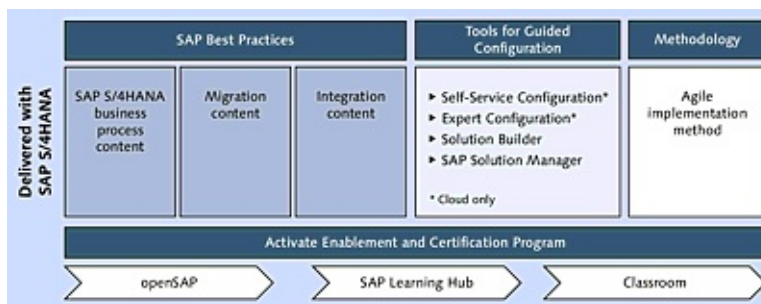
Figure 10.2 SAP Activate Accelerators

Currently, self-service and expert configuration are only available for SAP S/4HANA Cloud versions.

We'll perform a deep dive into these three key areas in the following sections. However, in addition to SAP Best Practices, guided configuration tools, and the agile implementation method, SAP Activate also provides a series of ready-to-use templates and accelerators that you can leverage throughout your project delivery cycle. These accelerators are adapted to each phase of the SAP Activate methodology, and templates range from guidebooks to checklists or even questionnaires to support the delivery of your SAP S/4HANA project.

The agile implementation method accelerates product development and focuses on shippable releases, also referred to as sprints. The techniques used enable more efficient and higher quality delivery execution while reducing the overall implementation risks. The agile

approach differs from the traditional *waterfall* approach where each phase of the project (e.g., design, build, testing, etc.) was sequential. With the agile method, these phases become incremental.

Nevertheless, the use of these templates isn't mandatory. One of the benefits of SAP Activate is the flexibility it provides based on the complexity and size of your implementation project. How many times have we all struggled trying to adopt a method or template and realized that more than 50% doesn't actually fit the project or our organization's requirements? One of the benefits with SAP Activate is that it provides a set of standard deliverables for each work stream. You can either adopt or adjust these deliverables according to your specific requirements, as demonstrated in Figure 10.3.

If you want to explore some of the SAP Activate templates in more detail, some sample versions are provided as part of the SAP Activate framework. These are available on the SAP road map viewer for SAP Activate at *http://bit.ly/28MZdvT*.

Prior to finding the right templates for your project, you'll need to select the deployment scenario (i.e., cloud or on-premise) and the methodology (agile or waterfall) that you intend to use.

In each deployment and methodology section, a set of accelerators and their associated templates are available to be downloaded, as shown in Figure 10.4.

Now that you have a better understanding of the ways SAP Activate can be used, including the scope and impact of each adoption and deployment scenario, in the following sections, we'll explain how to use the SAP Best Practices, how to leverage the tools for guided configuration, and how the methodology needs to be adopted to achieve successful project delivery.
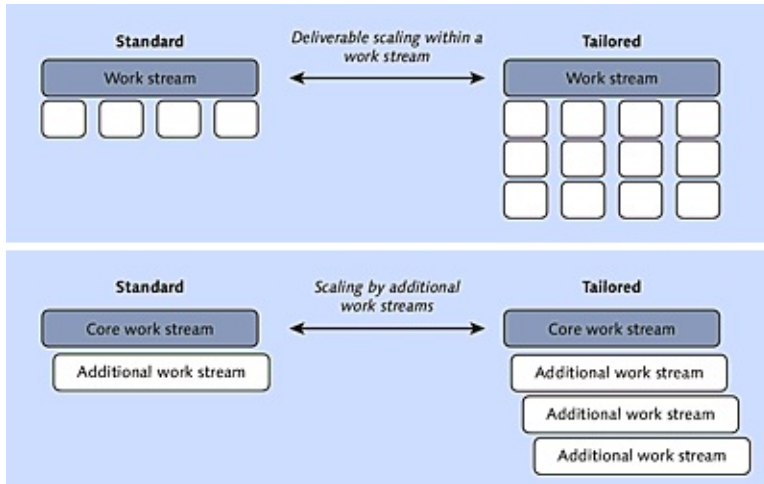
Figure 10.3 SAP Activate Flexible Methodology
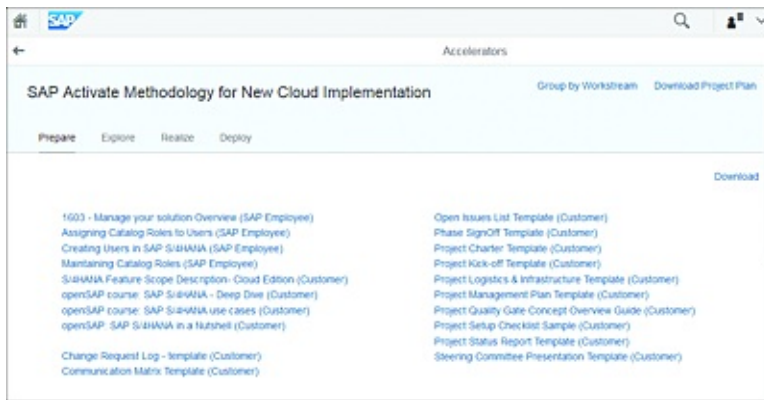
Figure 10.4 Sample List of SAP Activate Accelerators for SAP S/4HANA Cloud

10.2   SAP Activate Methodology

The SAP Activate methodology is built on an agile delivery approach using SAP Best Practices that have been built to provide structure while delivering sufficient space for specific customer requirements.

The objective of SAP Activate is really to accelerate the implementation or system conversion project you're undertaking. It provides structure and a foundation to adopt SAP S/4HANA with the methodology built around six key characteristics:

- **Start with SAP Best Practices**
  Use ready-to-run business processes.

- **Validate solution**
  Use SAP Best Practices to validate your process through fit/gap workshops.

- **Modular, scalable, and agile**
  Structure your project to deliver in sprints.

- **Cloud ready**
  Leverage cloud-based solutions to provide flexibility and speed.

- **Premium engagement ready**
  Use SAP Control Centers to support building and running your SAP solution.

- **Quality built-in**
  Identify risk early with total quality approach.

In addition to these characteristics, SAP Activate is divided into four phases known as *prepare*, *explore*, *realize*, and *deploy*. The phases and activities associated with each phase support the project execution to adopt SAP S/4HANA (see Figure 10.5).
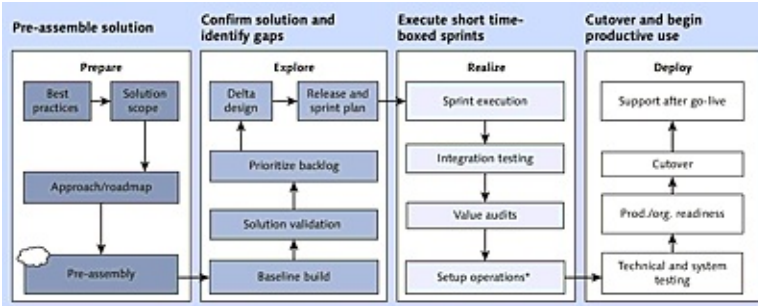
Figure 10.5 SAP Activate Methodology Phases

In the next few sections, we'll provide a detailed overview of each phase of the SAP Activate methodology before closing with a brief discussion of quality gates.

10.2.1 Prepare

The prepare phase is the foundation to the overall project kick-off and planning activities. You should start with the SAP Best Practices to accelerate your SAP S/4HANA adoption. Doing so ensures process standardization and is based on business processes that have been adopted, tested, and tried for many years. The objective here is to provide faster time to value for SAP customers, that is, to allow them to benefit from SAP S/4HANA more quickly. The journey to adopt the SAP S/4HANA solution is already fairly complex. Complexity will vary based on your starting point, but SAP Best Practices will help speed up the overall delivery.

These SAP Best Practices also provide a baseline for the overall solution, defining the scope of work to be adopted as part of the SAP S/4HANA implementation. Model companies can also be used that come with a full set of ready-to-use business processes, organizational structures, and sample data to support faster adoption. Additional detail on model companies is provided in Section 10.3.

To get started with the SAP Best Practices, you need an SAP S/4HANA system—either an on-premise sandbox system or a ready-to-use SAP

S/4HANA Cloud solution—to explore the content. This is referred to as preassembly in [Figure 10.5](#).

For preassembly, the recommendation is to use a cloud-based SAP system that will allow you to jump-start your project with a system that can be up and running in a few hours, compared to an on-premise sandbox system that would take longer, including setup. This system includes the SAP Best Practices and is aimed at supporting the validation steps during the explore phase. This helps clarify any process requirements or gaps in a live system before starting any work in the development environment.

During the prepare phase, the target environments are set up, and you can leverage the preassembled solutions using SAP Rapid Deployment Solutions (SAP RDS), SAP Best Practices, and the other prebuilt assets.

10.2.2 Explore

Coming out of the preparation phase, you should now have your baseline solution initiated using the tools and SAP Best Practices identified in the prepare phase.

During the explore phase, you validate your baseline and identify if any of the business processes differ from that baseline. This phase is used to play back and validate the business processes with the key stakeholders. The business process validation and the associated detailed analysis are completed during the fit/gap workshop (see [Figure 10.6](#)).
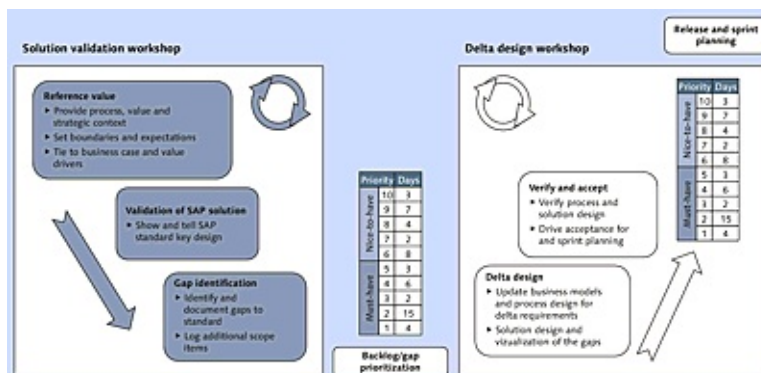
Figure 10.6   Fit/Gap Analysis and Workshops

Two types of workshops will help define the target business processes to be incorporated into the SAP S/4HANA solution. First, the SAP Best Practices review, known as the solution validation workshops, will ensure that most processes are covered with the SAP Best Practices solution. This will also provide you with the opportunity to flag any gaps associated with the SAP Best Practices and align the SAP solution to your specific business process requirements.

After the solution validation workshops have been completed, a series of delta design workshops will be initiated, taking into account the number of gaps identified and the associated complexity of each of these gaps.

The target business processes will then need to be updated to be in line with the latest agreement coming out of your delta design workshops.

The fit/gap workshops should also leverage the preassembly solution put together during the prepare phase. In addition to the preassembly system, the SAP Best Practices and SAP Solution Manager can be leveraged to initiate the documentation of your business processes. The starting point should be to leverage the SAP standard business processes and documentation, driving standardization across the board. However, any process changes identified during these workshops can be documented and maintained in SAP Solution Manager, as explained later in Section 10.4.4.

As an output of these workshops, the project team should have a clear understanding of the process gaps and the recommended solutions to remediate these gaps. After these gaps have been captured, the project management team can finalize the release and sprint plan that define the build and test phases per release, prior to moving into the realization phase.

10.2.3   Realize

Although the realization phase is also sometimes referred to as "build and test," the agile methodology backbone of SAP Activate means you can expect shorter configuration and build cycles that are better integrated with the business function to receive feedback on the fly.

The realize phase will vary based on the SAP S/4HANA adoption you've decided to undertake. Although the activities will be considerably different depending on whether this is a new implementation, a system conversion, or a landscape transformation, all the activities are still supported by the SAP Activate framework. You can find additional information on how to adopt SAP S/4HANA in Chapter 9.

After validating the business solution and undertaking the delta design workshops in the explore phase to flush out any additional business requirements, it's now time for your target solution to be configured, developed, and tested. This phase also provides you with the opportunity to execute testing and peer review to ensure the solution build is up to standard. In line with the overall SAP Activate method and agile delivery, the objective of this phase is to ensure that a minimum viable product (MVP) is ready to use. Additional features can be added through additional sprints. This will accelerate the deployment of your SAP S/4HANA solution and guarantee better time to value.

10.2.4   Deploy

The deploy phase supports the final preparation before you move all your transports into the production environment and execute the cutover activities during the go-live weekend. All testing activities must be completed prior to initiating these activities. During this phase, end-user training and execution of the change communication occurs. The project leads will prepare the sites for transition, and any data migration activities are executed in the productive environment before handing the system back to the business users.

Prior to executing the live cutover activities, a dry run should be performed to capture time lines and understand and identify any challenges that may occur during the actual cutover. It's also a good opportunity for you to get all of the project teams and business teams familiar with the activities they will execute during the cutover, ensure integration across these teams, and align on expectations for the big weekend.

The cutover will consist of a ramp down of the legacy system and ramp up in the new SAP S/4HANA system. Interfaces need to be redirected to the new productive environments, and all the build activities completed during the realization phase should now be moved to production.

After all of these activities are complete, and smoke tests are executed, the system can be handed over to your business users. Hypercare activities, which entail supporting the production system after a new release has been moved to that environment, will start straight after the project go-live, and it's important to ensure that your operations teams receive a handover to maintain the systems during the run phase. Handover activities should be initiated well in advance to guarantee a smooth transition.

10.2.5   Quality Gates

In addition to the four project phases in the SAP Activate method, a minimum of four quality gates are mandated as part of the SAP S/4HANA implementation projects (see [Figure 10.7](#)). For more complex implementation programs, additional quality gates may be required.

A *project preview* session at the beginning of the prepare phase is strongly recommended to give the project team time to influence the following phase and perform any necessary adjustments. Review sessions at the end of each phase are mandatory to guarantee project standards and to ensure the agreed approach has been followed. It's

possible to combine the preview and the review sessions for each phase to accelerate the overall process.
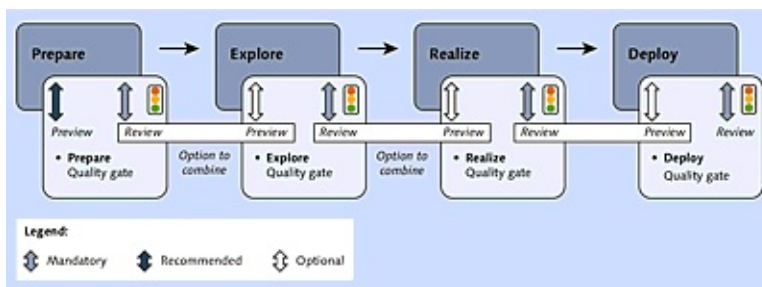
Figure 10.7   Mandatory Project Quality Gates and Recommended Review Phases

If you want to explore the SAP Activate methodology further, you can do so through the SAP Jam for SAP Activate. You can access SAP Activate content and templates, and you can interact with other SAP Activate subject matter experts in the SAP community (see Figure 10.8).
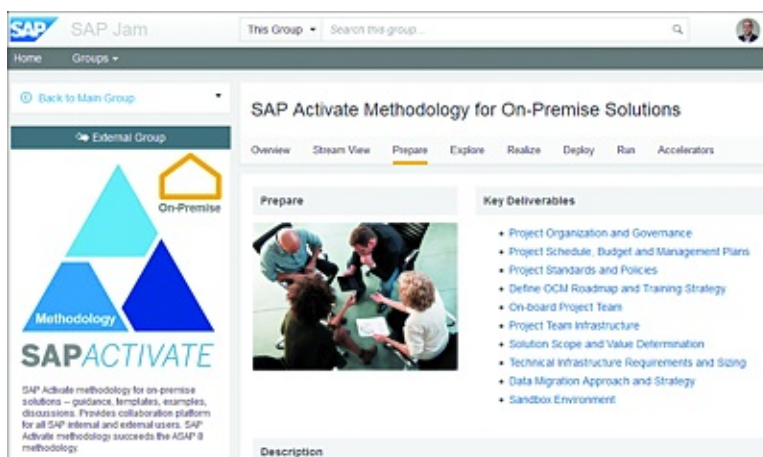
Figure 10.8   SAP Activate Methodology SAP Jam Group

To request access to the SAP Methodologies group on SAP Jam, you can submit your request at *http://bit.ly/SAPActivate*.

Now that you have a better understanding of how the SAP Activate method and project structure support the SAP S/4HANA project delivery, we'll dive into the SAP Best Practices and configuration tools that support the method.

10.3   SAP Best Practices for SAP Activate

The SAP Best Practices provided with SAP Activate are made available to help kick-start the overall SAP S/4HANA implementation project. They provide ready-to-run business processes for SAP S/4HANA that also integrate with SAP Cloud solutions such as SAP Ariba, SAP Hybris Cloud for Customer, SAP SuccessFactors, and SAP Hybris (see Figure 10.9).

The SAP Best Practices were built using SAP's deep industry and business process expertise to provide out-of-the-box processes, data, and template organizational structures to support strategic business imperatives and accelerate the adoption of SAP S/4HANA.
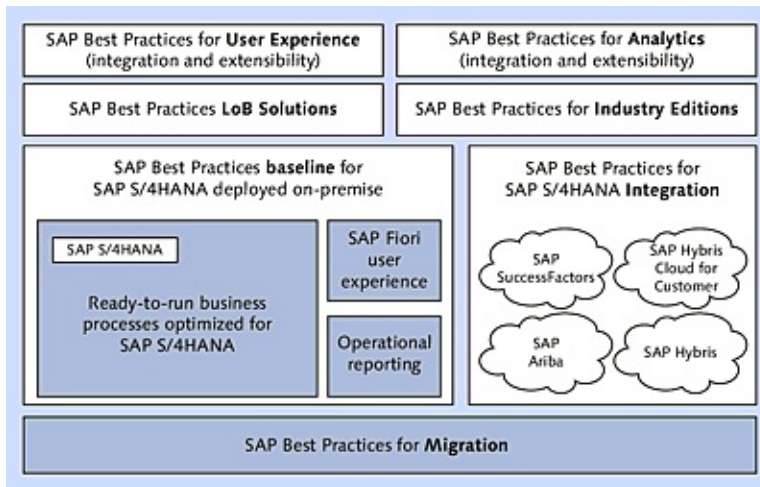
Figure 10.9   SAP Best Practices for On-Premise Deployment

The SAP Best Practice content is made ready and available in your SAP S/4HANA system. However, it's worth checking if a more recent version of SAP Best Practice content has been made available before you start your implementation.

Note

The latest SAP Best Practice content can be checked via SAP Note 2303306: SAP S/4HANA, On-Premise Edition 1511 – SAP S/4HANA

On-Premise 1511 FP Stack 02 (05/2016) Content Activation Note.

If you're using a different SAP S/4HANA version, a different SAP Note may be available.

SAP Best Practices not only kick-start the build process but also provide a baseline for the preparation phase, as well as support the fit/gap workshops. These SAP Best Practices should be activated in the sandbox system to demonstrate the solution while supporting fit/gap analysis to flush out any specific requirements you may have as part of your business processes.

The SAP Best Practices should drive rapid adoption of the standard SAP processes and solutions, which will help you eventually avoid additional customization requirements, reducing the overall maintenance cost in your SAP system.

Using the information from the fit/gap workshops, any delta requirements that aren't covered by the SAP Best Practices will be prioritized to plan the realization effort and time lines.

After the scope of the solution has been agreed and the related SAP Best Practices identified, the reference content associated with the SAP Best Practices can be imported and activated in the development system.

Note

The procedure for activating reference content in the development client is available in SAP Note 2226371: SAP S/4HANA, On-Premise Edition 1511 Collective Note for Content Activation.

If you're using a different SAP S/4HANA version, a different SAP Note may be available.
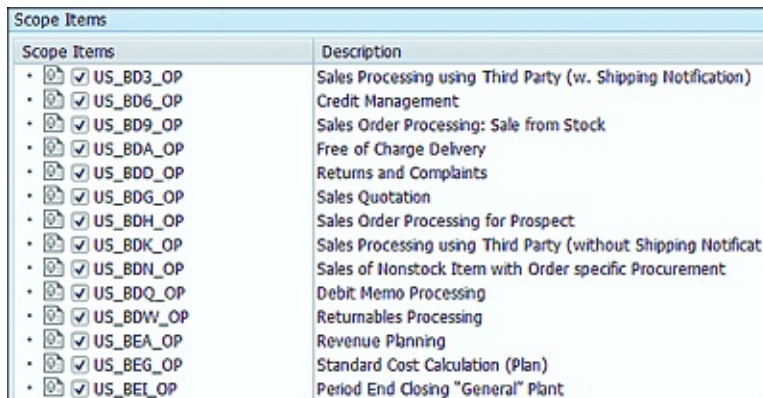
Prior to importing the SAP Best Practice content, the client associated with SAP Best Practices needs to be set up so that you can activate and

deploy the SAP Best Practices content.

After the SAP Best Practice content has been imported, you can select the SAP Best Practices that you want to activate. The SAP Best Practices are organized by business process, for example, period-end closing, make-to-stock production, Accounts Payable, and so on. This makes it easy to select the specific business processes you're looking for, as shown in Figure 10.10.

Figure 10.10   Scope Selection in Solution Builder

Each SCOPE ITEM has a series of dependencies that are referred to as *building blocks*. Additional information on the SAP Solution Builder tool and the building blocks are provided in Section 10.4.3. The building blocks will contain items such as sample master data, customization sets, and templates (e.g., process documents or reports).

The SAP Solution Builder tool allows you to activate the SAP Best Practice package you specifically require for your SAP S/4HANA project. The selection of these SAP Best Practices will be defined by your

business processes and are generated from the output of the validation and delta design workshops.

SAP Activate also provides model companies that help jump-start the configuration process within SAP S/4HANA. The model companies are part of the SAP Best Practices and come with their associated business processes, master data, and organizational structures (see Figure 10.11).
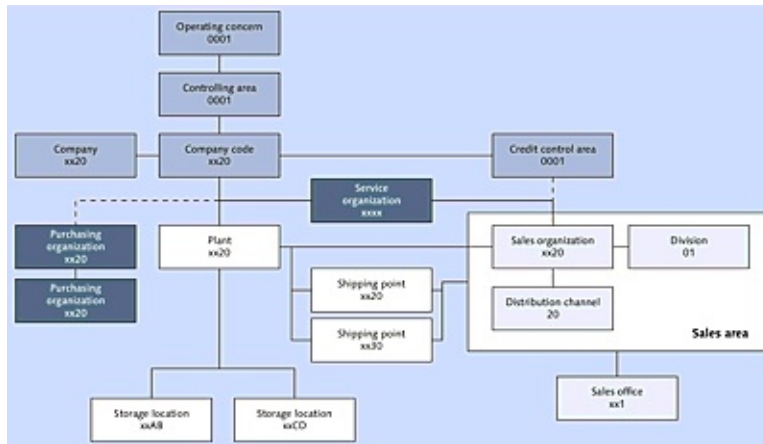
Figure 10.11   Example of the On-Premise Enterprise Structure Delivered with SAP S/4HANA

While leveraging the model companies, you can benefit from the ready-made and preconfigured country or industry solutions. The country and industry solutions can also be activated via the SAP Solution Builder tool.

> **Note**
>
> SAP Activate provides SAP Best Practices for industries by leveraging the existing SAP RDSs for SAP S/4HANA. SAP is building multiple country localizations as a priority, but it will continue to enhance line of business (LoB) scenarios and industry best practices on top of the existing SAP S/4HANA baseline.

10.4 SAP Activate Tools

SAP Activate isn't just a method, it also contains accelerators and tools that can be used by the entire project team during each phase of the SAP Activate framework. The SAP Activate accelerators vary from best practice guidebooks to delivery templates, checklists, and project management deliverables.

To support guided configuration of the SAP S/4HANA solution, SAP provide four key tools for the implementation of SAP S/4HANA:

- Self-service configuration (available with cloud deployment only)
- Expert configuration (available with cloud deployment only)
- SAP Solution Builder tool
- SAP Solution Manager

There are a few differences between the SAP Best Practices and tools that are available with SAP S/4HANA. The main discrepancies concern the preconfiguration and content lifecycle management services, as shown in Table 10.2.

SAP S/4HANA Cloud	SAP S/4HANA, Deployed On-Premise
SAP Best Practices, including business and integration processes optimized for SAP S/4HANA Cloud	SAP Best Practices, including business and integration processes optimized for SAP S/4HANA, on-premise edition
Starter system for initial scoping and fit/gap	Project jump-start with on-premise software appliance
Self-service configuration for initial setup	–
Scope extension through expert configuration	Scope extension through the classical Implementation Guide (IMG)

	approach
Content lifecycle management enabled by SAP	Content lifecycle management unavailable
SAP Solution Manager in the cloud, including SAP Best Practices business process and project content	SAP Solution Manager in the cloud or customer location, including SAP Best Practices business process and project content

Table 10.2 SAP S/4HANA Best Practices Based on Deployment Options

We'll now look at the functionality and benefits provided by the guided configuration solutions, the SAP Solution Builder tool, and the integration with SAP Solution Manager.

10.4.1 Self-Service Configuration

Self-service configuration is currently only available with SAP S/4HANA Cloud. The initial SAP S/4HANA system is preconfigured with sample data that provides a jump-start to system configuration and supports the prepare phase and the fit/gap workshops during the explore phase. The preconfigured system also comes with ready-to-run business processes provided with the SAP Activate framework and SAP Best Practices as mentioned in the previous sections.

Self-service configuration enables you to adjust the out-of-the-box solution to your specific business requirements. It leverages the SAP Fiori user interface (UI) making the overall solution easier to use than the IMG normally accessed via Transaction SPRO. The new UI, focused on simplification and ease of use, will only display the configuration activities that were added as part of the SAP Best Practice preselected scope, described in Section 10.3.

The new UI considerably reduces the time and complexity associated with performing the configuration tasks by simplifying the number of screens required to complete the system configuration requirements

(e.g., company code setup). However, the self-service configuration doesn't allow you to change the business process flow. It allows you to adjust the existing business processes to support your organizational structure requirements. Process adjustments fall under the umbrella of expert configuration, covered in the following section.

10.4.2   Expert Configuration

Expert configuration is primarily aimed at advanced SAP users who are responsible for maintaining business process configuration within your organization. Again, this is only for SAP S/4HANA Cloud.

This functionality provides both SAP customer and partners the ability to build on top of the standard SAP business processes while also ensuring consistency with the standard SAP business processes. The modeling of your solution needs to be completed via expert configuration, either to adapt standard SAP processes or build your own new process.

10.4.3   SAP Solution Builder Tool

The SAP Solution Builder tool is used to activate the SAP Best Practice content provided with SAP Activate for SAP S/4HANA.

After all the installation data files and solution scope files have been downloaded from the SAP Service Marketplace for the selected countries and release, you can import them into the SAP Solution Builder tool.

After importing the SAP Best Practices, the installation data that contains the installation settings associated with configuration, and data for the SAP S/4HANA solution, they can be uploaded into the system.

A new SAP Solution Builder profile has been created to import all SAP Best Practices; however, if your project scope has already been defined, it's possible to select the SAP Best Practice content that you're looking to activate as mentioned in Section 10.3. This defines the solution scope file

that contains the technical structure, scope items, building blocks, and technical objects for the SAP S/4HANA solution.

In addition, the selected scope items are assigned to building blocks. Certain scope items may have dependencies related to the building blocks, which means that some items will need to be deployed in a predefined sequence because the building blocks have reusable content such as business configuration, sample master data, and so on that are used cross-scope.

After all of the configuration is complete, including your specific business configuration requirements, it's recommended that you separate the transports among SAP Best Practices, the changes to the SAP Best Practices, and then your own specific configuration.

10.4.4   SAP Solution Manager

SAP Solution Manager 7.2 is designed to support SAP Activate. You can import SAP Best Practices for SAP Activate into SAP Solution Manager 7.2.

It's possible to review some SAP Best Practice content in SAP Solution Manager 7.1 by activating the solution package via Transaction SOLAR_PROJECT_ADMIN; however, the information provided isn't identical to the SAP Best Practices available with SAP Solution Manager 7.2.

Note

Throughout this book, when we refer to SAP Solution Manager, we'll be referring to SAP Solution Manager 7.2, as it's the version designed to support the implementation of SAP S/4HANA using SAP Activate.

SAP Activate provides templates, in addition to the SAP Best Practices described in Section 10.3, that can be imported into SAP Solution

Manager to support project management time lines and activities as well as business process design.

In addition, for any of your business processes that may differ from the standard SAP Best Practices, adjustments can be made and documented in SAP Solution Manager via the Business Process Model and Notation (BPMN). This will help you consolidate project documentation and process modeling within your SAP Solution Manager system.

In addition to the other benefits SAP Solution Manager usually provides while managing the application lifecycle of your SAP system, SAP Solution Manager 7.2 provides a centralized access point to project templates, SAP Best Practices, business process models, and documentation supporting the overall implementation of SAP S/4HANA.

10.5   Summary

SAP Activate is the framework designed to support your SAP S/4HANA adoption, regardless of the transformation scenario or deployment method you decide to follow for your SAP S/4HANA implementation. Certain restrictions are currently in place based on these decisions; however, SAP will continue to develop the SAP Activate framework to support and accelerate the adoption of SAP S/4HANA based on these scenarios.

In this chapter, we'll provide you with key considerations for moving from your current mode of operation to the future mode of operation. We'll provide a framework for addressing the prerequisites, requirements, and key considerations for each stage of the journey.

11   Building a Transformation Road Map

When we look at the transformation road map, there are some considerations. While the target future mode of operations (FMO) may be relatively clear (e.g., SAP S/4HANA, cloud platform-as-a-service [PaaS] and software-as-a-service [SaaS], mobile- and cognitive-enabled processes; advanced analytics, etc.), you need to understand the options and considerations for the road map based on the as-is current mode of operations (CMO) and business strategy.

You can't separate the SAP S/4HANA transformation road map from the business road map toward digital reinvention; they are intrinsically linked, as you'll see shortly.

In addition, you need to look at the digital transformation drivers and start defining a strategy with the business to understand how these drivers map to the business vision. Finally, you need to understand the technology components that enable this vision and then start defining the integrated IT road map as part of the transformational journey.

When looking at the transformation road map, there are other considerations to keep in mind from a business perspective. CEOs are asking three critical questions regarding their wider digital transformation strategy:

- Is my strategy ambitious enough?

- Is my execution fast enough?

- How do I transform my people and their capabilities?

Before you can map out the road map, you need to consider the following:

- External factors and drivers leading to an SAP S/4HANA adoption scenario

- Key IT and business benefits and value of SAP S/4HANA

- Other technology components and dependencies

- How to define a holistic SAP S/4HANA transformation road map aligned to the business drivers

11.1 Envisioning the "What" and the "Why"

It's clear that the digital economy is here across all industries and in many cases, is having a disruptive impact. Let's look at why organizations need to have a strategy for digital transformation. In particular, we'll look at aspects that key stakeholders take into consideration, before briefly summarizing the business value that SAP S/4HANA brings to the table. Although we've already discussed the business value of SAP S/4HANA in earlier chapters, we want to restate our case before diving into the current landscape.

11.1.1 Points of View

We'll explore two related key questions in this section:

1. What does "digital transformation" mean?

2. Is SAP S/4HANA a prerequisite for digital transformation?

To build a transformation road map enabled by SAP S/4HANA, it's important to understand the answers to these two questions. This then leads to a conclusion that when looking at the transformation road map

for SAP S/4HANA, you need to take a wider and more holistic view to ensure that your business vision is addressed. In other words, the underpinning IT road map, which will include SAP S/4HANA, needs to take a wider and more holistic view of the other technology enablers, options, priorities, and dependencies.

Let's first look at what digital transformation is. This has been covered in detail in Chapter 1, so we'll only briefly summarize the most relevant points here.

Digital transformation includes new technology, a new way of engaging with customers, and, for many, represents an entirely new way of doing business and defining new business models. In many cases, there are a diverse range of perspectives from across and within organizations that ultimately leads to a lack of alignment and common vision about where the business needs to go. This often results in piecemeal initiatives or misguided efforts that lead to missed opportunities, false starts, and regret costs when organizations look at building their digital transformation road map. Ultimately, however customer value needs to be centric and key.

Clearly, the emerging new technologies (e.g., big data, social media, Internet of Things [IoT], and mobile, cloud, and cognitive computing) are driving this disruption. While some of these newer technology areas focus on the systems of innovation and systems of differentiation domains based on Gartner's pace layered application strategy, the modernized digital enterprise resource planning (ERP) in the systems of record domain is a key enabler, removing many of the constraints from today's ERP systems.

> **Note**
>
> Gartner's pace layered application strategy is a methodology for categorizing, selecting, managing, and governing applications to

Today's ERP systems can be regarded as monolithic and inflexible to business change, restricting business innovation with an aged user interface (UI) and a lack of real business insight. On the other hand, SAP S/4HANA is regarded as a digital ERP core.

What we're seeing is that technology is the foundation for organizations transforming to digital. As shown in Table 11.1, businesses no longer view technology as a means to an end but as an enabler to address business outcomes and vision.

Technology	Benefits
Cloud computing and services	Benefits include more speed and agility, lower capital expenditure and operating costs, more productive use of IT resources, easier collaboration, accelerated time to value, higher adoption of new technologies, and value chain connection in real time.
Mobile and user experience (UX)	Benefits include access to real-time data and decision-making, as well as opportunities to improve customer experience. Mobile is the preferred method of exchanging information and services for organizations and professionals of all kinds anytime, anywhere, especially business-to-consumer (B2C).
IoT and big data, including data insights	IoT digitizes our world, providing us with prolific amounts of data. Along with other new structured and unstructured data sources over and above the traditional

	systems of record, new delivery models can be developed that allow businesses to engage in new value creation. For example: • Use assets better • Unlock new revenue from existing products/service • Inspire new working practices or processes • Change or create new business model or strategy • Provide better insights into all aspects of operations • Gain better understanding and engagement of customers Use of data is only one part of it; the more important part is the analytical tools and capabilities to make sense of this data to provide real business insight.
Cognitive computing	Cognitive computing is the key to unlocking value because it enables reinvention of existing business models and development of new business models. ERP systems (transactions and analytics) are fundamentally transformed by embedded cognitive methods to deliver insights and recommendations at the point of impact. Unstructured external data processing and continuous machine learning help these ERP systems evolve continuously with changes in the external environment. Cognitive computing can help make

	sense of the exploding data created by the Internet of Everything (IoE).
Redesigned business processes based on digitally enabled ERP core (e.g., SAP S/4HANA and SAP HANA Cloud Platform)	Benefits include greater efficiency, cost savings, potential for mass customization, easier experimentation and opportunity to react to business requirements, and deeper insight into business through advanced analytics capabilities.
SAP's Line of Business (LoB) solutions for SAP ERP Human Capital Management (SAP ERP HCM), commerce, procurement, and so on (e.g., SAP SuccessFactors, SAP Hybris, SAP Ariba)	New deployment models are available for traditional systems of record transactional processing.

Table 11.1   Key Technology Factors

Although each individual technological advance is expected to deliver significant benefits on its own, it's actually the confluence of these different technologies that holds the greatest promise and delivers the biggest value across all industries, creating exponential impact through technology combinations.

What is clear is that old technology can't keep up with the speed of digital transformation. Traditional enterprise systems of record were never designed to be systems of flexible engagement. No matter the industry, competition armed with advanced technology can emerge literally at any time based on disruptive business models.

In the more holistic approach to digital transformation, SAP S/4HANA is one of the technology-enabling components along with other technologies. Zooming in, we see that the following are the key business

levers addressing the new focus and new ways of working with new expertise:

- Creating differentiating experiences for customers, employees, and others

- Driving the way the organization works (people, process, and technology)

- Developing new ways of realizing and monetizing value

- Managing value, finance, and risk

- Spawning new business models, financing, and risk assessment

- Creating the strategy and execution plan for delivering experiences to the market

- Engaging and monetizing customer relationships

- Employing predictive, prescriptive, and advanced analytics

- Leveraging cognitive analytics to create deep and advanced competitive differentiation

- Digitizing products, services, and processes to redefine experiences with customers

- Leveraging cognitive computing, IoT, and automation

- Embedding situational awareness throughout the value chain

- Decapitalizing infrastructure and leveraging partner and full network strengths

- Developing novel relationships that unleash new sources of value

- Identifying, retaining, and building the right talent for a digital organization

- Creating a culture of design thinking, agile working, and experimentation

While technology, and especially SAP S/4HANA as the digital SAP ERP core, can be an enabler to address business outcomes and vision (e.g., engaging customers in the digital age, delivering first-class UX, driving demand and revenue, changing business models through technology, etc.), it must be mapped to business strategy and levers on the inner ring.

This then leads us to the second issue regarding whether SAP S/4HANA is a prerequisite for digital transformation. It's clear that the characteristics of SAP S/4HANA (which removes many of the constraints of today's SAP ERP solution) and the wider SAP HANA platform (e.g., analytics with SAP HANA Live; SAP HANA Cloud Platform; integration with big data; SAP Fiori UX, etc.) are key enablers. However, as indicated previously, it's the confluence of different technologies that changes the game, not SAP S/4HANA alone. In many cases, some early value and benefits of organizations on a digital transformation journey can be achieved before SAP S/4HANA adoption.

So let's look at SAP S/4HANA as the modern digital core and exactly what that means, as depicted in Figure 11.1.

The following breaks Figure 11.1 down into the various dimensions:

- The outer ring looks at some of the key CxO challenges in today's digital era as defined in the IBM C-Suite Studies (see Chapter 1, Chapter 3, and Chapter 4).

- The middle layer looks at some of the digital transformation technology enablers, focusing on the systems of innovation and systems of differentiation domains in Gartner's pace layered application strategy model mentioned previously.

- The inner ring focuses on the systems of record enablement layer with SAP S/4HANA, SAP's ERP digital core, and the other industry and LoB solutions (as addressed in Chapter 5) that make up the SAP landscape across the systems of record domain.
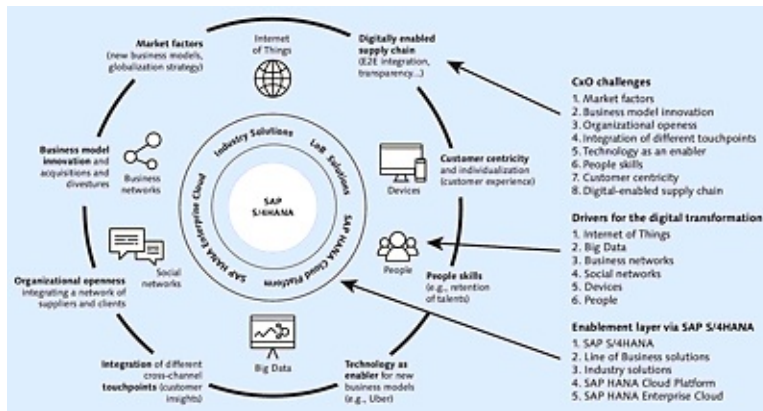
Figure 11.1   SAP S/4HANA: Transforming the SAP ERP Core into a Digital Enterprise Core

Therefore, SAP S/4HANA isn't specifically a prerequisite for digital transformation because there are a number of initiates and opportunities across all domains of the pace layered application strategy domains that will facilitate an organization's transformation to a digital enterprise. In fact, even within the systems of record, SAP S/4HANA is just one part. However, when you look at the SAP S/4HANA vision, it removes many of the constraints of today's ERP systems and has many of the following characteristics that will modernize and renovate the core systems of record for the SAP ERP system to facilitate the digital reinvention:

- **Reimagined business models**
  Connections to people, devices, and business networks are made simple through the SAP HANA platform and integration with SAP S/4HANA.

- **Reimagined business processes real-time business insights**
  Batch processing is no longer necessary because all processes are in real time, and analytics are embedded in transactions.

- **Flexibility, agility, and speed to value**
  SAP HANA Cloud Platform can be used for agile DevOps in the cloud.

- **Reimagined UX**
  Any device can be used to get the job done with SAP Fiori UX and other UX for interactive graphics (e.g., SAP BusinessObjects Lumira) and for mobile iOS with selected Apple apps.

With this in mind, SAP S/4HANA and modernization of the core ERP will be a key part of the journey.

11.1.2   Business Value

So what does this mean in terms of the SAP S/4HANA benefits for the enablement layer? In summary, SAP S/4HANA is a new generation of ERP solution running in real time and integrating predictive analytics, big data, and mobile computing, which will change how we work, how we run our businesses, and how we consume information. What is to be gained here?

- **Real time**
  Having data in real time will change how you work, do business, and organize your enterprise.

- **Power of prediction and simulation**
  Every employee can leverage real business insights to drive perfect decisions, improve productivity, and increase profitability.

- **Agility**
  Agility is required in the digital economy as it allows you to rapidly enter new markets, onboard new companies, and reflect organizational changes in a tenth of the usual time.

- **Deployment choice and lower TCO**
  Deployment options include in-house or on the cloud, which frees up more budget for innovation.

- **Consumer-grade UX**
  The modern UX drives adoption, user engagement, and productivity.

11.1.3   Making the SAP S/4HANA Case

When making the case for moving to SAP S/4HANA, you should first focus on the business outcomes and business benefits as follows:

- Understand the industry and pain points, including industry-specific and horizontal solutions (e.g., finance, sales, logistics), as shown in Table 11.2.

- Provide examples of the business processes that derive value from SAP S/4HANA (qualitative and quantitative).

- Show quick demos (with the new SAP Fiori UX, big data, analytics, cognitive computing).

- Look at opportunities to align the SAP S/4HANA adoption to other business initiatives such as digital transformation or other LoB initiatives such as finance or marketing transformation.

Examples of Customer Challenges	What SAP HANA Enables
- Data latency issues for operational reporting - Long lead time for new developments and reports - Aged UI preventing "anytime, anywhere" access - Multiple sources of truth, nonvalue-added processes - Highly customized core, which leads to high TCO - Incomplete information to make insightful business decisions	- Move of operational analytics back to OLTP and real-time reporting - Self-service reporting, SAP HANA Cloud Platform for DevOps in the cloud - Mobile-friendly UI: SAP Fiori, SAP BusinessObjects Lumira, and design thinking - Simplified data model: no aggregates, indices, and so on - SAP Activate (Content Lifecycle Management), SAP HANA Cloud Platform - Cloud analytics, SAP HANA Vora, advanced analytics
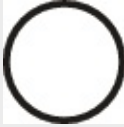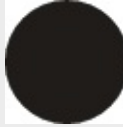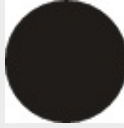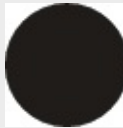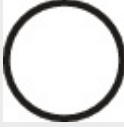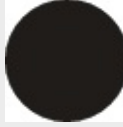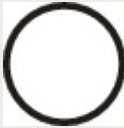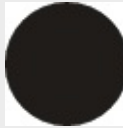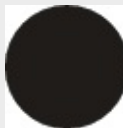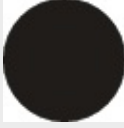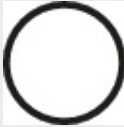
Table 11.2 Operational Pain Points Mapped to SAP HANA Enablers

The next step is to build your case for business simplification and creating business value using the following resources:

- Consider the industry and LoB solution viewpoints created by the IBM-SAP Digital Transformation initiative as additional sources of input to help make the business case for SAP S/4HANA and other technologies as part of a digital transformation. See *http://www.ibm-sap.com/digital_transformation* for these thought leadership viewpoints.

- Look at use cases by industry (e.g., consumer packaged goods [CPG], retail, banking, industrial products) that can be enabled by the SAP HANA platform to drive business value. See *http://www.ibm-sap.com/digital_transformation* for examples of digital transformation solutions and assets being codeveloped by IBM and SAP around industry-focused use cases powered by SAP HANA and other technology such as IoT and cognitive computing.

- Execute SAP S/4HANA business scenarios analysis to look at areas of potential value for SAP S/4HANA adoption. With the business scenario recommendations for SAP S/4HANA, IBM will help provide tailored recommendations based on your current productive system usage to show you where you can benefit most from SAP HANA, SAP Fiori, and SAP S/4HANA.

- Use the report at the following site to see which business scenarios are most relevant for you based on the data you submitted for analysis, including an indication of potential IT and business value: *https://service.sap.com/~form/handler?_APP=00200682500000002672&_EVENT=DISPLAY&_SCENARIO=&_*

Table 11.3 provides a summary across the key areas of considerations based on a specific customer example. No relative weighting has been applied, which should be factored in based on your priorities and IT/business context.

	SAP	SAP	SAP	SAP

	ERP AnyDB	Business Suite on SAP HANA	S/4HANA Finance (e.g., 1605)	S/4HANA (e.g., 1610)
Alignment to stated SAP road map	○ (empty)	◔ (quarter)	◐ (half)	● (full)
Functionality (e.g., core LoB and industry solutions)	◔ (quarter)	◔ (quarter)	● (full)	◔ (quarter)
Innovation and optimization (new functionality, enterprise-wide reduction of business model complexities)	◔ (quarter)	◔ (quarter)	◕ (three-quarter)	● (full)
Operational benefits (e.g., removal of batch processing)	○ (empty)	◔ (quarter)	◕ (three-quarter)	● (full)
Analytics benefits (e.g., real-time operational reporting)	○ (empty)	◔ (quarter)	◕ (three-quarter)	● (full)
Usability and UX (e.g., improved SAP Fiori UX)	◔ (quarter)	◐ (half)	◕ (three-quarter)	● (full)
Implementation costs, time line, etc. (pending full SAP Activate)	● (full)	◕ (three-quarter)	◕ (three-quarter)	◐ (half)
Longer-term TCO (e.g., custom developments, migrations, support)	○ (empty)	◔ (quarter)	◐ (half)	◔ (quarter)
Risk/maturity	● (full)	◕ (three-quarter)	◕ (three-quarter)	◔ (quarter)

Legend: ◯ = Worst ● = Best

Table 11.3 SAP S/4HANA Comparative Analysis

Take a close look at the asterisk in the Fᴜɴᴄᴛɪᴏɴᴀʟɪᴛʏ row in Table 11.3. While the new SAP innovations will be developed "SAP HANA first," there needs to be an assessment of required functionality (e.g., line of business solutions, industry solutions, country versions, and so on) to confirm that the functionality is available in relevant SAP S/4HANA release.

Although still a work in progress to transform fully all processes, SAP S/4HANA is the only in-memory, end-to-end solution that covers all business processes across 25 industries.

11.2 Developing Your Road Map Using the Open Group Architecture Framework

In this section, we'll show you how to develop your transformation road map. Ideally, the approach for defining the road map should be based on the Open Group Architecture Framework (TOGAF) method. TOGAF is a framework for enterprise architecture that provides an approach for designing, planning, implementing, and governing an enterprise information technology architecture modeled at four levels: business, application, data, and technology. SAP Enterprise Architecture Framework (EAF) is a TOGAF-based approach.

We'll use extracts of the IBM Better Transformation method as a guide and basis for a road map definition. The IBM Better Transformation (illustrated in Figure 11.2) method for road map *definition* and *execution* provides a framework that leverages assets to help with "as-is" analysis and "to-be" envisioning. This framework leads to the development of an IT road map that can be delivered to transform the organization. The road map addresses individual IT initiatives, priorities, dependencies, options, business cases, sequencing and timing, and activities to execute the delivery of the road map's component parts.
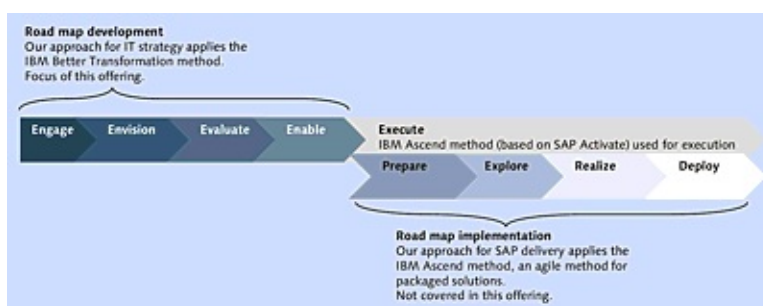
Figure 11.2   A Complete End-to-End Approach from Road Map Definition to Execution

The road map *development* stage includes the following four distinct phases that are described in detail in subsequent sections:

- **Engage**

Analyze the CMO.

- **Envision**
  Explore the target operational model (TOM).

- **Evaluate**
  Deep dive into the transformation approach.

- **Enable**
  Build the road map.

After the transformation road map has been successfully defined, you can carry out the final *execute* phase. For this, we propose the use of IBM Ascend, which leverages the SAP Activate methods and tools to deploy the target solution. The integration of an IBM Ascend (SAP Activate) method for execution of the road map provides a complete and integrated end-to-end approach from road map definition to project execution while providing the following benefits:

- The enable phase within the digital transformation road map develops the business case.

- A clear view of how the transformation can be delivered is developed.

- The outputs of the road map work accelerate the prepare and explore phases of the execute phase.

In this section, we'll look at the detailed phases and outcome objectives of the approach to defining the IT road map that supports organizations on their digital reinvention journey. Each phase is based on a TOGAF-based EAF. Each section shows an indicative but not comprehensive view of the objectives, activities, and outcomes by phase to deliver the transformational IT road map based on extracts of key activities. At a very high level, we'll attempt to achieve the following:

- **Landscape**

  - Simplify on-premise landscapes by moving applications to the cloud.

  - Rationalize on-premise SAP applications, looking at areas for

migrations to a preferred instance.

- Optimize and consolidate SAP instances via technical merge and harmonizations.

- Consider changes in the way employees now consume data via mobile devices and the transition to the "individual enterprise."

- **Platform**

  - Assess the value and readiness for SAP HANA adoption.

  - Understand the options for the IT platform (e.g., SAP Customer Relationship Management [SAP CRM] versus SAP Hybris Cloud for Customer, SAP Integrated Business Planning versus SAP Supply Chain Management [SAP SCM], SAP S/4HANA Cloud versus SAP S/4HANA, on-premise edition; use of SAP HANA Cloud Platform as part of an agile DevOps strategy).

- **Process**

  - Modernize the SAP ERP core to enable the business digital transformation.

  - Consider changes in the way employees now consume data via mobile devices and the transition to the individual enterprise.

Note

As you work through the phases, it's important to keep in mind that the move from the CMO to a target state FMO needs to go via multiple iterations, or interim modes of operation (IMO). In fact, it could be viewed that the FMO is a state that is never actually achieved because it's a moving target that will be reviewed and revised during the transition journey at the different IMO stages and then tested against the ever-evolving business strategy.

11.2.1 Engage Phase: Analyzing the Current Mode of Operations

The first phase of the IBM Better Transformation framework is known as the *engage phase*, in which you take a look at and analyze the as-is application landscape and propose a vision for the desired end state.

The activities of this phase are as follows:

- Collect the following data on the current environment:
  - As-is IT landscape
  - Application portfolio
  - IT strategy
- Understand the following parts of the business vision:
  - Target operating model
  - Pain points
- Compare CMO versus the target FMO of the model company for a specific industry by doing the following:
  - Identifying opportunities for digital transformation initiatives
  - Setting up the envision phase workshop to identify participants, logistics, and so on

The goals for this phase are as follows:

- Documented understanding of the current IT landscape and application portfolio
- Gaps identified between the CMO and the FMO
- The identified gaps drive the workshop to be run in the envision phase

11.2.2 Envision Phase: Exploring the Target Operation Model

The second phase of the IBM Better Transformation framework is known as the *envision phase*, in which we explore the target operating model

(TOM) in the context of the business and IT strategy, the current pain points and business expectation gaps, and the business case for digital transformation.

The activities of this phase are as follows:

- Explore the findings of the engage phase.

- Explore the opportunities identified in the context of the client's business ambition and IT strategy.

- Demonstrate how current business expectation gaps are closed.

- Establish digital transformation priorities around key technology components.

- Decide to proceed with the evaluate phase.

The goals for this phase are as follows:

- Envision the workshops completed.

- Align qualified digital transformation opportunities to technology enablers and value propositions.

- Decide to proceed and contract in place to move into the evaluate phase.

11.2.3 Evaluate Phase: A Deep Dive into the Transformation Approach

The third phase of the IBM Better Transformation framework is known as the *evaluate phase*, in which you define an approach to address the priorities identified in the envision phase to modernize the core of the enterprise applications and deliver digital transformation. During this phase, you demonstrate solutions and iteratively build agile proof of concepts/proof of value.

The activities of this phase are as follows:

- Evaluate the current IT strategy and its ability to deliver the FMO and identify gaps.

- Run initiatives to deep dive into the identified transformation opportunities.

- Model business components to identify operational versus differentiating applications.

- Identify application consolidation opportunities.

- Identify application rationalization opportunities.

- Define key architecture principles and decisions for the IT road map.

- Identify alternative options, and make assessments based on business- and IT-ranked evaluation criteria.

- Run iterative proof of concepts/proof of value based on immediate priorities.

The goals of this phase are as follows:

- Assess current strategy, identify improvements, and articulate business values.

- Define a prioritized set of actions to deliver business value.

- Identify tools and accelerators for road map delivery.

11.2.4   Enable Phase: Build Your Road Map

The fourth phase of the IBM Better Transformation framework is known as the *enable phase*, during which you define the road map to introduce the FMO and close business expectation gaps based on prioritization of business capabilities.

The activities of this phase are as follows:

- Develop a prioritized portfolio and IT road map to achieve business objectives.

- Develop a supporting business case.

- Develop a plan to deliver the transformation and associated business objectives.

- Plan the approach for architectural vitality.

The goals of this phase are as follows:

- Define the road map and supporting plan showing the path to the FMO via an IMO.

- Define the approach for periodic application reviews of the road map against business ambition and needs.

11.3 Understanding the As-Is Current Mode of Operation

It's very rare that to be faced with a greenfield situation where you can start from a blank canvas, so you need to also take into account the constraints of the CMO and any inhibitors that may prevent moving to the target FMO end state. However, you do need an FMO strawman in mind for testing the various hypotheses against when looking at the target end status based on business drivers and business benefits.

In this section, we'll discuss the CMO—taking a quick look at existing pain points before diving into some analysis tools from SAP, IBM, and other third-party providers. This corresponds to the engage phase of the IBM Better Transformation framework.

11.3.1 Pain Points

Ultimately, there needs to be a reason to act. While this needs to be mapped to the business vision, to make a change at the technology layer needs to be mapped to a pain point on the existing technology domain, whether that is as simple as compliance factors (e.g., older versions of software), it ultimately needs to be mapped to business value.

Table 11.4 provides some examples from LoB questions in the CMO and marketing domains.

Questions to Ask	Pain Points That Need to Be Addressed
Do you have a comprehensive view of your customers? Are you able to engage customers consistently across channels?	Real-time customer insights aren't available to understand customer intentions (customer can be a final consumer or a company).
Are you able to develop a	The company can't connect with or

dialogue with all your customers?	engage customers.
Are you proactive with your sales and marketing?	The sales and marketing process is too long and inflexible to react quickly.
How well are your commerce and marketing technologies integrated with one another? Is there seamless process automation across key processes?	The technology landscape is complex, and there are too many silo systems.

Table 11.4 Key Considerations for Drivers to Innovation

Your specific pain points will vary based on your industry, but part of the engage phase will be to identify those that are relevant to your business.

11.3.2 Objectives

The objective of the engage phase is to analyze the CMO application landscape so that a vision can be put forward for the desired end state based on the client's current landscape.

This phase of the engagement is key to gather the information required to prepare for the envision phase workshop. The workshop needs to be tailored to assess the client's SAP landscape and gather the relevant information prior to initiating this session.

To maximize the information gathered and to reduce time lines, a set of SAP, IBM, and third-party tools have been identified, especially around the SAP HANA Readiness Assessment, to help understand the CMO and the impact of the transition to SAP S/4HANA. The output will be input into the options and recommendations.

11.3.3 Approach

Now we'll look at the tasks and activities as well as what tools (accelerators) can be used to carry out the two main pieces of work of the engage phase: analyzing the CMO and proposing a vision for the desired end state.

The analysis is carried out on the organization's current as-is landscape focusing on the application landscape:

- **Workshops**
  General and specific sessions with application owners, IT, and business owners are held to understand and document the range and depth of the application architecture and landscape for both SAP and non-SAP systems. In many instances, the organization will already have a lot of this documented in various forms. Consolidating this understanding is an important part of the workshops and subsequent follow-up sessions.

- **Technical assessments**
  Detailed analysis and statistics from existing systems and applications such as analysis of the SAP EarlyWatch reports can be used to document existing challenges and provide a view of the CMO.

- **Interviews and questionnaires**
  These methods are used to gauge a more detailed understanding of key areas following the workshops with key IT and business stakeholders.

You'll also need to propose a vision for the desired end state based on the CMO analysis with the FMO in mind. To do this, we propose the use of some or all of the following activities:

- Compare the CMO with the FMO target in mind to identify opportunities and innovations.

- Provide relevant business cases for identified digital transformation opportunities.

- Recommend opportunities to address with the digital transformation

road map.

Some accelerators are available to help with this stage of the transformation road map:

- Target FMO reference architecture
- Technology questionnaire
- SAP S/4HANA business case and road map creation
- SAP Journey Maps
- SAP UX Explorer
- SAP cloud computing explorer
- IBM Technical Healthcheck
- SAP HANA Readiness Assessment
- SAP business scenarios recommendations

11.4 Defining the To-Be Future Mode of Operations

In this section, we'll discuss the FMO, that is, how to achieve the digital transformation discussed in Chapters 1 and 2 and how to address the pain points identified there and in Section 11.3.1. We'll discuss the principles of enterprise architecture and show you how to map a business strategy and TOM to your processes and applications. In short, we'll show you how to plan your future landscape. This corresponds to the envision phase of the IBM Better Transformation framework. The objective of the envision phase within the digital transformation road map is to start defining the options and considerations for the target FMO.

11.4.1 Considerations

There are two key challenges in defining a successful digital transformation strategy:

- **Lack of business alignment and vision**
  A diverse range of perspectives from across and within organizations may lead to a lack of alignment and common vision about where the business needs to go and how it can get there. This lack of alignment can often result in piecemeal initiatives or misguided efforts that lead to missed opportunities, false starts, and regret costs.

- **Lack of IT alignment and vision**
  A lack of alignment and common vision about where IT needs to go to support the business, partly caused by the plethora of technologies, can also lead to piecemeal IT initiatives that fail to support the real business vision, with missed opportunities, false starts, and regret costs.

Ultimately, while technology is an enabler to achieve business outcomes and vision, a successful road map must be created to support the

realization of the business strategy. There also needs to be a framework for helping customers on their journey.

11.4.2 Approach

Now we'll look at the tasks and activities to carry out the main pieces of work during the definition of the CMO. We'll begin by envisioning the FMO and running a series of workshops to explore the FMO in the following contexts:

- **Business and IT strategy**
  Identify how closely the IT strategy and business strategy are aligned, identify any piecemeal anomalies and proposals to close the gaps, and identify how the FMO fits into the IT and business strategy.

- **Current pain points and business expectation gaps**
  Using information from the CMO analysis (via the workshops, questionnaires, interviews, and technical assessment), define how pain points can be addressed in the FMO and how gaps in business expectations can be plugged.

- **The business case for digital transformation**
  Begin the process of defining the key elements of the business case for digital transformation. Identify key qualitative and quantitative measures.

The key inputs of this phase are as follows:

- **Outputs from the engage phase**
  The CMO analysis, pain points, business expectation gaps, and opportunities identified in the engage phase.

- **Current IT landscape**
  The current application landscape identification.

- **IT strategy**
  Description of how the IT strategy is aligned to support the current

business strategy.

- **SAP technology road map**
  The latest technology road maps from SAP with regards to the SAP applications in the current application landscape.

- **Relevant point of view**
  The business case viewpoint for digital transformation.

The main activities of this phase are as follows:

- **Facilitate workshops to achieve the following:**

  - Present the context and business case for digital transformation opportunities to reduce TCO and better meet requirements.

  - Review the findings of the analysis in the engage phase.

  - Present initial recommendations on the opportunities for digital transformation initiatives based on SAP value engineering and the IBM CxO studies contextualized for SAP.

  - Discuss these recommendations in the context of the client's business ambition, IT strategy, perceived business expectation gaps, current pain points, and the SAP technology road map.

  - Qualify and prioritize the opportunities for digital transformation mapping solutions to solve problems and pain points, and, if applicable, reduce TCO.

  - Tailor the initial business case for the digital transformation initiative to make it even more specific to individual organizations.

  - Plan the evaluate phase.

- **Tailor your business case**
  Present a tailored business case for digital transformation, including a set of desired business outcomes to be met by the digital transformation activity.

- **Identify opportunities**

Identify qualified opportunities for digital transformation that include tailored use cases. These use cases identify candidate processes that can be simplified with initiatives aligned to the latest technology road maps, including industry and solution points of view:

- Platform optimization and advanced analytics with migration to SAP HANA
- Migration to the cloud and taking advantage of SaaS (e.g., SAP Ariba, SAP Hybris, SAP SuccessFactors)
- Mobile solutions and UX modernization for user engagement

Some accelerators are available to help with this stage of the transformation road map, as follows:

- Target FMO reference architecture
- IBM viewpoints on the business case for implementing new technologies aligned to a technology road map
- IBM component business model (CBM)
- SAP HANA adoption scenarios
- SAP S/4HANA business case and road map creation
- SAP Journey Maps
- SAP UX Explorer
- SAP cloud computing explorer
- IBM Explore SAP HANA

11.5   Choosing How to Adopt SAP S/4HANA

In the following sections, we'll discuss your options for how you'll get SAP S/4HANA based on business priorities and IT dependencies. This sections corresponds to both the evaluate and enable phases of the IBM Better Transformation framework.

Each SAP landscape is different, so before moving to SAP S/4HANA, it's important to understand how LoB processes from the SAP ERP in the past are currently covered between SAP S/4HANA and SAP cloud solutions.

11.5.1   Evaluate Phase

In this phase, you perform the following activities that can help evaluate your options:

- **Rationalize**
  Use component business modeling (e.g., IBM CBM) to align applications that support each component of the Gartner pace layered application strategy model. This will help identify opportunities for rationalization and make sourcing (build vs. buy) recommendations.

- **Consolidate**
  Conduct application consolidation analysis to identify where benefits can be realized from process harmonization and technical consolidation.

- **Modernize**
  Carry out application modernization analysis to define the ideal current and future state for the current and ported applications. Look at the new versions of SAP, for example, SAP S/4HANA and hybrid ERP (mix of on-premise and cloud SaaS applications).

- **Determine the individual enterprise**

Carry out user productivity analysis—perhaps using Design Thinking client workshops—to identify use cases where the need for a "consumer-grade" UX will increase user adoption and productivity can be increased with the use of SAP UX modernization (SAP Fiori, SAP Screen Personas) and mobility.

- **Identify target component architecture**
  Complete product evaluations to identify the most appropriate technical component to deliver the business ambition. This activity will define the target component architecture—the FMO.

- **Perform demos and create prototypes**
  Build and demonstrate prototypes to bring the road map to life. Use time boxed iterations to maintain momentum.

- **Address key issues**
  Develop approaches for the key issues associated with digital transformation, integration, security, and data governance.

11.5.2   Enable Phase

Some of the additional activities that can be carried out to design the path to value by finalizing the road map to introduce the FMO are as follows:

- Develop and finalize the deployment road map. Use a framework such as the IBM application lifecycle management (ALM) framework shown in Figure 11.3 to break down the transformation journey into a series of manageable steps. This will set out an approach and time lines for the technology transformation from the CMO to the defined IMO and finally on to the FMO.
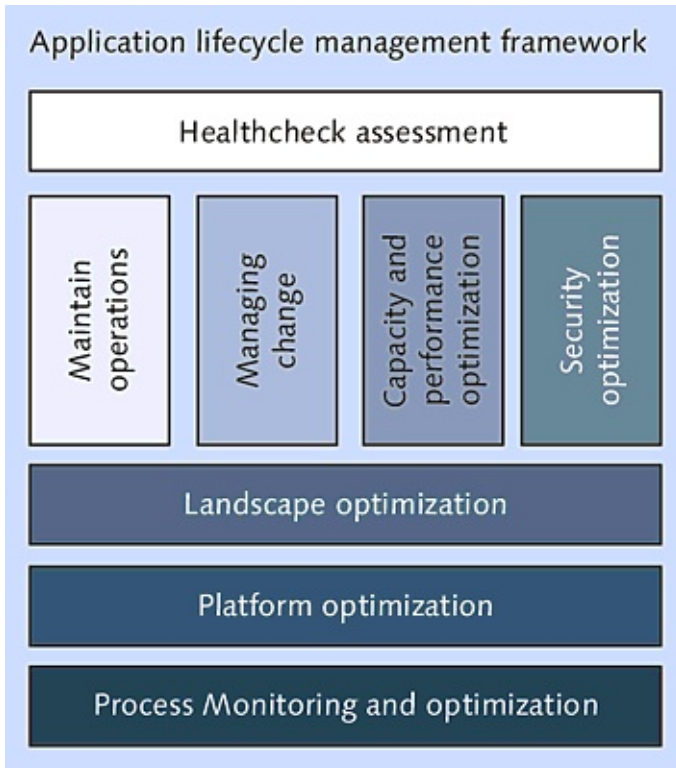
Figure 11.3 IBM's Application Lifecycle Management Framework

- Develop an implementation plan to validate the transformation time lines. This will also feed in the execute phase.

- Develop an approach to maintain architectural vitality. Periodically review the FMO in the light of advancements in technology or business ambitions.

11.6 Summary

In this chapter, we discussed an approach to developing a digital transformation road map and some of the considerations required. We proposed the use of the IBM Better Transformation framework method to guide you through the journey of identifying and analyzing your CMO, documenting associated pain points and business gaps vis-à-vis the FMO vision and then identifying IMOs based on priorities to define a road map.

Many SAP ERP customers still find it difficult to define the business case for SAP S/4HANA. In this chapter, we'll show you the value that was realized by SAP S/4HANA in real projects that can help to build your own business case.

12   Customer Case Studies

Don't forget that implementing SAP S/4HANA and taking advantage of the IT, finance, and logistics business benefits it offers isn't the destination but, instead, simply a stepping stone that will help you along your journey to digital transformation. Technological advances are disrupting the status quo and creating huge turbulence. Industries are converging and new competitors are emerging at breakneck speed. The pressure to innovate has never been greater, nor has managing the risks been more difficult. So how are CxOs carving a path through the chaos and helping their enterprises pursue profitable growth?

Let's look at a series of case studies, beginning with two customer projects that can help showcase the allure of SAP S/4HANA Finance. Of course, it's important to mention that for each business case, the focus should not only be on the cost of implementing SAP S/4HANA but especially on the business benefits it brings (e.g., the finance organization becoming a real business partner for the CEO, supporting him with real-time insights).

12.1   Multinational Industrial Company

A multinational industrial company is operating in a multi-ERP system landscape, which means that instead of having a single ERP instance

running its business, the company has a landscape with multiple versions of SAP instances and non-SAP instances. To report financials on a global scale, they usually develop global financial data standards such as a global chart of accounts or develop a common definition of profit centers, cost centers, and so on.

However, this approach requires a high degree of governance and reconciliation between all systems that use common global master data. The only place where financial data comes together on a global scale is a financial information warehouse and the consolidation system itself. However, this isn't a real-time process; data can be accessed one day later after a nightly upload or, sometimes, only after a month-end closing process has been finished. Further, most of the time, this consolidated financial information is delivered on an aggregated level only and not always uploaded via an automated interface to this consolidation system; this makes it impossible to drill down to the details behind these consolidated figures. In many cases, the closing process timelines are jeopardized as well because the upload to the consolidation system fails due to master data issues.

This kind of financial architecture and data flow is common in many multinational organizations. In this architecture (see Figure 12.1), an SAP Business Warehouse (SAP BW) system is often used as a kind of *financial data warehouse* to collect financial information from various source systems before sending the data to the corporate consolidation system.
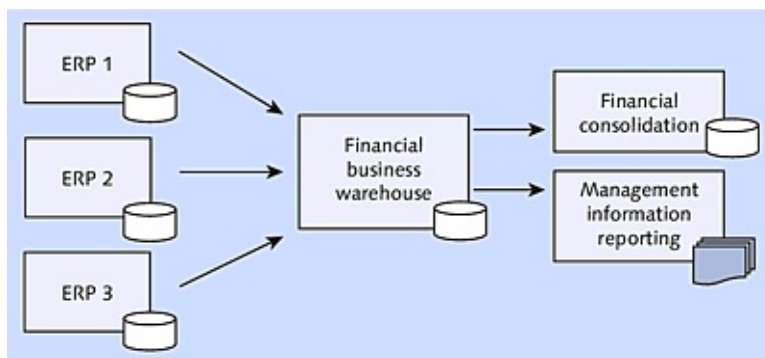
Figure 12.1   Typical Financial Architecture and Data Flow

However, because the load of data to a central system is irregular, this architecture causes the following problems:

- Because inconsistencies can only be detected late in the closing process, intercompany reconciliation issues arise that add to the time needed for the closing processes.

- There is a lack of instant insight into cash flow and working capital movement on the group level.

- With financial data in the local ledgers *and* in the consolidation ledger, there are multiple versions of truth that cause transparency issues.

- Most of the time, the load to the consolidation system is a nonstandard solution containing massive data mapping constructs that results in high total cost of ownership (TCO).

Can this be rectified with SAP S/4HANA? Let's see.

12.1.1   Vision

To overcome these problems, this customer was looking for a way to consolidate its financial system environment and create a single source of truth for finance by implementing SAP S/4HANA Finance via the Central Finance deployment model. The company envisioned that the end-state architecture could look like .
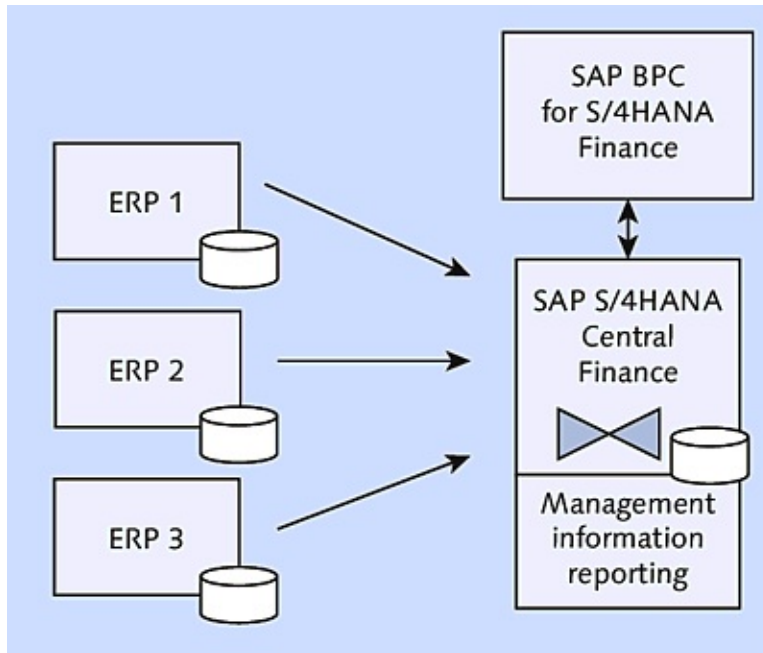
Figure 12.2   SAP S/4HANA Finance End-State Architecture

In this architecture, detailed financial transactions will be *replicated* in real time to a Central Finance box. In this process, the mappings needed between source and target systems will be handled by SAP Master Data Governance (SAP MDG) functionalities. This function can be used, for example, to make source data that employs different financial data standards compliant to the global financial data standards. (In this scenario, we can assume that consolidation functionalities are provided SAP BPC for S/4HANA Finance.)

So in this architecture, we expect that most of the management information reporting requirements can be satisfied from the Central Finance system in real time, which would eliminate the need for management information reporting via SAP BW.

12.1.2   IT Project

The main driver for this Central Finance project was to implement SAP S/4HANA without any disruption, which is only possible using the sidecar approach. This also enabled the client to integrate and consolidate

multiple SAP ERP systems into one SAP S/4HANA system. The client was able to test the SAP S/4HANA Finance simplification (Central Journal) easily to pave the way to upgrade existing SAP ERP to SAP S/4HANA Finance in the future. A lot of large corporations are looking at Central Finance as a noninvasive way to introduce SAP S/4HANA in the landscape.

12.1.3 Benefits

Having all financial transactions in one SAP S/4HANA system provides the following benefits:

- Instant insight in cash flow and working capital movements on the group level

- Intercompany reconciliation process in real time to accelerate the month-end close process

- Improved transparency due to the realization of a single source of truth for finance via the Universal Journal concept

Universal Journal

Recall from Chapter 3 that the Universal Journal acts as the single source of truth in an SAP S/4HANA Finance system and needs to be based on your global and local operational financial reporting requirements.

- Improved user experience (UX) with SAP Fiori screens for core finance functionality in SAP S/4HANA

- Soft close in SAP S/4HANA as opposed to hard close in SAP ERP

- Operational reporting directly in SAP S/4HANA

- Better insight into the costs and revenues due to the introduction of account-based Profitability Analysis (CO-PA) as part of the Universal

Journal

Currently, Central Finance can only replicate data the SAP General Ledger (G/L) level and clearing information around Accounts Receivable (AR) and Accounts Payable (AP), but in a pilot version we're using in a proof of concept for this multinational industrial customer, it's possible to replicate open items as well. This will open the opportunity to use Central Finance as the single source for shared services operations.

12.1.4   Path Forward

Activating Central Finance can be done without a lot of risk. One possibility is to activate Central Finance using a sidecar scenario (see Figure 12.3), meaning that it would act initially as the source for feeding the current consolidation and corporate finance reporting environments for a limited number of sources only.
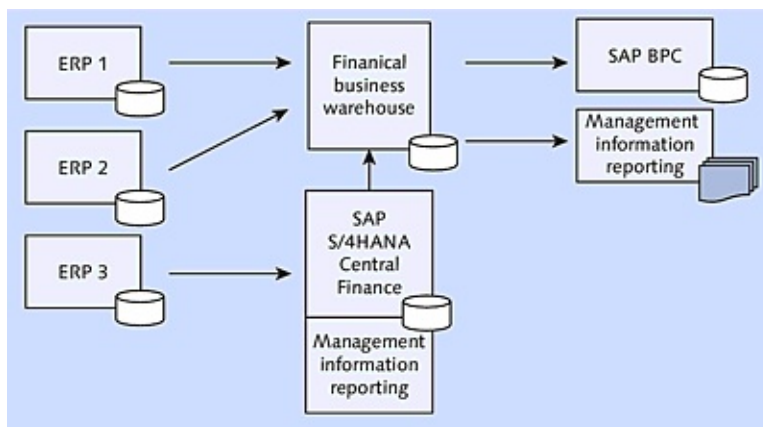
Figure 12.3   Central Finance as a Sidecar Scenario

Later, when more organizations are connected to the Central Finance box and it works satisfactorily, we could route all sources via Central Finance so it will become the single source for feeding the consolidation and group reporting systems.

In the future, we expect SAP BPC to work directly on Central Finance as well, with the application landscape as shown earlier in Figure 12.2.

Next, many of our customers today manage their cash position using Microsoft Excel. Because they operate multiple ERP systems rather than one ERP system, they don't have a standard process for long-term cash planning; the result is manual cash planning and laborious reconciliation efforts. The effect is that many customers lack insight into their cash position on a daily basis, which makes it very difficult to centrally manage risk and exposure across regions/geographies.

This customer and many others show a lot of interest in bringing cash data together in a central repository such as Central Finance. To solve the issue of the lack of a centralized financial system environment, various proof of concepts started to explore this capability of SAP S/4HANA Finance in more detail. It can provide global cash positions in real time—even in the presence of heterogeneous backend systems. New analytical capabilities provide detailed analysis on forecasted cash flows to bring greater levels of consistency to cash balances, cash requirements, and liquidity strategies.

Many large organizations are considering the Central Finance scenario as a viable option for optimizing their system landscape. Some of them already started the journey because having all their G/L-level data in one system was already enough business benefit to choose this scenario. Central Finance offers them a centralized, real-time data reporting instance that can be used as single source for the consolidation process as well. It allows them to harmonize data on the fly and will support full data mapping and document drillback.

Central Finance provides a low-risk, nondisruptive path to adopt the latest SAP finance simplification and innovations for customers with multi-ERP system landscapes. It provides a consolidated financial and management reporting instance to centralize process execution, planning, and reporting based on the same (single source of truth) data. Central Finance is also an excellent vehicle to implement financial shared

services more quickly and will be a fast track for digitally reinventing your finance function.

12.2   Multinational Service Company

Our next customer case study recently embarked on a multiyear transformation program to enable improved reliability, agility, and efficiency across all of its business segments. This global SAP implementation project on SAP S/4HANA for Finance included the following functional domains: corporate finance, supply chain, customer engagement, manufacturing, quality management, human resources, enterprise asset management, and product and services delivery processes. It has been live for six months at the time of publication.

12.2.1   Vision

Due in part from a continual series of acquisitions, this customer had a lack of consistent structure and streamlined business processes across different segments, functions, and business units. The company needed to integrate key processes across multiple functions, including corporate finance, supply chain management, customer engagement, manufacturing, human resources, enterprise asset management, and product and service delivery. To do so, the company selected the SAP S/4HANA Finance add-on.

12.2.2   IT Project

The client was already running its SAP Business Suite on SAP HANA and getting the benefits of being on the latest suite from SAP, so it was natural to upgrade to SAP S/4HANA Finance to benefit from further simplification and innovation. The key to TCO was reducing the data footprint, which was achieved due to the simplified data model.

12.2.3   Benefits

Let's look at some of this customer's pain points and how SAP S/4HANA was deployed to overcome them through a lens of the following financial business elements.

Financial Reporting and Analysis

Running detailed operational reports such as CO-PA reporting on the ERP system had an unacceptable impact on system's performance. It forced the company to extract this operational data to an SAP BW environment, which caused a delay in reporting. During the course of a given month, extracts to SAP BW were normally made only once a day, and during month-end, it could be done on demand. Furthermore, not all business data required was even available on the spot; the company often had to run month-end closing jobs to make the data available on the level needed to satisfy financial reporting requirements. The company also needed to perform a complex reconciliation task to guarantee reliable financial reporting because it had no single version of truth in its SAP landscape. Instead, the company had to deal with various ledgers such as the G/L, Asset Ledger, SAP Material Ledger (ML), CO-PA ledger, and so on. A lack of access to real-time data produced significant manual efforts in internal financial reporting and analysis.

SAP S/4HANA Finance took away the majority of these pain points because it provided one access point for all financial reporting requirements. Now the finance team never has to wonder where to report their financial data from; the Universal Journal contains all the financial information they need. It took away the necessity of reconciling the various ledgers as well.

Next, due to SAP S/4HANA technical capabilities such as in-memory processing and columnar storage, this service company no longer needs to run operational reporting in an SAP BW environment. The company can simply define and run operational reports in the SAP ERP system without jeopardizing its performance.

In a nutshell, SAP S/4HANA Finance combines financial and management accounting as well as profitability data into one Universal Journal. It abolishes totals, indices, and other predefined aggregates, and relies on line items as a single source of truth to provide an intuitive UX, reduce operational reporting efforts, and accelerate financial processes. It significantly reduced the finance business operation and analysis costs for this specific customer.

Managing Month-End Close

Beyond the described financial reporting and analysis pain points, the customer experienced more month-end misery:

- End of period bottlenecks because many activities need to be run at the same time, but not enough manpower is available to execute it in parallel

- Manual workarounds for loading data in the system due to lack of automation

- High cost of audit due to lack of transparency of the data and audit trail

The good news is that a soft close with SAP S/4HANA Finance supports the following:

- Real-time execution of closing activities

- Intra-month execution of month-end activities such as intercompany reconciliation

- Accelerated month-end batch processes and real-time reporting

- Self-service analytics, which eliminates the requirement to develop specific reports to satisfy your reporting needs

This customer was able to eliminate one third of its month-end closing processing. By combining financial, management accounting, and profitability data into one Universal Journal and offering a real-time

intuitive UX, SAP S/4HANA clearly reduced operational reporting efforts considerably.

Managing Receivables

This customer was struggling with the fact that AR-related data are only visible within the AR department. Sales and account managers talking to their clients were often equipped with outdated open item and payment history reports, making it cumbersome to discuss open item issues with their customers.

SAP S/4HANA Finance offered them all of this information in real time and easily accessible by mobile applications. Next it provided a lot of analytical SAP Fiori apps that enable exception-based management reports, allowing for proactive responses and decisions. In addition, SAP S/4HANA Finance offers the following:

- Real-time simplified analysis to help determine a customer's top line contribution

- Improved search facilities to support detailed analysis

SAP Receivables Management in SAP S/4HANA improved working capital and financial health by using real-time receivables data to assess customer credit risk, streamline billing, resolve disputes, and prioritize customer collections.

Managing Payables

As in the receivables process, payables processing suffered from delays caused by batch-oriented processes in SAP ERP. The multinational service company was bogged down by the following obstacles:

- Often manual, error-prone, and time-consuming invoice processes

- Open items only visible within the AP teams, which cause delays in the

issue resolution process

- Inaccurate view of days payable outstanding (DPO) due to lack of understanding of exceptions and duplicates

- Missed opportunities to take advantage of cash discounts

SAP S/4HANA Finance boosted the payable process significantly by allowing real-time, detailed information. It offered our customer the following benefits:

- Automating invoice management and increasing speed of payment proposal runs

- Full visibility of relevant AP invoice content

- Real-time insight into AP open items and details

- On-demand forecasting of available cash for using discount opportunities and payment term adjustments

- Improved working capital and financial health by using real-time payable data

Managing Assets

The current architecture of SAP ERP was causing inefficiencies in financial asset processing and required a reconciliation between the asset subledger and the G/L. Details on this customer's assets weren't visible in a central place, which caused the following:

- Lack of hierarchical views of depreciation areas

- Cost center asset postings only on the accumulated level, meaning the customer couldn't drill down to the individual asset

- A complex way of running the deprecations for the various depreciation areas

The Universal Journal in SAP S/4HANA Finance removed the need for reconciliation. All detailed asset data can be viewed from here, and depreciation can be run much simpler due to simplified processing logic and data structures. Multiple parallel documents for all valuations are posted in real time to ensure correct values from the beginning.

12.2.4   Path Forward

For both customer engagements, SAP S/4HANA Finance showed clearly it has the potential to remove pain points that couldn't be resolved with SAP ERP functionality. The client was one of the very early adopters of SAP S/4HANA 1503; the next step would be to upgrade to SAP S/4HANA Finance 1605 to benefit from the latest updates. Now that migration from 1503 and 1605 to 1610 is possible, the client will eventually migrate to SAP S/4HANA 1610 and start enjoying the benefits of logistics simplification and innovation as well.

12.3   Water Solutions Manufacturing Company

Our next case study is about a leading manufacturing company of industrial products. The company is continuously seeking future growth opportunities, either in new products or in new markets. The company realizes that to promote the growth, it needs to have a world-class ERP infrastructure.

Let's get a better understanding of the company's key pain points to see how they can be addressed by SAP S/4HANA.

The company is continuously seeking growth opportunities, either in emerging markets or in new products. Some of the challenges in this area are the following:

- Inability to measure and report partnership effects

- Inability to use significant amount of data for decision making, analysis, and reporting purposes

- Inability to implement specific requirements that may come with the introduction of new products and new markets

Additionally, the company was also facing the following challenges in the core business processes:

- Inability to make operational decisions in core processes due to unavailability of data and insufficient analytics

- Inability to balance operational efficiency with continuous investments

- Lack of transparency in its diverse dealer network with a variety of commitment levels and ability

When these challenges coalesce, the company may miss opportunities in identifying new business revenue and process optimization. Now, let's have a look at the company's vision and see if SAP S/4HANA can address these pain points.

12.3.1 Vision

The company's vision is to have a world-class ERP infrastructure that will enable robust control over its financial reporting and analytics, as well as reporting that will allow the company to perform better monitoring and decision-making regarding its assets, to optimize their processes and resources, and to create value for their stakeholders. Realizing that the world today is all about digitization, the company wanted a product that would serve as a foundation for the future and would deliver innovation on the social platform directly to their customers via smart connectivity. With SAP S/4HANA, the company will be able to build and deliver future innovation, making use of business networks to connect to their customers and partners on any device.

The company wants to achieve complete digital transformation by implementing SAP S/4HANA 1511 across their entire business in order to create better opportunities to enter new markets and to build smart and innovative solutions.

12.3.2 IT Project

The client chose to implement SAP S/4HANA because it meets the company's business requirements and delivers a great value. One system was able to deliver Online Transaction Processing (OLTP), Online Analytical Processing (OLAP), and mobility. It also reduced operational costs, real-time year-end financial close, and faster access to real-time data.

12.3.3 Benefits

We'll now review the key pain points of the company, described earlier, and discuss how SAP S/4HANA can address these pain points, as well as the benefits and value drivers for doing so.

Before SAP S/4HANA, it was a challenging process for the company to identify and create new business revenue and to optimize its core processes due to the lack of available data to measure and to report on the effect of partnerships. There was insufficient flexibility to support new requirements. The company lacked the data necessary to make investments decisions or optimize processes. With SAP S/4HANA, the company has a much greater visibility into its operational and financial data. The company can run analytics at any point in time, resulting in better transparency of the entire planning, production, inventory, and sales processes, as well as better capabilities to optimize those processes.

The key value drivers of SAP S/4HANA can be divided into three groups, and the benefits become clear with the following results achieved by the company:

- **Reliability and optimization**

  - Already in the first 6 months of implementation, the company successfully achieves 50% faster access to real-time data visibility and a 60% increase in operational efficiency.

  - With the analytics provided by SAP S/4HANA, the company can optimize its production planning and execution processes by identifying and eliminating the products that have a high number of months in stock but with no sales in the pipeline.

- **Speed and efficiency**
  Average processing time per invoice (with an average of 10-15 items) is reduced per invoice.

- **Staff productivity and satisfaction**
  After implementing SAP S/4HANA, the average server downtime of was reduced, increasing the productivity of users due to less server downtime and less manual processing. The total number of working hours for the users was also reduced.

In addition, with SAP S/4HANA, the management team of the company was satisfied. They wanted a quick, user-friendly interface to access and authorize business documents on the go. With SAP Fiori UX, the management team can access the business documents on any device.

12.3.4   Path Forward

With the successful implementation of SAP S/4HANA, release 1511, the company wants to further optimize its processes, reduce operational costs by 15%, and improve the lead time for year-end financial closing from a few months to real time. The company is now on the road map to go on the cloud and start levering digitization and further innovation.

12.4   Manufacturing Company

This next logistics case study will describe the implementation of SAP S/4HANA Enterprise Management for a different manufacturing company.

The company wants to run its business processes through an integrated and standardized platform that offers transparency and accountability across its different lines of businesses (LoBs): manufacturing, procurement, and order to cash. The company also wants to drive margin-efficiency improvement through cost-optimization.

This company was experiencing some of the common key challenges associated with these LoBs. In manufacturing, this meant the following:

- Lack of real-time inventory data and inaccurate inventory stock levels, resulting in inaccurate production planning and stock-out situations

- Inability to report on cost, resulting in incapability to optimize cost

- Process and data redundancies, resulting in inefficiencies (e.g., long lead time for running material requirements processing [MRP] process)

In procure-to-pay, the company was burdened by the following obstacles:

- Lack of transparency and inability to hold and track supplier information

- Inefficient and error-sensitive process due to manual intervention and usage of different documents through the entire process

Finally, in order-to-cash, the company needed to overcome the following problems:

- Inability to see issues over the entire end-to-end process quickly, resulting in late actions for order exceptions, which can lead to customer complaints

- Lack of collaboration due to lack of real-time data and inability to run analytics across the entire process

12.4.1 Vision

The company's vision is to gain operational efficiencies by enhancing critical processes across various departments in the company and drive growth by using real-time data insights with the ultimate goal to gain market share. Due to the capabilities of SAP S/4HANA as the digital core, the company has selected this as its preferred solution to manage the day-to-day operations and to support the company's strategy for growth.

The project for the implementation of SAP S/4HANA Enterprise Management was six months, and SAP S/4HANA was deployed across multiple plants and distribution centers simultaneously.

12.4.2 IT Project

The client is benefiting from faster MRP because it can now run across multiple plants—something that wasn't possible on SAP ERP. Real-time operational reporting is driving the business, which is something else that wasn't possible earlier when transactional data had to be sent to SAP BW servers overnight. The company has reduced its legacy ABAP code, and many of its business processes are now using the SAP S/4HANA standard code and configuration. This has reduced the company's TCO for maintenance. Many similar clients are using the SAP S/4HANA transformation to go back to standard and reduce their custom development footprint.

12.4.3 Benefits

SAP S/4HANA offers functionalities that will support some of the company's key requirements at a lower TCO. The company has gone live very recently, so it's still early to quantify the benefits. However, following are some of the key benefits of SAP S/4HANA, which will resolve some of the key pain points of the company by LoB per the business case. In manufacturing, the company made the following gains:

- Real-time inventory reporting, resulting in more accurate production planning and fewer stock-outs

- Increased transparency due to the availability of real-time analytics, enabling the company to make better decisions based on real-time business insights

- Improved performance due to several simplifications and elimination of process and data redundancies (e.g., MRP is running more than 10 times faster)

There were two key benefits reaped by the SAP S/4HANA implementation in the procure-to-pay area:

- Standard integration with SAP Ariba, enabling seamless collaboration scenarios and improved process transparency

- Improved process efficiency due to better integration, less manual intervention, and usage of only a single document

Finally, there were much-needed improvements in order-to-cash:

- Order cockpit allowing the company to monitor issues across the entire end-to-end process easily via dashboards, enabling internal sales representatives to get full insights of the order fulfillment process and immediately take action (e.g., orders that are on credit block, incomplete orders, and delays in delivery and shipping)

- Real-time inventory levels and data across the entire chain, allowing more accurate order promise dates and better collaboration among manufacturing, sales, and the supply chain

With SAP S/4HANA, SAP offers the company an integrated platform through which the company can optimize its processes across different LoBs and use real-time business insights to make better decisions and drive growth.

12.4.4   Path Forward

The client is waiting for SAP S/4HANA 1610 and will upgrade in the fourth quarter of 2016 and activate the embedded Production Planning/Detailed Scheduling (PP/DS) and SAP Extended Warehouse Management (SAP EWM) that it needs. This will enable the client to decommission its current SAP Supply Chain Management (SAP SCM) system and further reduce its TCO.

12.5   Bakery Products Company

The company is one of the major players in the food industry, specializing in bakery products. The company has experienced a quick growth path due to acquisitions that led to a very broad product portfolio distributed in 83 countries, with a direct presence in Italy, France, the United States, and India. It has 1,200 employees and more than 435 million dollars in revenue.

12.5.1   Vision

The project was launched last year as a strategic initiative to support the client's transformation and innovation strategies. This project is paramount to foster the group growth strategy that will lead to double the turnover by 2025. The client will benefit from the project in many ways: streamlining and redesigning the core processes, defining the new organization, and implementing leading-edge SAP solutions that will enable the company to compete and win in the marketplace.

The client was seeking to achieve the following:

- Increase the efficiency of its activities.

- Rethink the processes starting from the needs of the client and confronted with best practices of their sector and products.

- Make real-time information available to support its activities and decision-making process.

- Measure process performance via key performance indicators (KPIs)

- Be flexible and quick in response to change.

- Comply with international financial standards such as International Accounting Standards/International Financial Reporting Standards (IAS/IFRS).

The company has successfully completed the first phase of the project comprising the following initiatives:

- Business Process Reengineering Phase 1 scope items

- Review of the organizational model

- Design of the performance management system both on an operational and management level

- Change management support

- Design and implementation of the transactional SAP S/4HANA enterprise system

- Design and implementation of the operational reporting and planning of the SAP S/4HANA enterprise system

Through the functionality of the SAP S/4HANA 1511 Enterprise Management system, the client has activated the following processes: finance and administration, controlling, purchasing and related invoice verification, sales invoicing, and management of the nonproduct-related sales orders.

Operational reporting, including real-time analysis, was implemented directly in SAP S/4HANA by activating the BI embedded models through the use of SAP BusinessObjects and SAP Fiori.

Purchase requisition and order approval process were activated using SAP Fiori, which enabled the client's management to issue approvals via mobile technology using their smartphones or tablets.

12.5.2 IT Project

The client implemented SAP S/4HANA to replace its legacy ERP system to leverage the digital core and integrate with cloud solutions such as SAP SuccessFactors. The company will also gain real-time insight into the business performance via SAP Fiori and embedded analytics, which

reduces TCO; operational reporting via SAP S/4HANA (no SAP BW required); and mobility via SAP Fiori (SAP Fiori frontend server and SAP Gateway server required).

12.5.3   Benefits

This initiative has supported the bakery products client in the transformation into an organization focused on streamlining processes, eliminating paper and manual activities, and enabling specific processes to be performed in full mobility (smartphones and tablets). The client has also optimized its target operating model, centralizing SAP processes and various systems and releasing reporting tools in areas formerly not covered by any application (e.g., analysis of purchasing services).

The implemented financial model ensures full compliance with international financial standards and supports the company's globalization strategy.

The controlling model is an advanced multidimensional model that uses the block postings capability in table ACDOCA to simultaneously synchronize the sales, procurement, and financial data flows. This enables the client to manage its complex analytical dimensions in real time.

12.5.4   Path Forward

This go-live is the first phase of a full scope implementation project of SAP S/4HANA Enterprise Management. The next go-live is planned for India operations in the second quarter of 2017. At the end of 2017, the remaining processes will be activated (production management, stock management, quality management, material movements), and the client's focus will shift to structuring and implementing the new product development and customer service.

12.6   Summary

This chapter has explored several recent and ongoing SAP S/4HANA implementation projects in order to showcase real companies' paths to digital transformation. The number of SAP customers beginning these transitions is growing every quarter, and we expect the trend to continue in the coming years.

Let's close the book with a summary of the preceding chapters, which introduced SAP's next-generation SAP S/4HANA.

13 Conclusion

For many organizations in the SAP customer community, the journey to digital transformation with SAP S/4HANA is just beginning. To wrap up this introduction to SAP S/4HANA, this chapter highlights key ideas covered throughout the earlier chapters, calling attention to common themes interwoven throughout the book.

What does this mean for your company? Let's review.

The Digital Transformation

The imperative of digital transformation is upon us. The tidal forces of the digital revolution brought about by smart devices, smartphones, smart cars, and huge amounts of automation in processes such as manufacturing have swept across many industries. IT departments in each industry are reacting to this change in the business at their own pace—some with short-term goals and others with longer-term goals for the transformation. IT departments across the world are evolving from interacting with the business as reactive service providers to becoming proactive innovation centers that harness technology changes, help businesses become better equipped, and enable self-service as much as is relevant or possible.

Chapter 1 defines the *digital transformation* as the way in which businesses are being impacted by their strategic leveraging of new

technologies such as cloud computing or process automation via robots and how these changes affect the overall organization of a business. These days, the name of the game is hyper-connectivity and using and interpreting new data to provide better insight and generate predictable results. In the end, we can reimagine business models from procurement to sales and services and improve the entire value chain.

A lot of business potential can be tapped by moving into the digital era. Different industries have progressed into different maturity levels in terms of adoption of the digitalization wave; for example, high-tech industries, banking, and retail industries are early adopters for institutionalizing changes in business models to suit the tech-savvy customers of today. This entails not only transforming existing ways of doing business but also bringing in new business models previously not thought of.

The adoption of digital transformation impacts both business and technical drivers. Each industry needs to identify the effect of digitization for its own business processes. For example, through digital banking, banks could effect savings in terms of operating costs reduction and simultaneously reach new customer segments. The availability of their services nearly 24/7 means more transactions and, as a result, more business.

While organizations need to figure out the business drivers by asking the relevant questions outlined in Chapter 1, technical innovations that act as enablers for digital transformation are cloud computing, mobility, Internet of Things (IoT), and, of course—to make sense of this vast amount of data obtained through the different means—big data analytics and cognitive computing. These also form the mega trends of today's technology, per the studies conducted by the IBM Institute of Business Value.

Before today's IT landscape can reach the potential of digital transformation, it needs to undergo a technical transformation itself; that is where SAP S/4HANA can form the digital core. This transformation is,

however, typically not a big-bang project, but rather it evolves over time; different smaller pieces fit together to form the larger picture of the puzzle.

SAP S/4HANA and the Digital Enterprise

Chapter 2 talks about the evolution of the SAP solution from SAP ERP to the new product: SAP S/4HANA Enterprise Management with SAP S/4HANA 1511. SAP S/4HANA Enterprise Management is a new product with a new code line; SAP S/4HANA Finance, once introduced as SAP Simple Finance, is an add-on on top of the SAP Business Suite on SAP HANA. Both these products have a cloud edition available.

Global business trends require cloud adoption, and there are several business and technical drivers behind the popularity of the cloud adoption. These have led SAP to take a "cloud first, but not cloud only" approach in which all new functionality is developed for the new product line and is later available in the traditional product line. That means that all new functionality is being pushed into the SAP S/4HANA Cloud and then made available in SAP S/4HANA, on-premise edition, a bit later. However, because SAP S/4HANA, on-premise edition, is evolving from the existing SAP ERP product, it's still ahead of the game while SAP S/4HANA Cloud has limited functionality as of 2016 and is still achieving parity. Even when new functionality is added to SAP S/4HANA, on-premise edition, it's designed to be easily adapted to SAP S/4HANA Cloud.

The key innovations that put the new SAP S/4HANA Enterprise Management solution at the very core of the digital transformation are as follows:

- Leveraging SAP HANA to drive technical architecture innovation, making it possible to have Online Transaction Processing (OLTP) and Online Analytical Processing (OLAP) data on the same database to

drive analytics as part of the transactional processes

- Improving the user experience (UX) with user-centric, role-based SAP Fiori apps for transaction, analysis, and information to guide the business

- Unifying functionality in the core to simplify SAP S/4HANA and to follow the *principle of one* as a key driver for simplification, removing redundancies in the data and functional areas

Chapter 2 outlined how these factors combine to help SAP S/4HANA support all five transformational layers impacting business outcomes. The SAP S/4HANA core provides options to integrate with the other cloud-based solutions such as SAP Hybris, SAP SuccessFactors, SAP Hybris Cloud for Customer, Concur, and SAP Fieldglass, with integration contents either already provided or planned for a future release. Apart from this, the SAP HANA platform provides options to integrate the SAP S/4HANA core with IoT-based solutions created on the SAP HANA Cloud Platform or with structured and unstructured data obtained from various sources such as social media, and so on.

Chapter 2 also provided examples with a few business processes: how they are impacted today with the new solution provided by SAP S/4HANA core and how the end UX differs widely from the earlier experience on a traditional SAP ERP-based solution.

Finally, Chapter 2 provided a high-level look into the architecture of SAP S/4HANA, in which we see that many software components have either been removed or merged with the core components of SAP S/4HANA. Based on the principle of one, the simplifications enabled by this architecture are as follows:

- SAP S/4HANA 1511 covers simplified data models and process innovations around the following modules of core SAP ERP functionalities: procurement, inventory management, material requirements planning (MRP), available-to-promise (ATP), capacity

planning, order management and billing, accelerated financial close, Universal Journal, and Central Finance.

- The industry-to-core transformation started with the discrete manufacturing mill industries, and this transformation will continue into retail, oil and gas, and beyond.

- The Long Material Numbers (LAMA) is simplified as the material number is natively extending from 18 to 40 fields.

- A general deprecation process has simplified around 70,000 main repository objects.

- There's been a consolidation around the use of a single business partner instead of customers and vendors, with customer vendor integration (CVI) mandatory as a single point of entry to create, edit, and display master data for business partners, customers, and vendors.

- There's one single valuation in the Material Ledger (ML).

- Finally, the suite offers one analytics approach with data created through the transactions being reused for analytics via SAP S/4HANA embedded analytics.

So far in the book, we discussed functionality in general or key innovations in particular. Chapter 3 and Chapter 4 started getting specific with innovations for finance and logistics lines of business (LoBs).

SAP S/4HANA Finance

The IBM CxO study classified finance organizations into four profiles based on their level of finance efficiency and ability to provide business insights: scorekeeper, disciplined operator, constrained advisor, and value integrator. Within value integrator is another group called performance accelerators who represent the top performers in that area. What sets this group apart are their better efficiencies in managing

investor/stakeholder relations, processing transactions, strengthening compliance/internal controls, providing inputs to enterprise strategy, developing talent in the finance organization, and driving enterprise cost reductions. Savvy organizations aspire to this standard. SAP S/4HANA contributes in these areas to help organizations move into the performance accelerator category:

- Drive integration of information across the enterprise effectively. This includes the governance that ensures common business processes and data definitions in your enterprise as well as the single source of truth, technically provided by the Universal Journal (table ACDOCA) of SAP S/4HANA Finance.

- Drive enterprise cost reductions by multiple means, including elimination of batches and elimination of reconciliation requirements, which arose because of storing redundant information multiple times. This redundancy in terms of data has been removed through adoption of the Universal Journal. Increased processing speed enables processes such as soft close, which can happen any time, and important activities to spot problems need not wait for the month-end close. All these factors contribute to the cost optimization of the overall processes.

- Measure/monitor business performance. SAP HANA enables operational reporting in real time in the system of records itself, and this analysis is available through SAP Fiori apps or SAP Smart Business Cockpits, which can be rendered in the mobile devices. SAP S/4HANA Finance also provides options to simulate what-if analysis, making the business more efficient to engage in the right discussions with their customers or make the right decisions in the line functions such as SAP Cash Management powered by SAP HANA with its own SAP Smart Business Cockpit features.

- Optimize planning, budgeting, and forecasting. SAP S/4HANA Finance 1511 provides some planning features, and the rest of the planning and

consolidation functions are augmented with SAP BPC for S/4HANA Finance, which is in the process of getting into the SAP S/4HANA core in future releases. These two products together provide a strong capability for planning, budgeting, and forecasting.

- Execute continuous finance process improvements. With SAP S/4HANA Finance, functions that could be done in batch or in a month-end timeframe due to the requirements from a lot of system resources can now be done in real time, anytime. Thus operations such as spend analysis by responsibility and profit and loss by market segments, combined with other dimensions such as customer and material group or WIP analysis by relevant production orders, relevant cost centers, or intercompany reconciliation, are now possible in SAP S/4HANA Finance.

- Provide inputs to enterprise strategy. While value integrators are able to implement a single version of truth for the financials processes, performance accelerators have integrated their organization's strategic, operational, and financial planning so they are able to impact the overall business performance. SAP S/4HANA Finance (along with products such as SAP BPC) can provide the capabilities that help organizations provide a single source for the data and impact overall business performance, which helps in advanced analytics for key performance indicator (KPI) monitoring and predictive analytics.

- Develop talent in the finance organization. With SAP S/4HANA and SAP S/4HANA Finance, the finance organization needs to spend less time on transactional items or on nonvalue-adding work (e.g., reconciliations) but can focus on self-service analytics and development of more comprehensive KPIs and advanced analytics. These capabilities can propel the organization ahead of the competition and, at the same time, utilizing the skills and honing them further for the finance team.

Following are the key features of the SAP S/4HANA Finance:

- **Single version of truth**
  SAP S/4HANA uses the single table ACDOCA to present the Universal Journal, information from SAP ERP Financials (FI), Controlling (CO), Asset Accounting (FI-AA), ML, and account-based Profitability Analysis (CO-PA). However, to make the best design of the solution using this product, the concept of coding blocks should be leveraged to document all reporting requirements of an organization. A coding block consists of business measures represented by the chart of accounts in your SAP system and business dimensions by posting details such as materials, customer channels, and so on.

- **Material Ledger (ML)**
  While the ML has been present in traditional SAP ERP for a long time, its usage was optional and widely differing based on business requirements. Now, in SAP S/4HANA Finance, there is a single common solution for material valuation, which consists of a mandatory ML functional component plus key architectural changes. This has made several tables redundant while some other table information about the ML has been moved to table ACDOCA.

- **Asset Accounting**
  New Asset Accounting (new FI-AA) has been introduced in SAP ERP 6 EHP 7, but the functionality has changed in SAP S/4HANA Finance and is now mandatory.

- **SAP Cash Management**
  This is an additional licensed item that has evolved in SAP S/4HANA from the traditional cash management functions to include innovative functions (e.g., SAP Smart Business Cockpit) and to change the way companies manage cash. Main functions provided by this component are Bank Account Management, Cash Operations, and Liquidity Management.

- **Planning and consolidation**
  SAP BPC for S/4HANA Finance is a tool for planning and consolidation

in a world where traditionally, planning is done outside the SAP ERP system. Now, with SAP S/4HANA, much of the planning functions are available in SAP S/4HANA Finance.

- **Profitability Analysis (CO-PA)**
  Profitability Analysis has taken a new dimension with several additional features and functions than the traditional PA. SAP's recommendation was to use costing-based CO-PA as a main profitability analysis tool with account-based CO-PA activated for reconciliation purposes with FI. Now, account-based CO-PA has several additional functions, and there is constant reconciliation between FI and CO-PA because fields from CO-PA are part of table ACDOCA. These additional functions have impacted the area of cost of goods sold (COGS) postings, valuation, top-down distribution, production variance allocation to CO-PA, and so on.

- **Central Finance**
  This is a very new concept and available as a deployment option for SAP S/4HANA Finance. In this model, multiple legacy ERP systems (SAP and non-SAP) are connected via an SAP Landscape Transformation Replication Server (SAP LT Replication Server) to an SAP S/4HANA Finance system that will act as the central repository for financial data. Chapter 3 covers best practices regarding some key design elements that need to be considered for design and implementation of Central Finance.

- **Real-time data and soft close**
  Thanks to the unification of data from different areas, certain transactions once performed only during month-end can now be handled any time of the month. Financial close was a resource-intensive period dependent on several batch processes, intensive reconciliation, and corrective actions after the period close. Now, this process is much smoother and faster, aided by the data structure change, processing power of SAP HANA, and the SAP Fiori Financial Closing app.

Several features in SAP S/4HANA Finance already help to create a strong business case for the adoption of this product. There are certain areas that need to evolve further, as detailed in [Chapter 3](#).

SAP S/4HANA Materials Management and Operations

IBM's insights from its chief supply chain/operations officer (CSCO) and chief operations officer (COO) study revealed that C-level executives are facing the following key challenges today: a lack of supply chain visibility, increased volatility of supply and demand, increased complexity, a lack of collaboration, and a lack of customer-friendly interfaces.

SAP S/4HANA offers several features aimed at resolving these key challenges for logistics processes:

- **Manufacturing**
  - Cockpit for MRP that offers several improvements, such as real-time data and analytics to improve the visibility of material flows and solution, alert, and simulation capabilities to allow material planners to make better decisions
  - Simplified logic for subcontracting and sourcing processes
  - Production Planning and Detailed Scheduling (PP/DS) integrated with SAP S/4HANA, allowing seamless master data and user interface (UI) harmonization and offering several improvements
- **Supply chain management**
  - Improvements surrounding material master data, such as the simplified data model, which results in increased throughput, better and faster reporting, and increased flexibility, and the inventory valuation data model that involves only one material valuation through the ML
  - Several new innovations around advanced ATP are offered, such as mass functionality for availability check; business decision support

based on almost every attribute of sales order, material, plant, or customer; and grouping and aggregation capabilities to allow collective allocations

- SAP Extended Warehouse Management (SAP EWM) embedded in SAP S/4HANA, offering several benefits, such as one single system, resulting in a simplified integration to SAP S/4HANA core processes; reduction of data redundancy; and several simplifications

- Integration and simplification of the quality inspection process in SAP S/4HANA

- **Sourcing and procurement**

  - Integration of three core business functions (supplier portfolio management, supplier evaluation and collaboration, and activity management) from SAP lifecycle management into SAP S/4HANA, and additional new functions and apps to improve efficiency and collaboration with business partners

  - Various real-time KPI reports (e.g., purchasing, invoice spend, etc.) to provide the purchaser a holistic view of activities within procurement

  - Simplified and improved self-service procurement process, with new more user-friendly interfaces to increase efficiency

  - Standard integration with SAP Ariba to provide a system for a single point of action

- **Sales**

  - Sales order cockpit that provides a comprehensive overview of the order fulfillment situation at any point in time, using real-time data and analytics

  - Simplification of the SD data model, resulting in faster business outcomes and reduced total operational costs

  - Reduced memory footprint and increased performance

With SAP S/4HANA, CSCOs can now achieve digital transformation in their enterprises. They can drive digitized mission-critical processes across all operations in real time. With the logistics functionality in SAP S/4HANA, SAP offers the following benefits to its customers:

- Companies can run their operations in real time and have analytics at any point in time, from a single source of live information on any device.
  Enterprises can be more resilient against supply and demand volatilities and increased competition with a system that is more integrated, fast, and flexible. With tools provided by SAP S/4HANA, enterprises can now focus more and act quicker on exception management. Better information and more capabilities in analytics allow companies to proactively follow up on issues and predict changes.

- SAP S/4HANA allows better collaboration between departments due to several enhanced functionalities that run in real time, such as the MRP cockpit. Additionally, SAP S/4HANA offers improved external collaboration through standard integration with SAP S/4HANA extended solutions (e.g., SAP IBP, SAP Ariba, etc.).

- An intuitive user-friendly SAP Fiori-based UX spans functions that may be relevant for a given role, including analytics.

SAP S/4HANA and the SAP Landscape

Having examined the finance and logistics functionality in SAP S/4HANA, the time came in Chapter 5 to cast our sight outside the SAP S/4HANA core solution to the native and acquired cloud applications that complete the SAP S/4HANA landscape.

The following independent solutions can be consumed standalone if this is required, but they are also tightly integrated with the SAP S/4HANA core to meet the demands of a digital platform:

- SAP Ariba is SAP's strategic sourcing and procurement solution embedded in SAP S/4HANA. With SAP Ariba, you can manage sourcing and contracts, requests and purchases, and invoices and payments.

- SAP Fieldglass handles services procurement and vendor management; it completes the SAP portfolio for external services such as contingent workers, statement of work projects and services, independent contractors, and specialized talent pools. SAP Fieldglass gives SAP customers total workforce management with full-time and contract workers on a single platform.

- Concur is a solution that combines and integrates the overall spend into three major blocks: Concur Travel, Concur Expense, and Concur Invoice. The central principle is that all connected information can be managed in one place to provide transparency on the overall spend. Concur integrates with numerous third-party solutions and apps (e.g., Airbnb, United Airlines, Uber, and Starbucks).

- Cloud-based SAP SuccessFactors is the default HR functionality of SAP S/4HANA. This HR suite is mobile enabled and offers users a modern UX; it includes a complete set of core HR with payroll, tightly integrated talent management solutions, robust workforce analytics and planning, and social collaboration tools.

- The SAP Hybris portfolio includes key offerings for customer engagement and commerce: SAP Hybris Commerce, SAP Hybris Marketing, SAP Hybris Billing, SAP Hybris Cloud for Sales, and SAP Hybris Cloud for Service. These combine digital strategy, implementation services, and support services, which are integrated across multiple channels.

- SAP Master Data Governance (SAP MDG) provides enterprise-wide governance for master data creation and updates. It acts as a single source of truth for master data and makes it possible to have accurate reporting. This solution also helps to consolidate existing data and

enhance data quality. While this is not yet available as a cloud-based SaaS product, it's possible to have it hosted on a cloud-based infrastructure.

Though acquired or developed and named outside the realm of SAP S/4HANA, these applications are part of the SAP S/4HANA vision because they supplement "core" functionality and enable businesses to move their processes into the cloud.

SAP S/4HANA Architecture

The architectural paradigm shift brought about by SAP HANA has helped to solve several IT and business problems, which we discussed in Chapter 6. IT problems that now are losing significance include performance issues associated with handling large amounts of data in real time and with handling aggregates of huge amounts of transactional data, batch processing for reports, and table locking issues, to name just a few.

The underlying architecture beneath SAP S/4HANA is the SAP HANA platform, which has several capabilities. Common services that are useful across multiple business applications are being developed under the SAP HANA platform and can be classified into the following major groups:

- Application services, which help process several open standards

- Processing services, which help in various types of analytical and other common business functions

- Integration and quality services, which are gaining importance because they form the backbone of integration with many other systems in the landscape and because they improve data quality while complementing other products/services such as SAP Master Data Governance (SAP MDG)

- Database services (the most important part of the platform), which utilize the core capabilities of the in-memory and columnar attributes of the SAP HANA database, help with data modeling options, and make it all possible through the necessary administration and operations support

From the deployment perspective, there are a couple of scenarios to choose from: Multiple Components One Database (MCOD) scenario, Multiple Components One System (MCOS), and Multitenant Database Containers (MDC). The best option for a given SAP customer depends on the components that need to be deployed, whether it's a production or nonproduction scenario, and whether such deployments are supported per white lists published by SAP. Be sure to consult the relevant SAP Notes before finalizing your deployment plans (e.g., for SAP S/4HANA deployed on-premise, this is SAP Note 2248291 at *https://launchpad.support.sap.com/#/notes/2248291*). Considerations for high availability (HA), disaster recovery (DR), scalability, virtualization, and security are discussed in detail in [Chapter 6](#).

Beyond the platform, the SAP S/4HANA architecture uses the Core Data Services (CDS) to form the virtual data model (VDM) on top of the physical tables in the database.

SAP S/4HANA's application layer powered by the SAP HANA platform makes it an ideal choice as the digital core for an IT environment. Some of the attributes that support SAP S/4HANA as the digital core include the SAP Fiori-based UX, real-time analytics made possible with in-memory processing of high volumes of data without aggregate tables, and the capability to handle various types of data from multiple transactional systems and sources. On top of that, the core is strengthened through industry solutions and other applications being embedded in the core solution. For example, SAP S/4HANA 1610 now contains SAP S/4HANA embedded analytics, embedded SAP MDG, and integration capabilities

with cloud solutions such as Concur, SAP SuccessFactors, and SAP Ariba.

Extending SAP S/4HANA

Although customization to varying degrees is common for business applications, it makes a software solution difficult to maintain and makes periodic upgrades more time-consuming.

As you learned in Chapter 7, for this reason, SAP is aiming to have solution extensions that are outside the SAP S/4HANA core. When it comes to extensions, SAP S/4HANA Cloud has constraints in terms of how much customization is possible and where it can be done; in contrast, on-premise deployments of SAP S/4HANA have more flexibility with its two options for solution extension: traditional in-app extension and the side-by-side extension.

Within the in-app extension, you have three options for solution extensions:

- **Key user extensibility**
  Key users can personalize their UIs by hiding, moving, or adding fields or via the ABAP Editor to add additional business logic. This is useful for both deployment options.

- **Managed extensibility**
  This caters to a need for coded extensibility for the SAP S/4HANA Enterprise Management Cloud under a very strong governance model. Access is provided through whitelisted Application Programming Interfaces (APIs).

- **Classical extensibility**
  These are traditional extensions using ABAP tools, although these tools have now evolved to a considerable extent.

The side-by-side extension ensures the stability of the SAP S/4HANA core solution while extending the solution with additional custom functionality. This is the preferred option, whenever feasible. There are several ways to build these extensions: additional logic for calculations or business processes, integration with other business applications such as social networks, and so on. These extensions at different levels are possible through the SAP HANA Cloud Platform. For certain types of extensions (e.g., the extension of the cloud-based solutions like SAP SuccessFactors, Concur, or SAP Hybris), this is the only option. The advantage for such extensions is having separate lifecycle management and integrating SAP S/4HANA business processes with LoB solutions from SAP.

SAP HANA Cloud Platform has emerged as the developer's platform to do a multitude of things. This cloud-based platform provides cloud-based SAP Fiori apps, which can consume data from on-premise backends using OData services. SAP HANA Cloud Platform also has the option to host SAP Gateway, which transforms the functions from the backend and exposes these as OData services.

SAP HANA Cloud Platform also has specific services, for example, for IoT-related use cases such as device management and management of data from various sources, including social media.

Deployment Options

In the past year, much confusion has arisen in the SAP customer community about the various versions of SAP S/4HANA; we cover these in .

SAP S/4HANA has an on-premise version and a set of cloud versions available. Per SAP, its focus is on the cloud-based version, which is why new features are expected to be released in the cloud-based models first and then replicated to the on-premise version.

So before choosing a deployment option for your own SAP S/4HANA implementation, you must first evaluate whether, for your enterprise, the relevant workload is suitable for cloud deployment.

Think about the following when making your decision:

- Choose whether to deploy SAP S/4HANA, on-premise edition, or SAP S/4HANA Cloud based on your requirements for flexibility, solution standardization, cost, brownfield or greenfield environment, functionality requirements, and so on.

- For each of these options, there are logical deployment models such as MDC, MCOD, or MCOS, which can be used either in a virtualized environment or on the hardware level to optimize server resource and cost optimization.

- Consider the SAP HANA appliance compared to the tailored data center integration (TDI) model for your infrastructure, which influences the reuse of the existing infrastructure, your selection of the hardware vendor, and so on.

Nonfunctional requirements also play an important part in some of these decision points. After you've chosen your SAP S/4HANA deployment, you'll then need to identify integration patterns (e.g., on-premise to on-premise, on-premise to cloud-based solutions, or cloud-to-cloud integration patterns) and choose the right tool or option for integration based on use cases. Some of the integration tools are SAP HANA Cloud Integration (in which SAP is investing heavily), SAP Process Orchestration (SAP PO), SAP HANA smart data integration (SDI), or non-SAP integration products. You can even use patterns such as calling RESTful APIs directly from the SAP S/4HANA system to, for example, Concur.

Adopting SAP S/4HANA

In addition to building the business case associated with your move to SAP S/4HANA, planning the transition and identifying the best adoption scenario for your organization will be a critical step in your overall SAP S/4HANA journey.

If you're new to SAP, a new implementation with data migration from your legacy system is the logical path. For existing SAP customers, you'll need to assess which of the three options (new implementation, system conversion, or landscape transformation, as we discussed in Chapter 9) is best suited to your goals.

Early planning will help identify the challenges ahead and ensure that you have the right resources and sufficient time available to support a successful SAP S/4HANA adoption. The assessment of your existing SAP or non-SAP landscape will help define how quickly you can move to SAP S/4HANA and which areas you'll need to focus on. Understanding if a one- or two-step approach is best for your business is important. Moving in two steps isn't necessarily a bad thing; it might be tied to technical limitations, business readiness to adopt SAP S/4HANA, or even a desire to leverage features that aren't yet available in the latest SAP S/4HANA release. A progressive transition may support the business case. For example, some decide to move to SAP S/4HANA Finance rather than to SAP S/4HANA Enterprise Management, which might reduce the change management impact on your business.

It's also important to understand the restrictions that are in place for the target SAP S/4HANA version you want to move to. (Consult the SAP Notes referenced in Chapter 9.)

For existing SAP customers, running SAP's maintenance planner, the SAP S/4HANA prechecks, and the custom code migration worklist will give you a head start on your SAP S/4HANA adoption journey. If you're looking at a system conversion, you can identify the effort associated with the SAP HANA code impact before you start your transition using the SAP Code Inspector.

Some other activities can also be initiated before the project starts. Data archiving will help reduce data volumes that add complexity during the conversion to SAP S/4HANA. You can also start some of the SAP HANA code remediation before you run your SAP application on an SAP HANA database. Finally, you should consider custom code cleansing if you're looking at a system conversion, especially if you're not using all of your existing custom code.

These considerations will help you define the right adoption path for your organization. If you're looking at business process standardization or reengineering, you'll have more flexibility with a new implementation. This scenario will also allow you to leave the legacy custom code in your SAP ERP system and focus on moving the custom code that is currently in use and that you really need.

While starting your SAP S/4HANA journey, it's normal to have more questions than answers. This is where planning and an initial assessment can help before you start your transition. With the introduction of SAP S/4HANA, you have an opportunity to either build on the existing SAP solution or to rework a non-SAP or SAP system that may not be meeting the expected business requirements.

As we concluded in Chapter 9, whatever path you choose, getting the adoption right will be key. The overall process may seem challenging, but the upfront investment in understanding the different scenarios and impact will be the foundation to a successful SAP S/4HANA implementation.

Using SAP Activate

After you've identified the SAP S/4HANA adoption scenario that is best for you, the next step is to leverage SAP Activate for successfully moving to SAP S/4HANA. This was the topic of Chapter 10.

Each SAP S/4HANA adoption scenario has different SAP Activate features available to support your move. There are variations between the on-premise and cloud SAP Activate deployment options of SAP S/4HANA (the more advanced SAP Activate framework supports the cloud deployments). For the cloud version, users will benefit from self-service and expert configuration via SAP Activate, whereas for on-premise deployments to SAP S/4HANA, standard configuration is only available using the SAP Implementation Guide (IMG).

SAP Activate will provide structure throughout the project lifecycle with each phase (prepare, explore, realize, deploy), supporting both agile and waterfall implementation methods. Templates and accelerators are also made available and ready to use for all phases of the project. You can adjust these templates to support the size and scope of your project, providing flexibility to the overall SAP S/4HANA implementation. The four mandated quality gates provide additional governance throughout the implementation for each of the project phases.

However, the foundation of SAP Activate is on leveraging SAP Best Practices and maintaining standard delivery. Project teams can now leverage preassembly solutions available in the cloud to support faster implementation and prototyping of the SAP S/4HANA solution.

SAP Solution Manager 7.2 is one of the primary tools that supports SAP Activate for all SAP S/4HANA projects. SAP Solution Manager 7.2 comes with embedded features such as Business Process Model and Notation (BPMN) that were enhanced with the latest SAP Solution Manager release. SAP has made it easier for customers to use the standard best-practice scenarios and enhance them on the fly to fit their requirements, which provides an easy and central way to ensure all business processes are up to date and available in SAP Solution Manager.

Finally, SAP Activate is the successor to ASAP. SAP will continue to provide access to the last version of the ASAP 8 methodology but will no longer be providing enhancements to its functionality. Instead, SAP

Activate framework will continue to evolve with industry solutions and best practices as SAP S/4HANA itself matures. Features that are currently only available for the cloud versions will be released to support on-premise implementations to facilitate the overall adoption of SAP S/4HANA.

Building a Transformation Road Map

Having looked at the considerations for and the value of SAP S/4HANA its adoption scenarios, it's more apparent than ever that what is called for now is a holistic and consistent approach for defining the underpinning IT road map that supports the business transformation. So while we need to understand the technology (in other words, that value proposition, the reference architecture, the integration considerations, the delivery capabilities, and so on), we need to start not with the technology, but with the business pain points and how the technology can be an enabler to overcome them.

When it comes to planning a digital strategy, there are three key abbreviations to keep in mind: the current mode of operations (CMO), the interim mode of operations (IMO), and the future mode of operations (FMO). Because each organization's path between these is unique, Chapter 11 gave you a framework for creating a road map for your digital transformation with SAP S/4HANA in five key steps:

- **Envisioning the "what" and the "why"**
  There two key issues at this stage are what "digital transformation" actually means and whether SAP S/4HANA is a prerequisite for digital transformation. Each organization must take a wider and more holistic view of the other technology enablers, options, priorities, and dependencies that surround SAP S/4HANA.

- **Developing your road map using the Open Group Architecture Framework (TOGAF)**
  TOGAF is a framework for enterprise architecture that provides an

approach for designing, planning, implementing, and governing an enterprise information technology architecture. This chapter showcased the IBM Better Transformation method for considering the landscape, platform, and process at each of the following stages: engage, envision, evaluate, and enable.

- **Understanding the as-is CMO**
  Before you can take a step, you need to know where you stand. It's critical to think through the current state of affairs and identify pain points. Where and how does your current solution fall short of your expectations?

- **Defining the to-be FMO**
  The objective here is to determine your destination. To do this, you'll need to run a series of workshops to identify how the FMO fits into the IT and business strategy, define how pain points can be addressed in the FMO and how gaps in business expectations can be plugged, and begin the process of defining the key elements of the business case for digital transformation, among other tasks.

- **Choosing how to adopt SAP S/4HANA**
  This adoption methodology step includes the evaluate and enable phases of the IBM Better Transformation framework. At this point, you address the priorities you've identified to modernize the core of the enterprise applications and deliver digital transformation, define the road map and supporting plan showing the path to the FMO via an IMO, and, critically, define the approach for periodic application reviews of that road map against business ambition and needs.

Customer Case Studies

In Chapter 12, we offered readers a glimpse of successful and ongoing SAP S/4HANA implementations that are helping SAP customers take advantage of new technologies to meet changing business requirements in their IT department and in their finance and logistics LoBs.

For most SAP customers, the question is *when* to implement SAP S/4HANA, rather than *whether* to implement SAP S/4HANA. Though SAP ERP will be supported until 2025 as per the SAP road map in October 2016, corporations need to start evaluating the SAP S/4HANA product and building their road maps to enable digital transformation using the SAP S/4HANA digital core either through new implementation or through conversion of their existing SAP ERP solution. Remember that SAP S/4HANA isn't a like-for-like replacement of another product, but rather a unification of several other functionalities once provided by other products.

From the examples in this chapter, you can see that many of the customers have chosen new implementation or landscape transformation to replace their legacy SAP ERP systems. Many customers' business models have changed, and they've taken the opportunity to replace decades-old SAP ERP systems with the latest SAP S/4HANA system (for example, a Central Finance deployment of SAP S/4HANA Finance or embedded BI for reporting requirements).

As you take your next steps toward digital transformation by way of SAP S/4HANA, remember to conceive of an SAP S/4HANA implementation not as a simple technical or functional upgrade, but as the nexus of important IT and business innovations.

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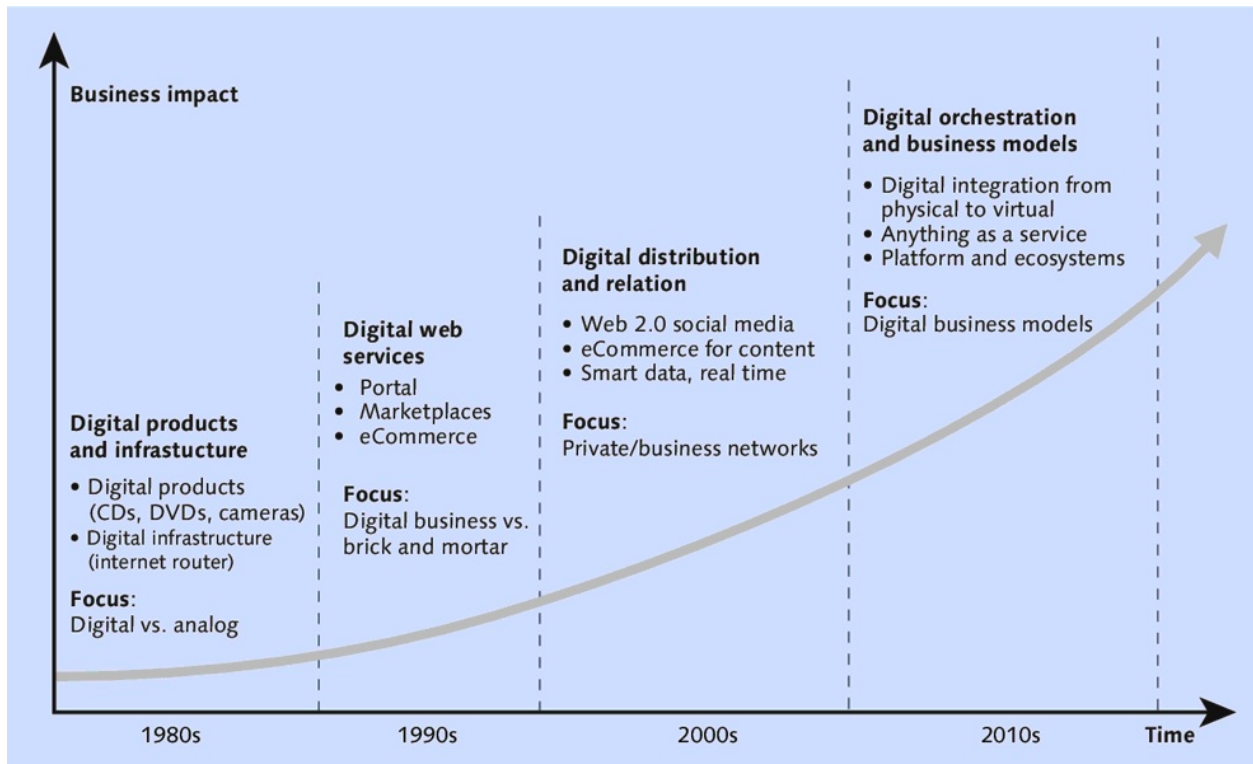
Figure 1.1 Phases of the Digitalization from Products to Business Models

External forces impacting the enterprise (in 3 to 5 years)

- Technology factors: 72%
- Market factors: 71%
- Regulatory concerns: 55%
- Macro-economic factors: 51%
- People skills: 48%
- Socio-economic factors: 34%
- Globalization: 31%
- Geopolitical factors: 31%
- Environmental issues: 27%
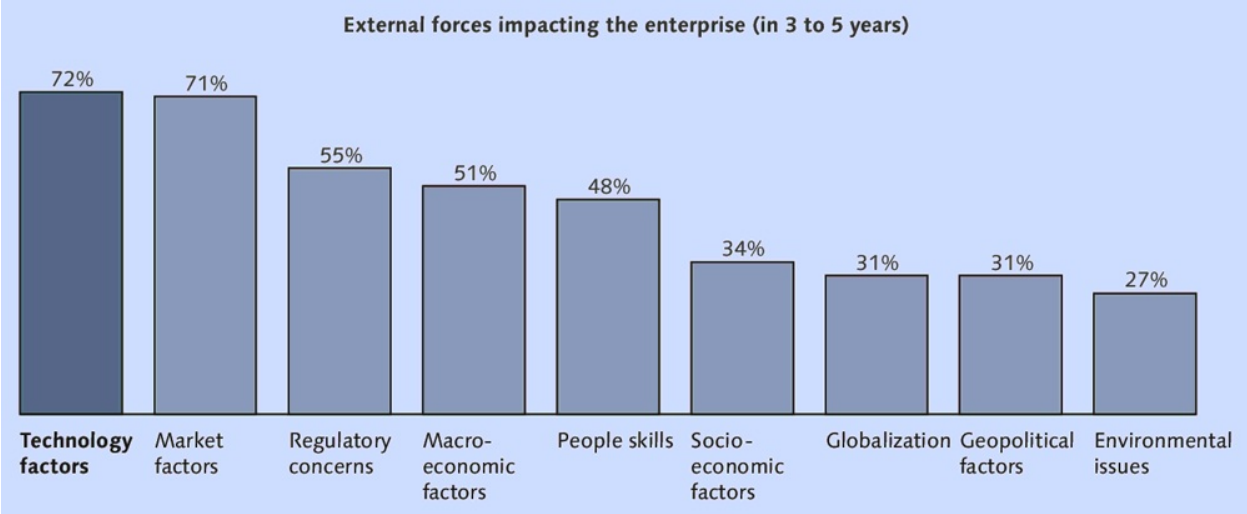
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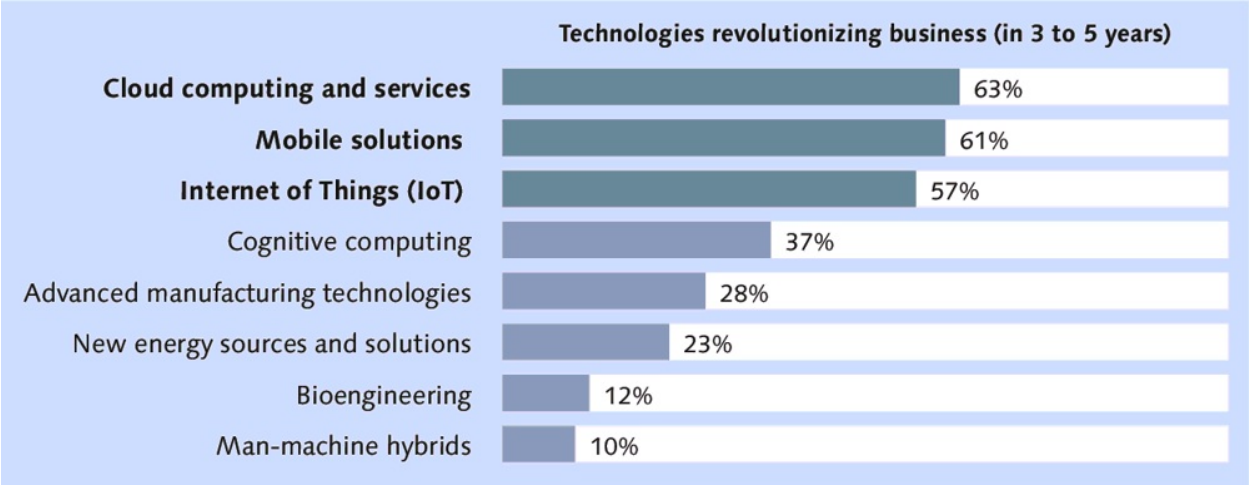
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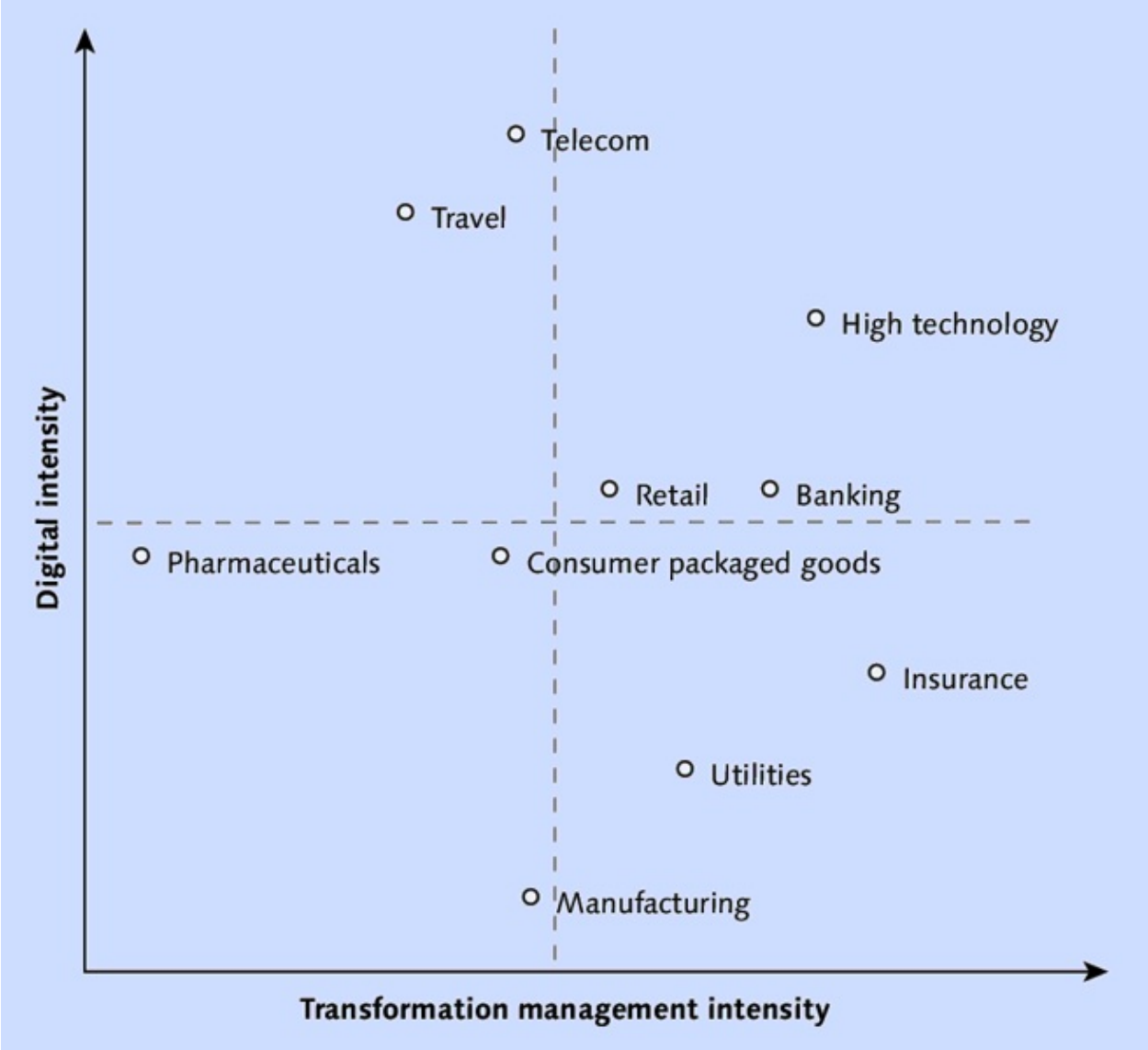
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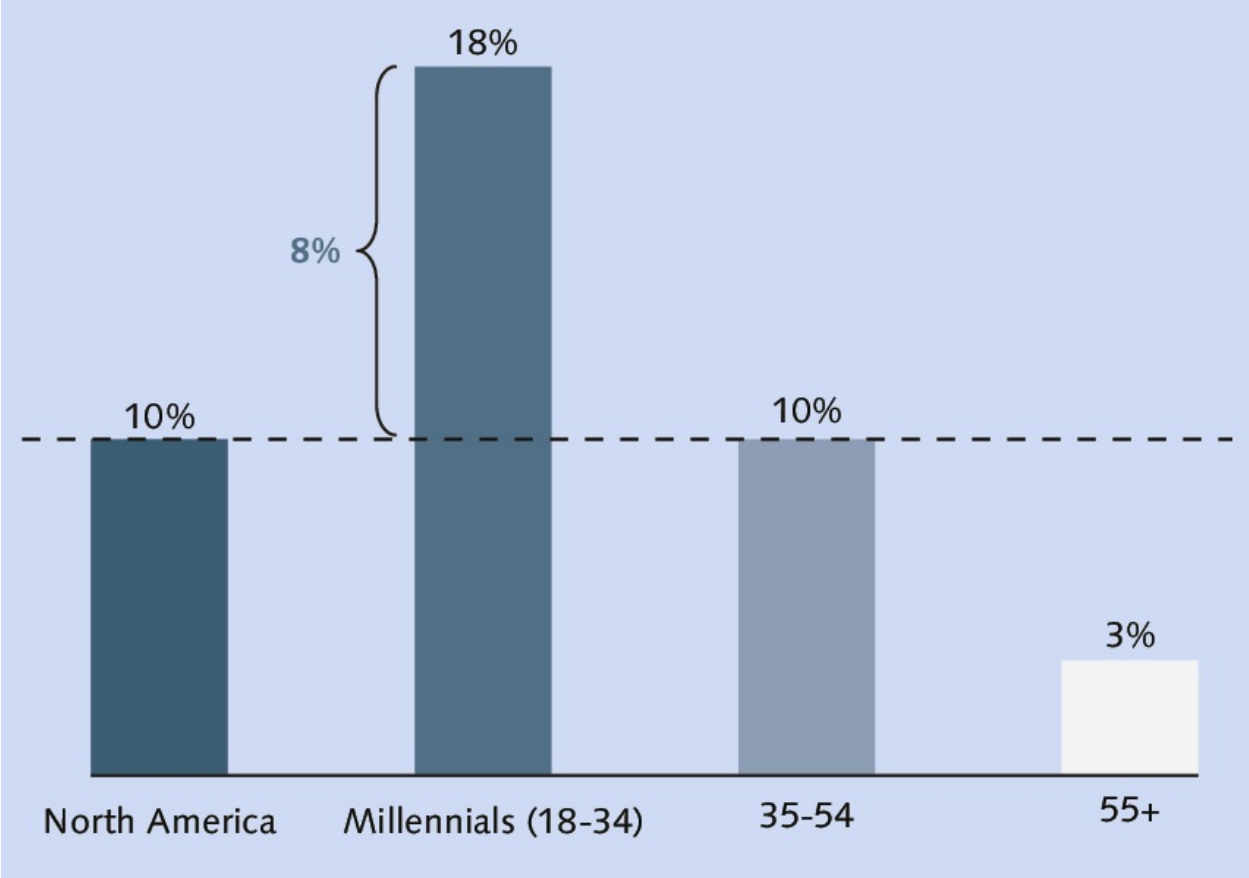
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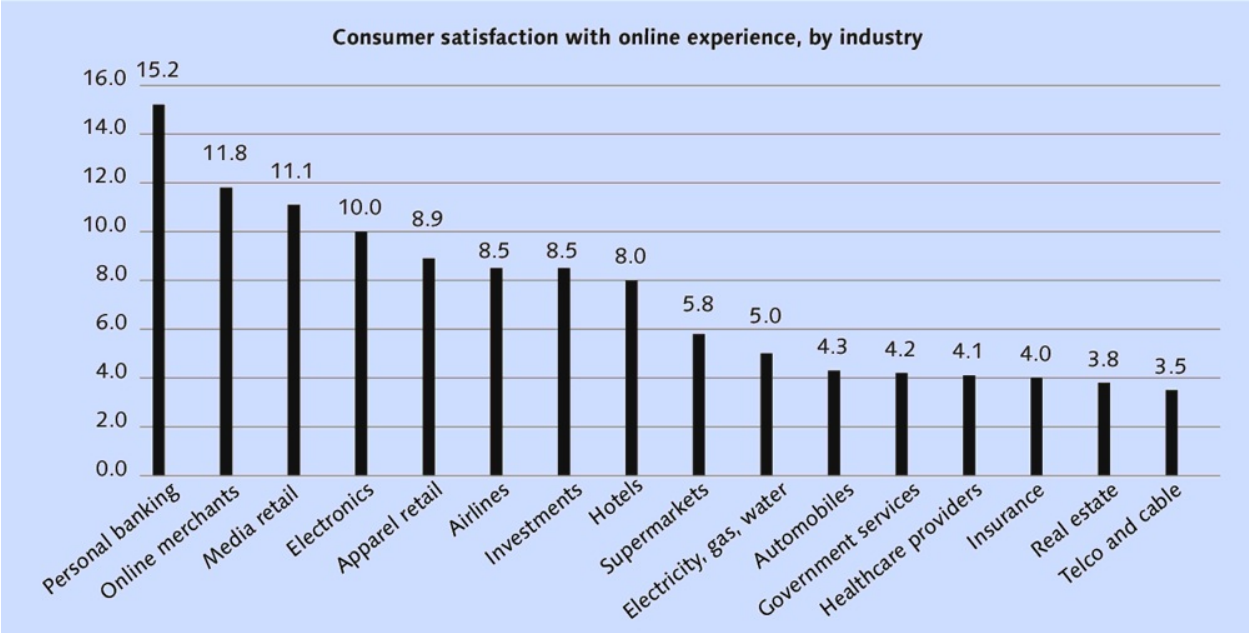
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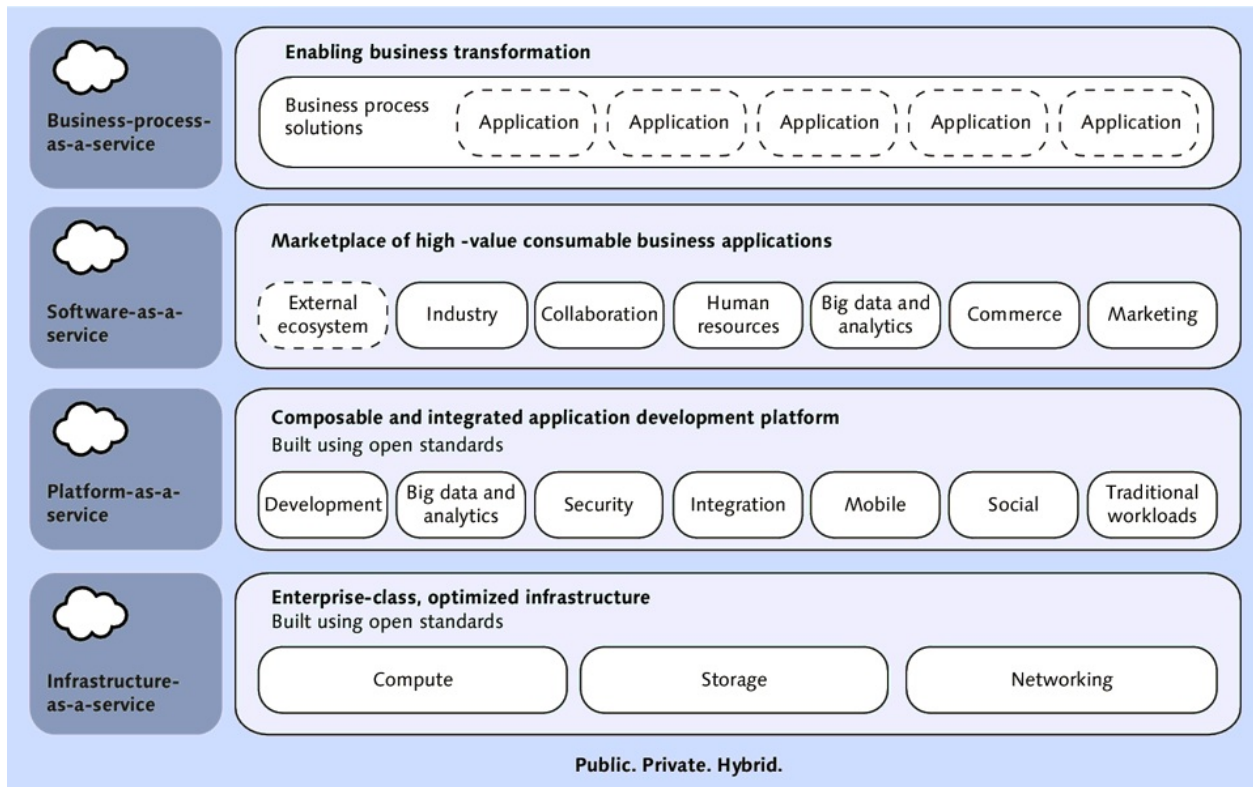
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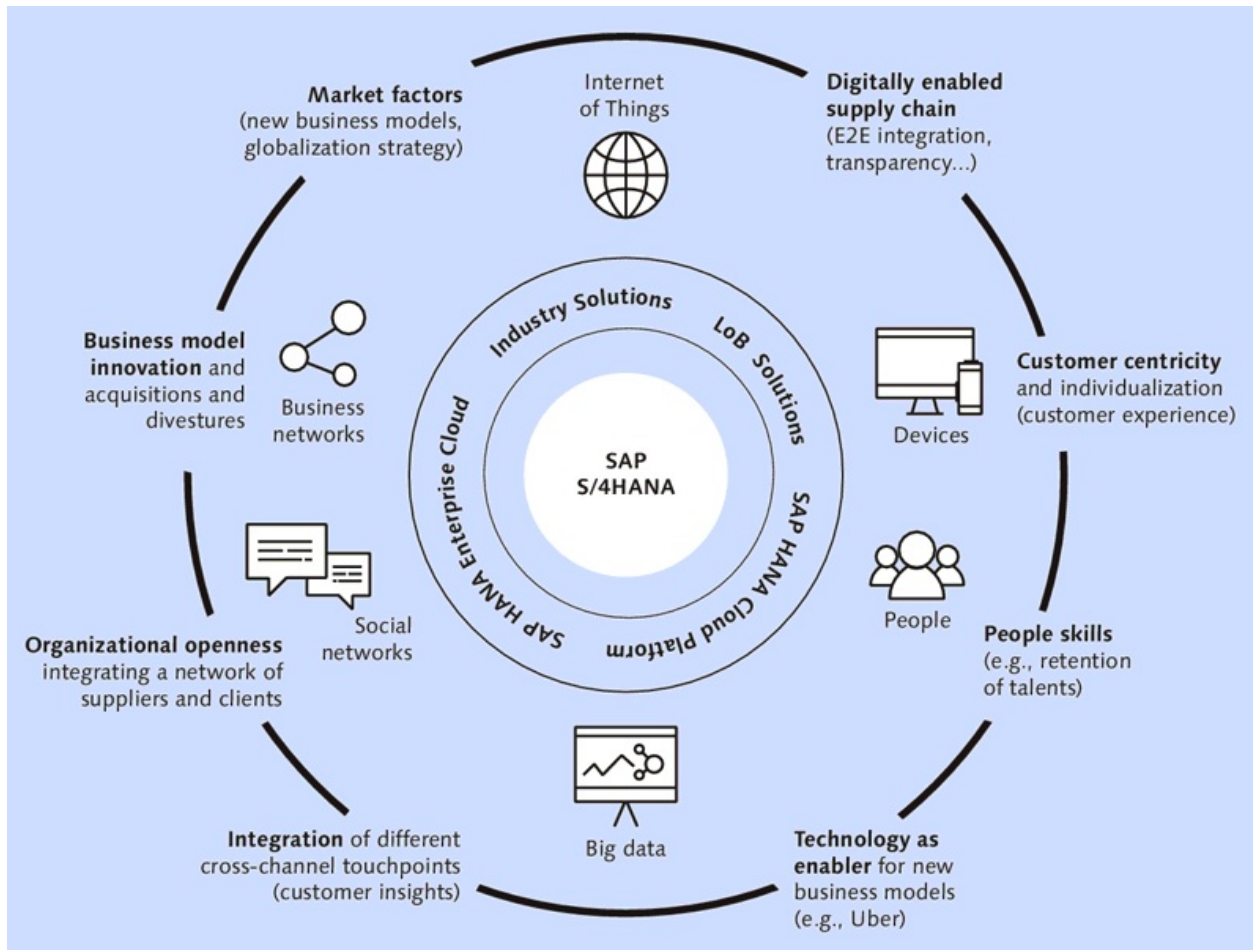
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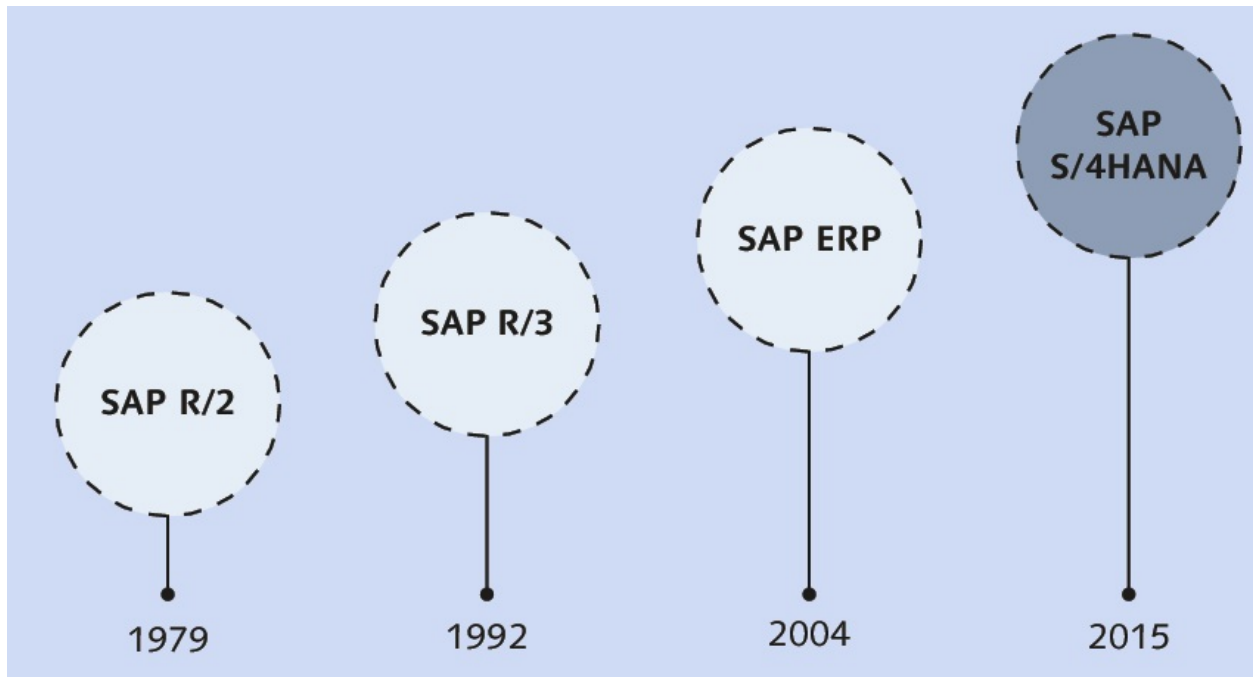
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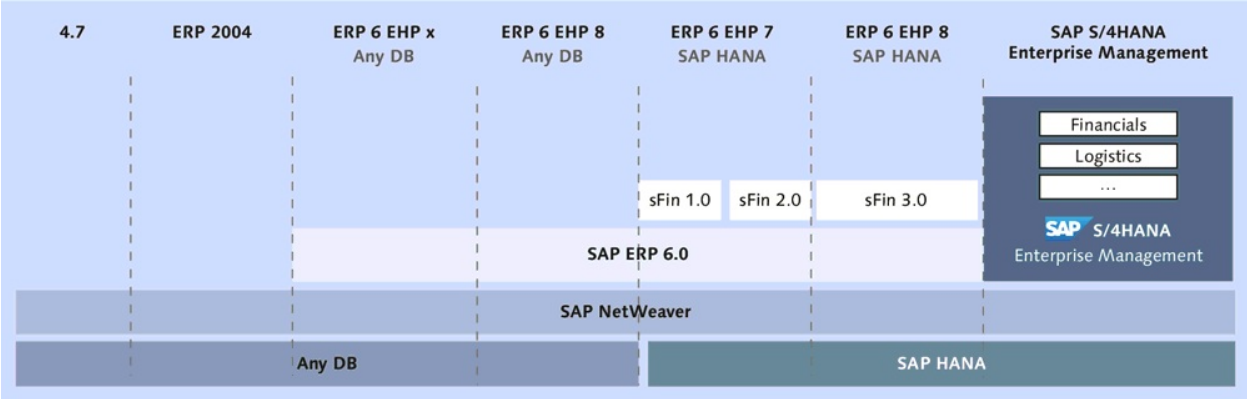
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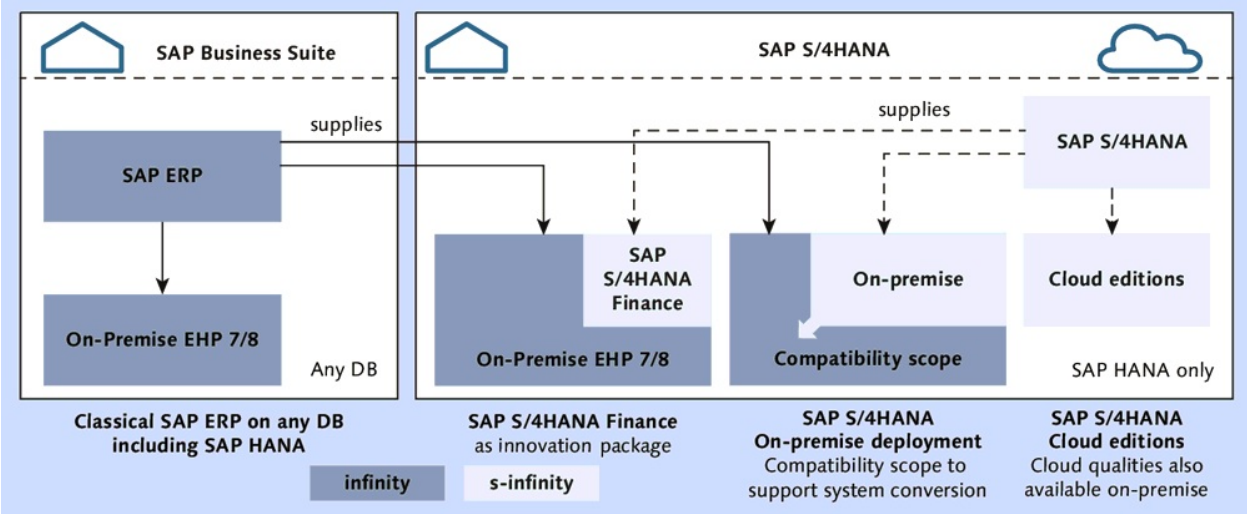
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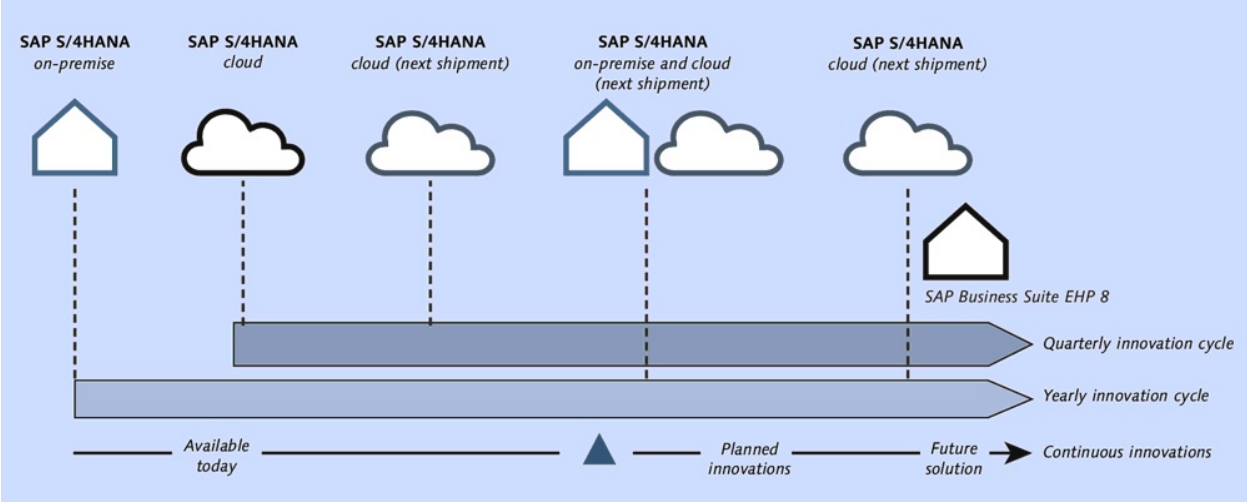
Figure 2.4   Release Cycle of the Different Editions

On-premise	Cloud			
	Cloud private option	Cloud public options		
SAP S/4HANA 1511	**SAP S/4HANA Enterprise Management Cloud, private option**	**SAP S/4HANA Enterprise Management Cloud**	**SAP S/4HANA Professional Services Cloud**	**SAP S/4HANA Marketing Cloud**
Features and functions similar to SAP EHP 6 Plus: • major innovations in Finance and Logistics • Inclusion of additional industries in the Core Except: • Simplification list items **Deliver new innovations, leveraging the potential of in-memory technology and new user interfaces**	**Functional scope of SAP S/4HANA, Enterprise Management 1511** • Configuration options within standardized, pre-configured packages • Full process flexibility • Extensibility • No modifications • Geographical reach similar to on-premise edition 1511	**Edition for ERP core scenarios** • Streamlined procure-to-pay • Accelerated plan-to-product • Optimized order-to-cash • Core human resources • Core finance • Project services	**Edition for professional services industry** • Project services • Streamlined procure-to-pay • Optimized order-to-cash • Core human resources • Corefinance	**Edition for the marketing line of business** • Analyze consumer and customer • Start mail campaign and analyze return rate • Marketing recommendations • Marketing planning • Marketing executive dashboard
Customer on premise / **Provided via SAP HANA Enterprise Cloud (HEC)**	**High standardization TCO and scalability of cloud solution**	**High standardization cloud TCO and scalability side-by-side extensibility**	**Specific to the need of a modern project service management**	**Specific to the need of a modern marketer**

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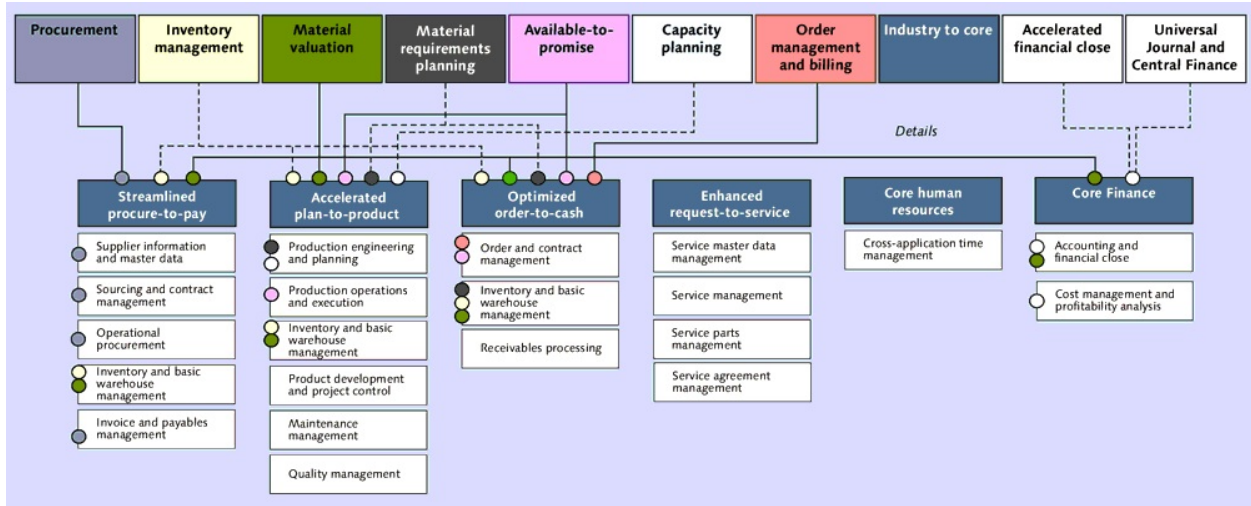
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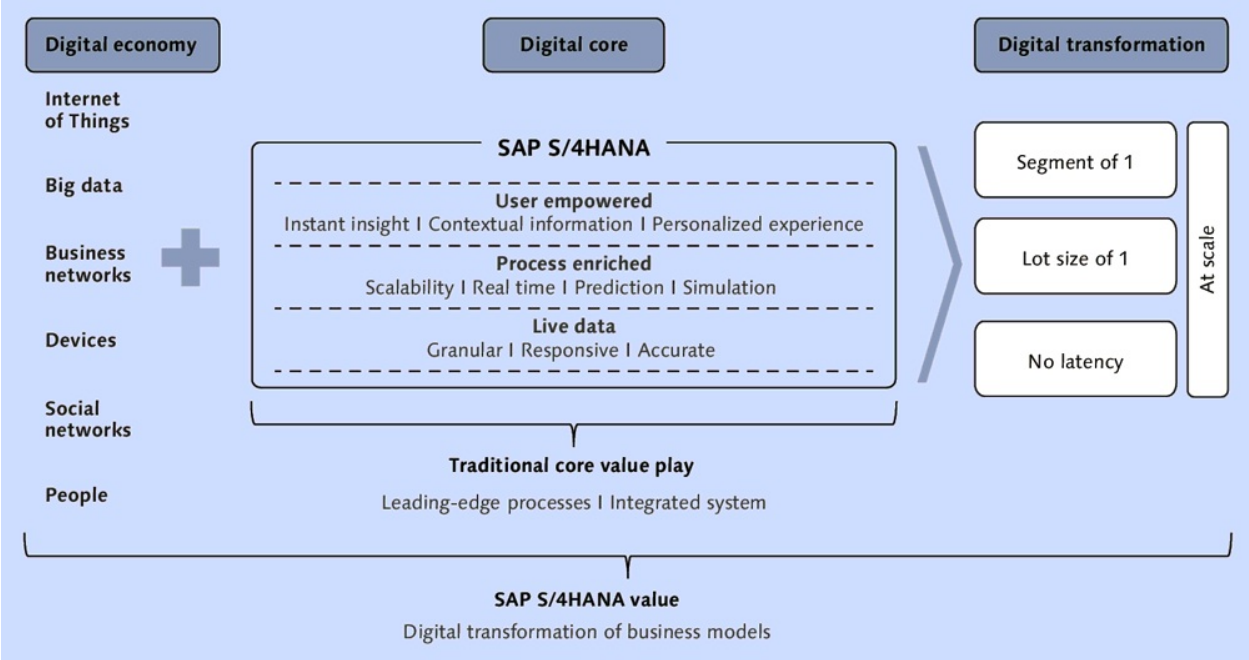
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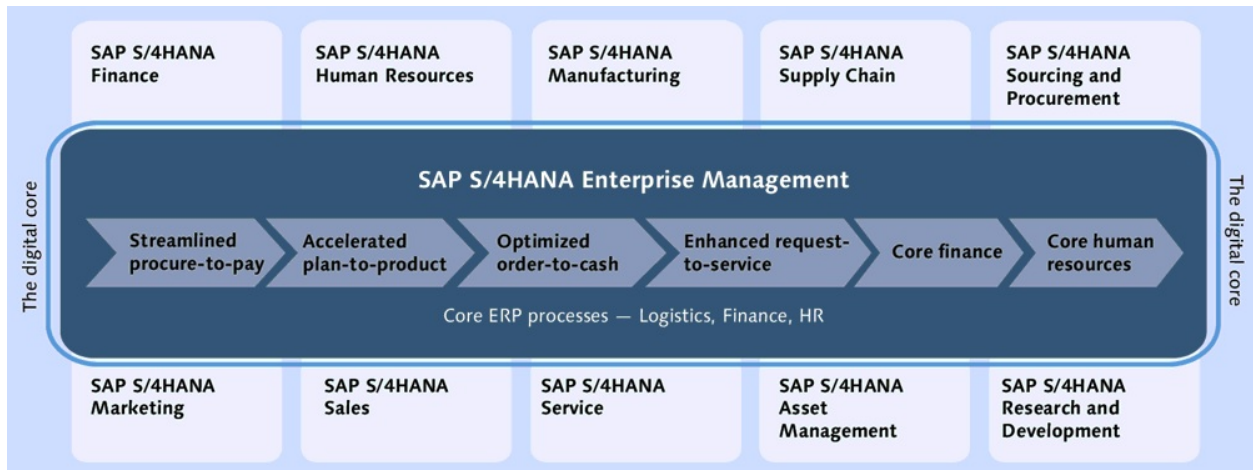
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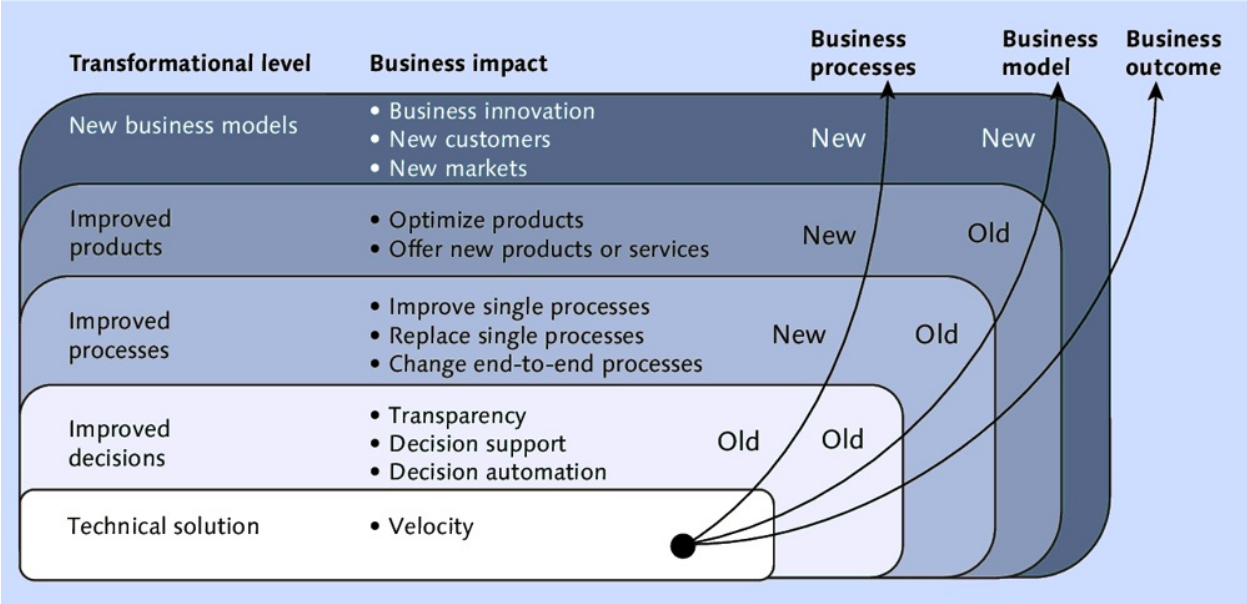
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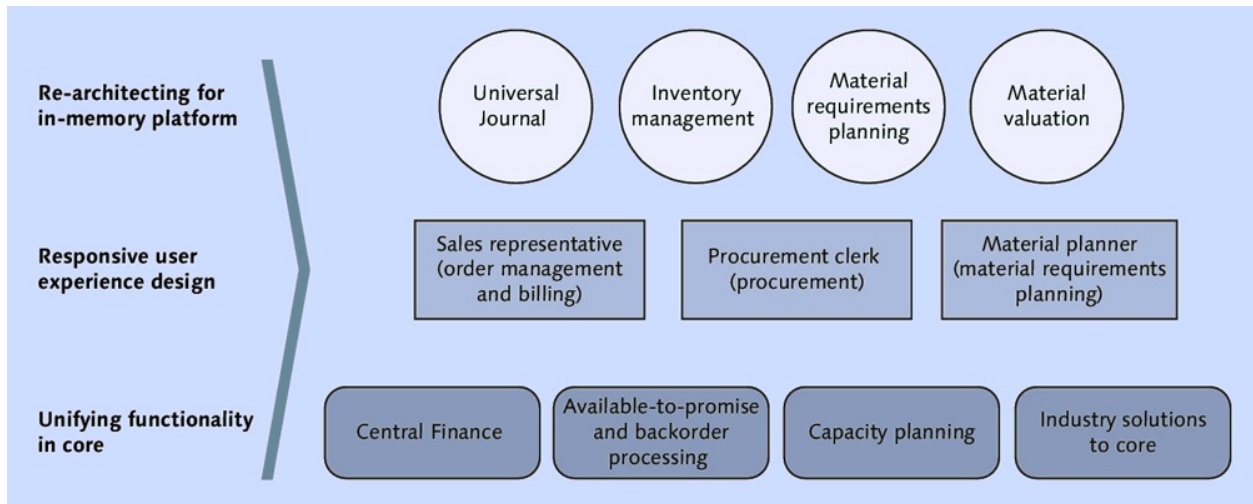
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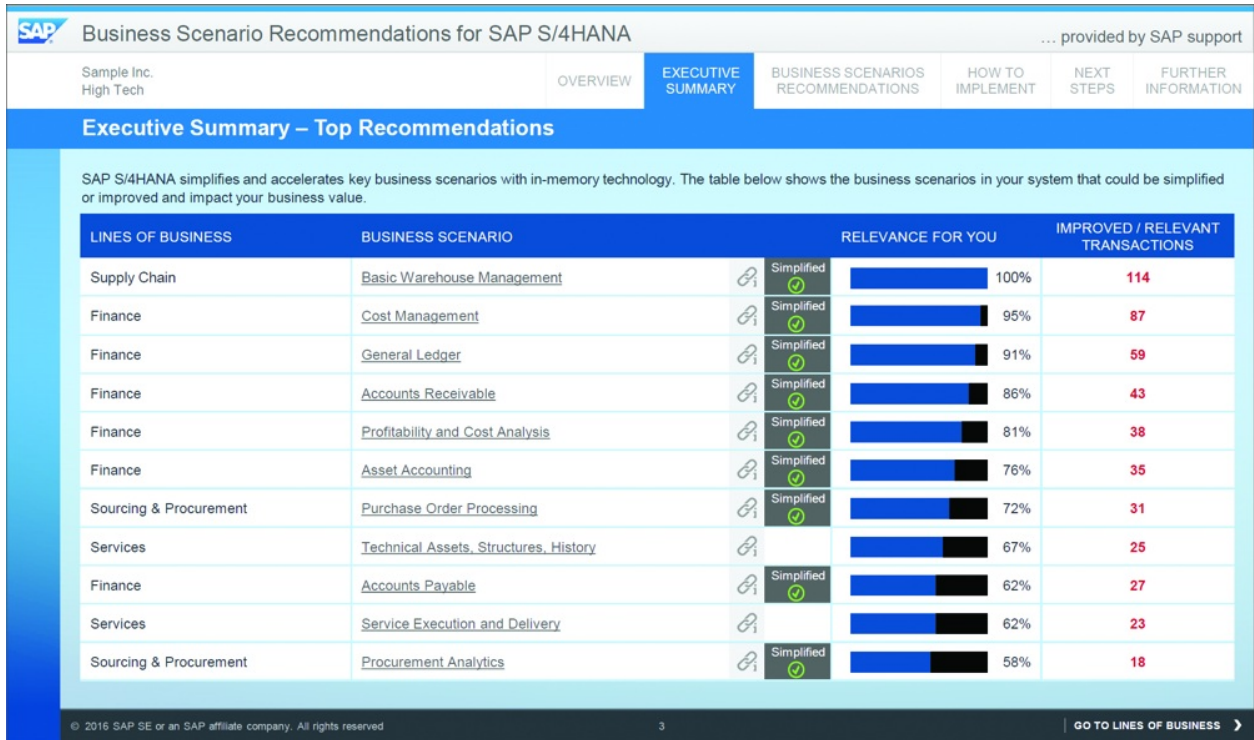
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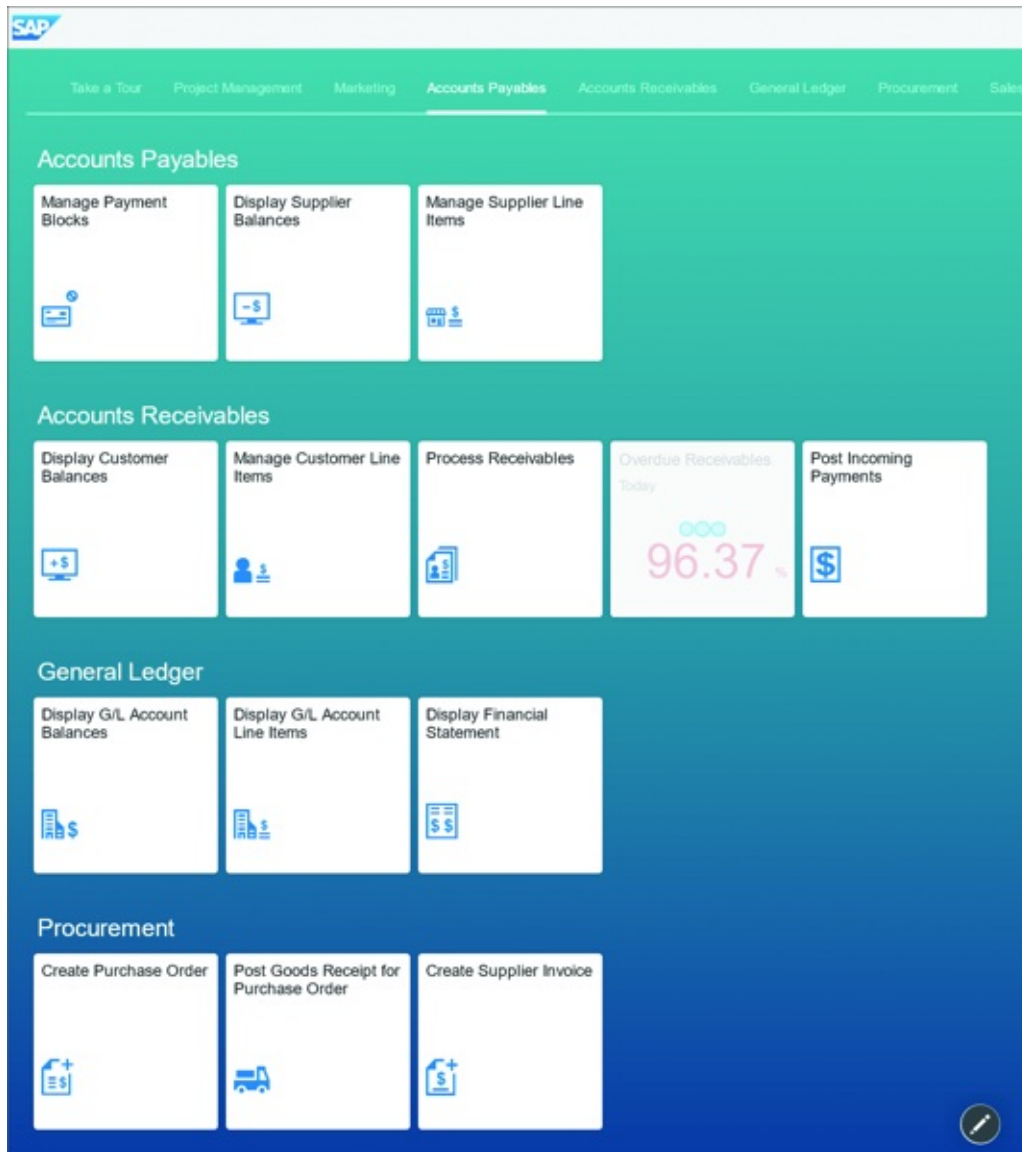
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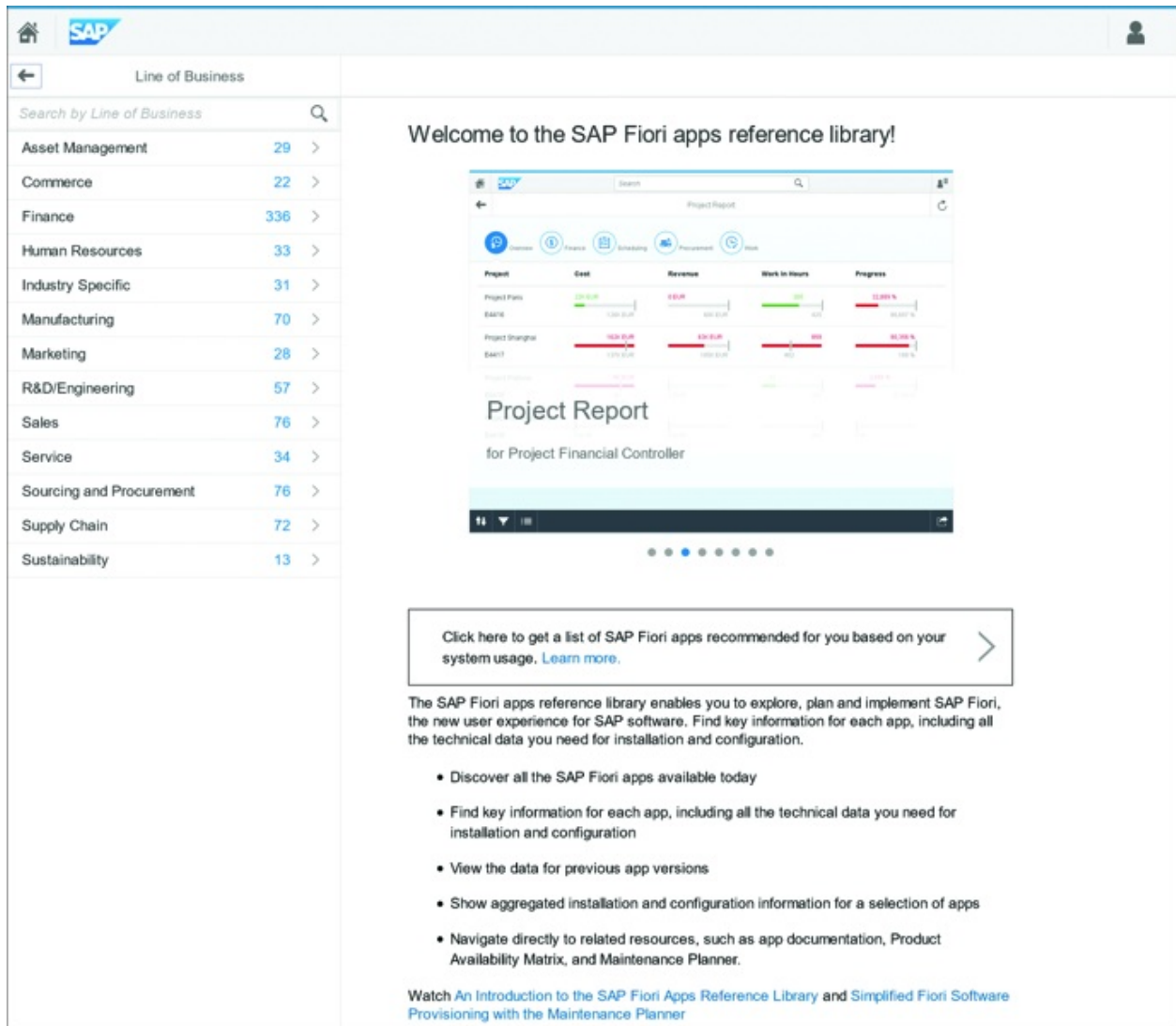
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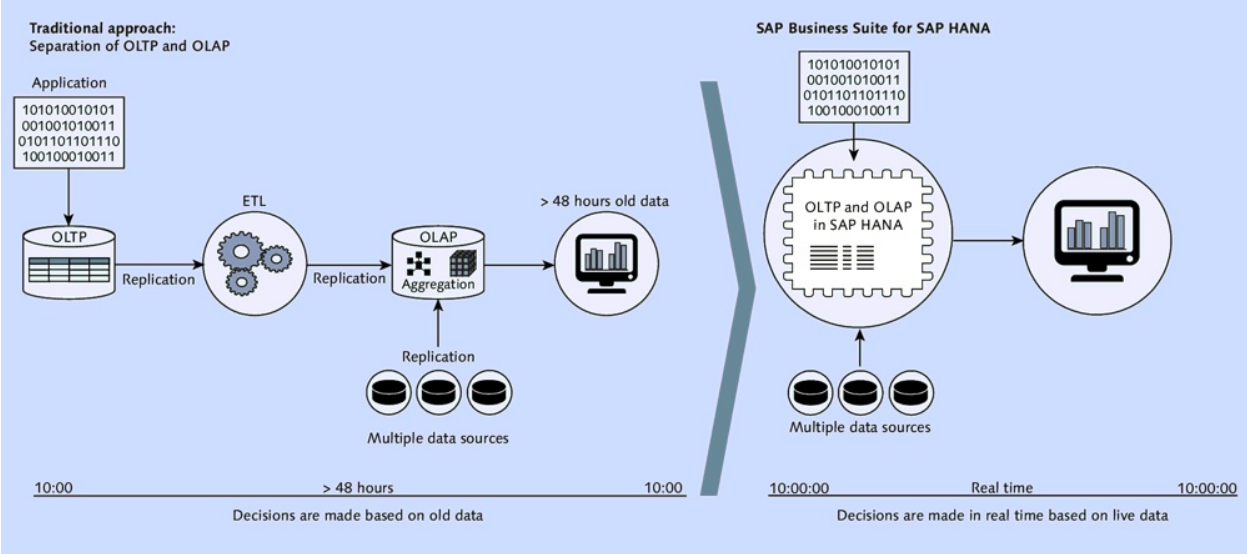
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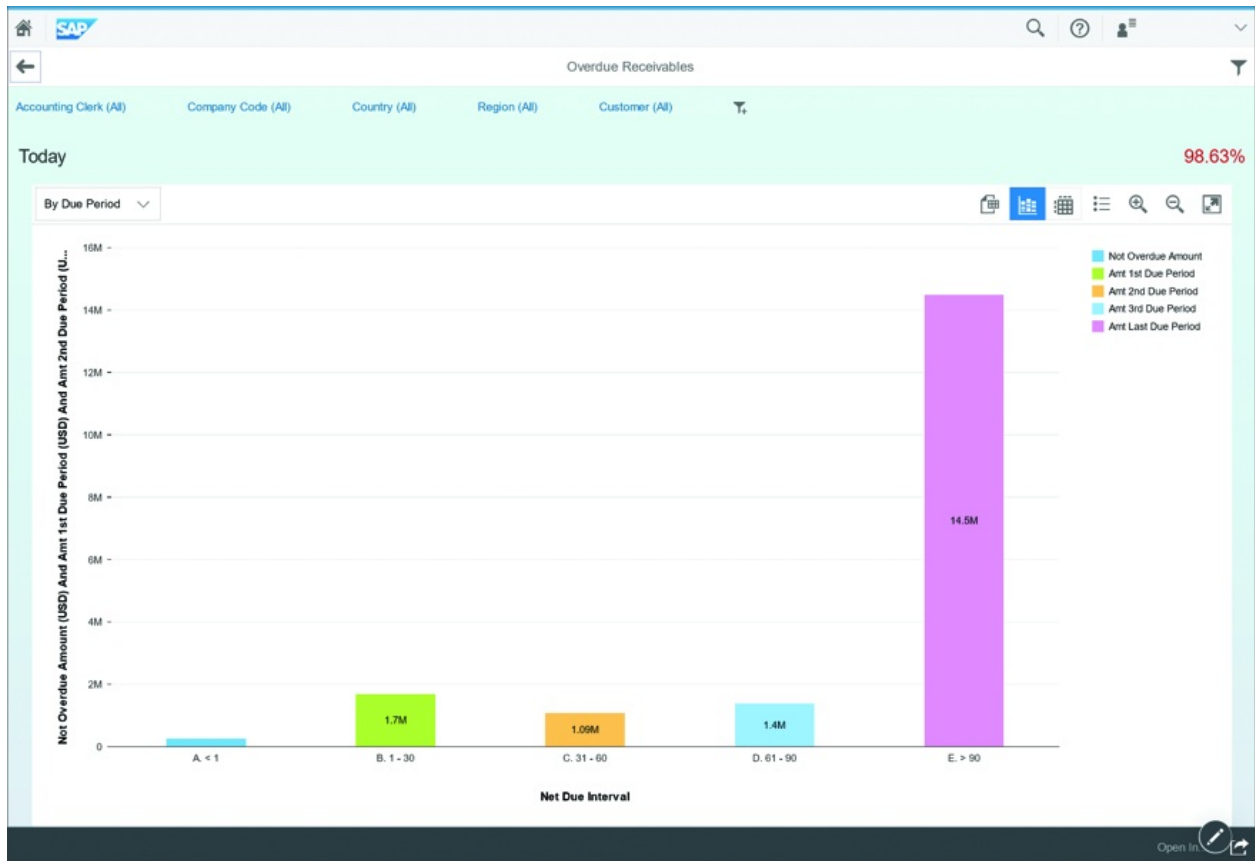
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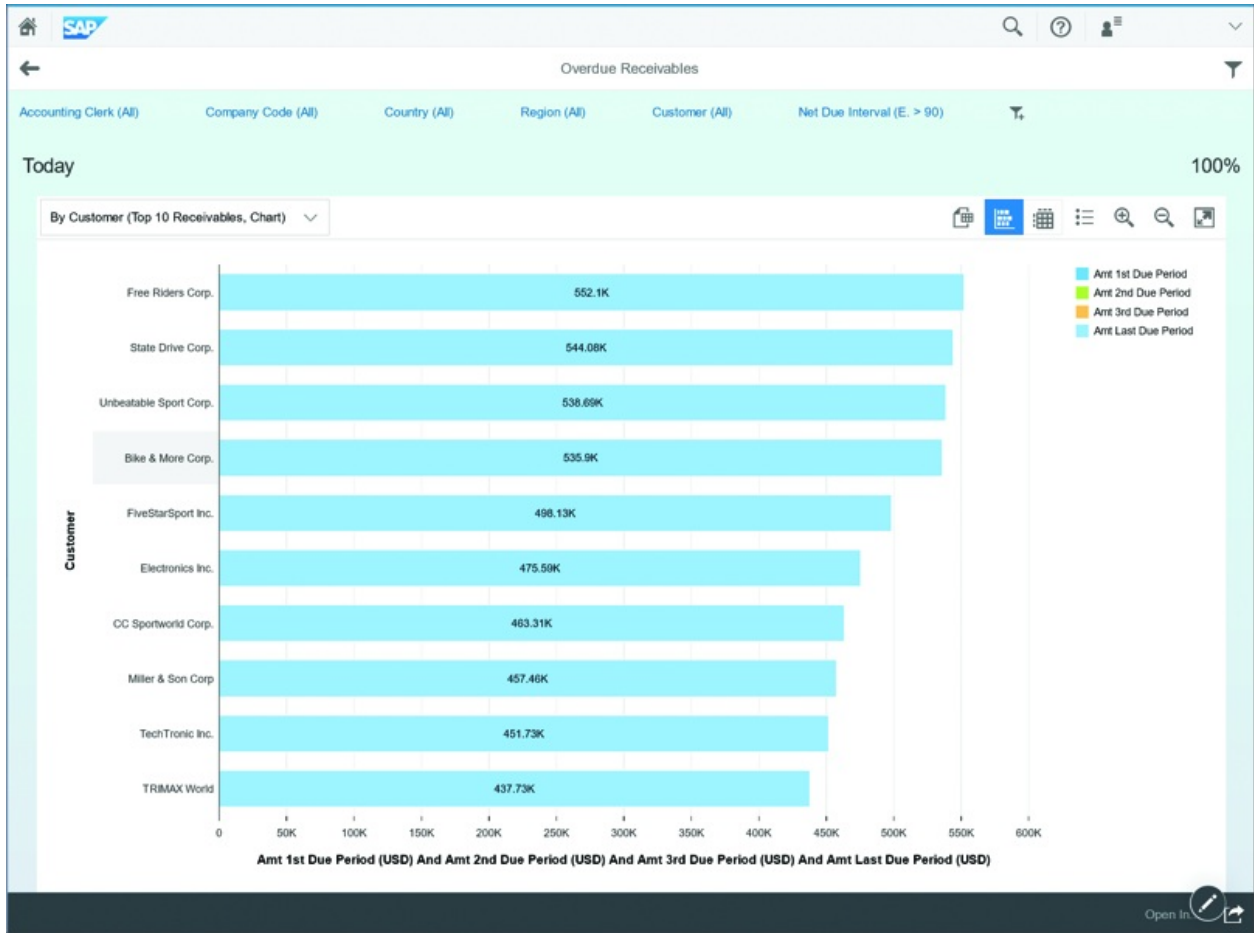
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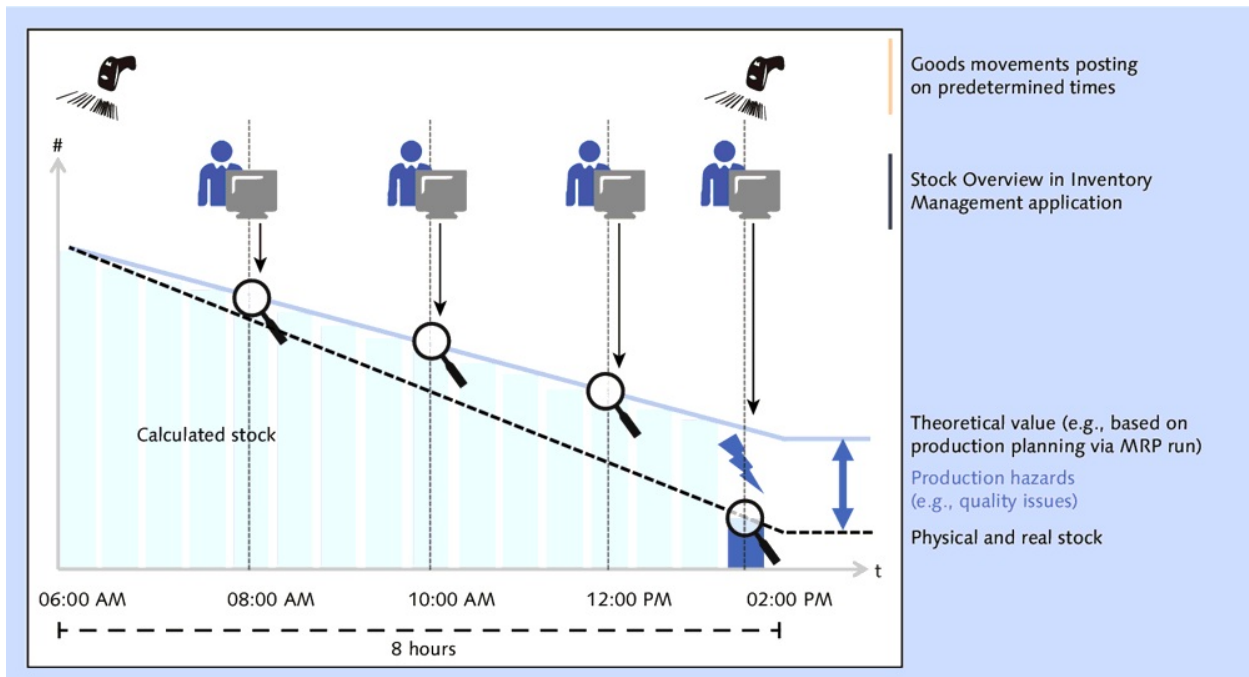
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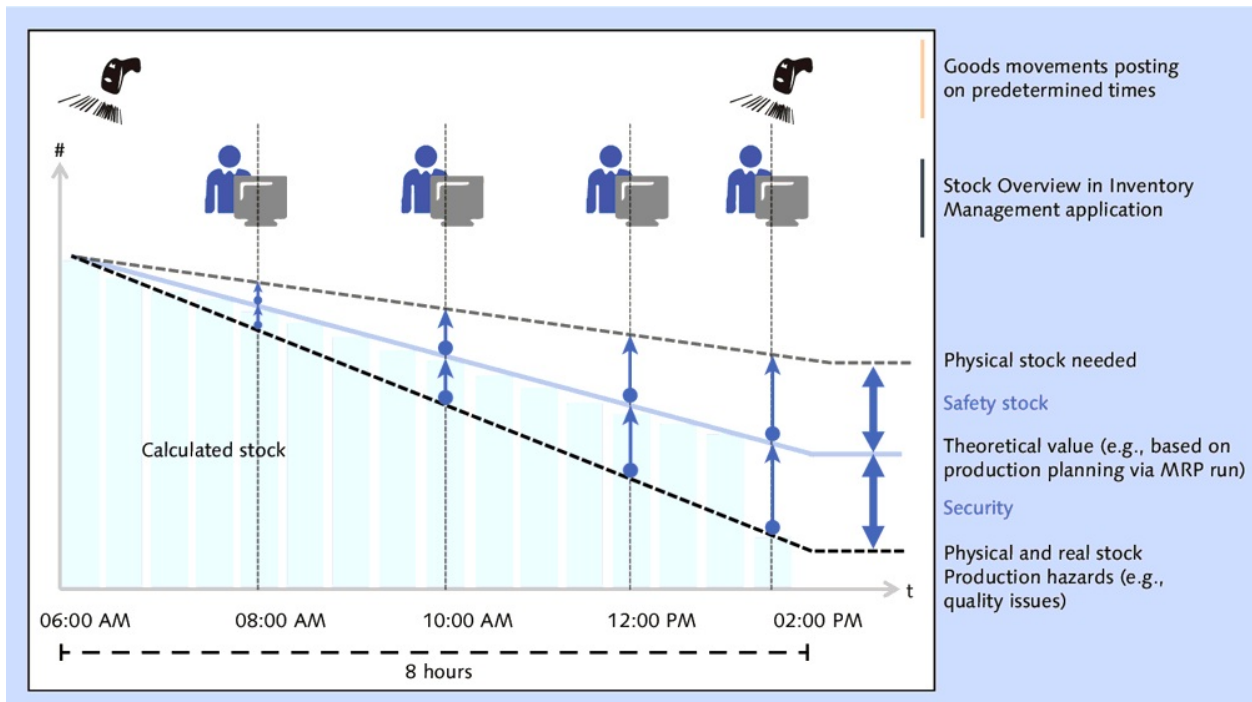
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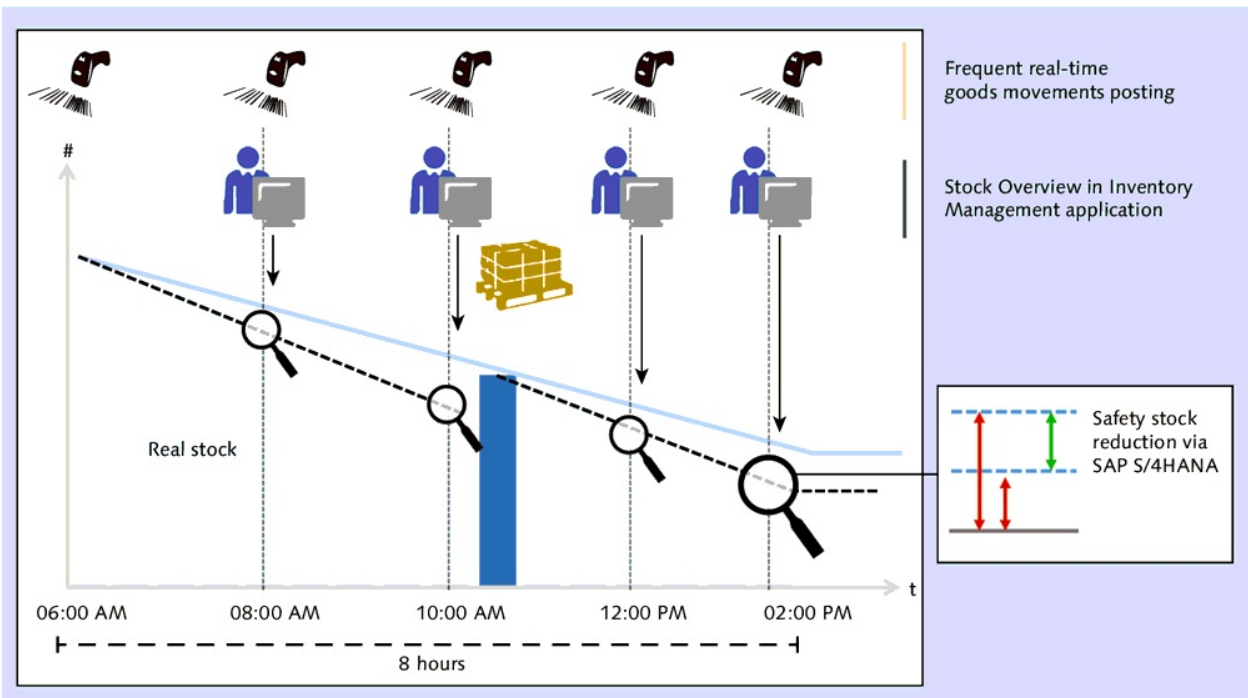
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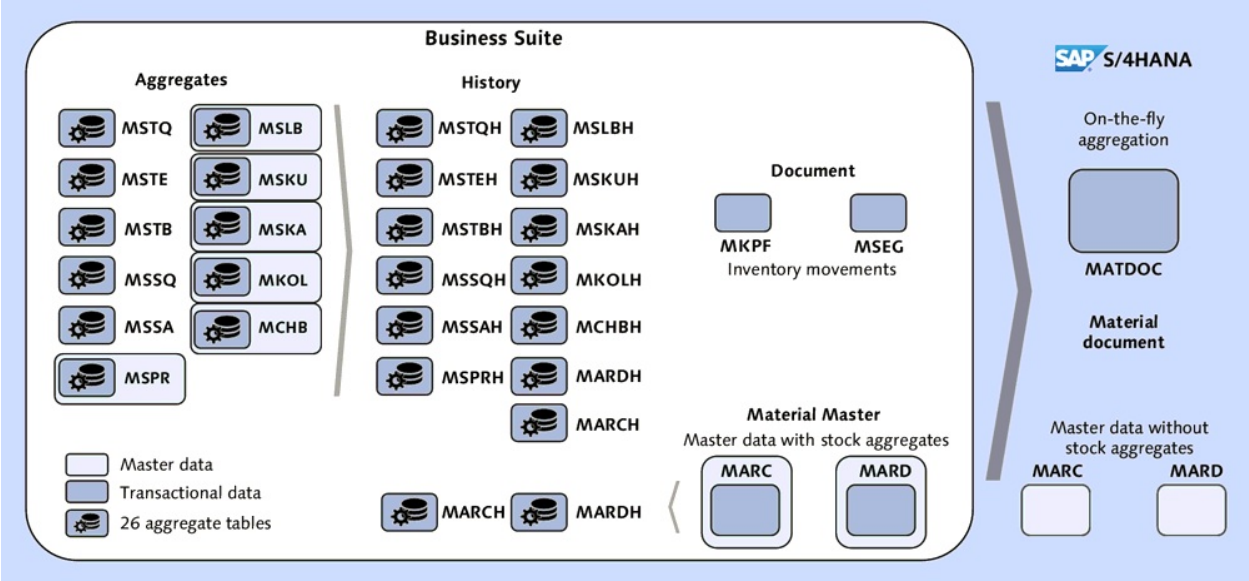
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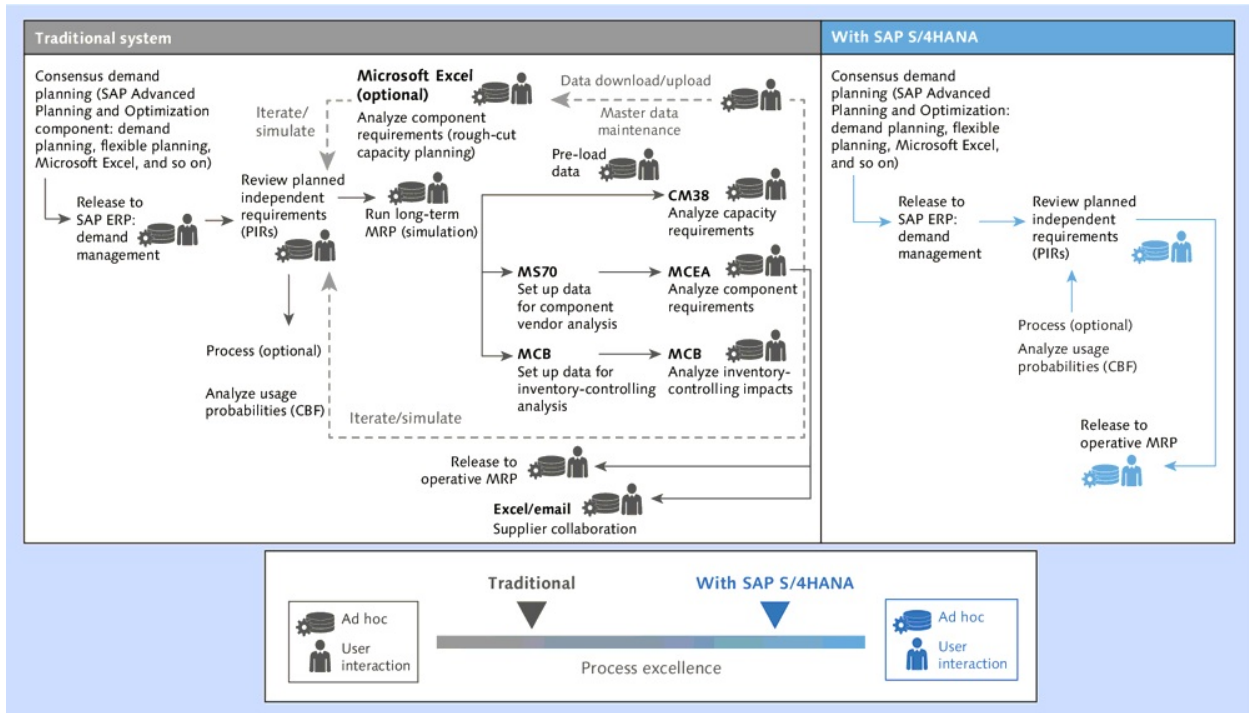
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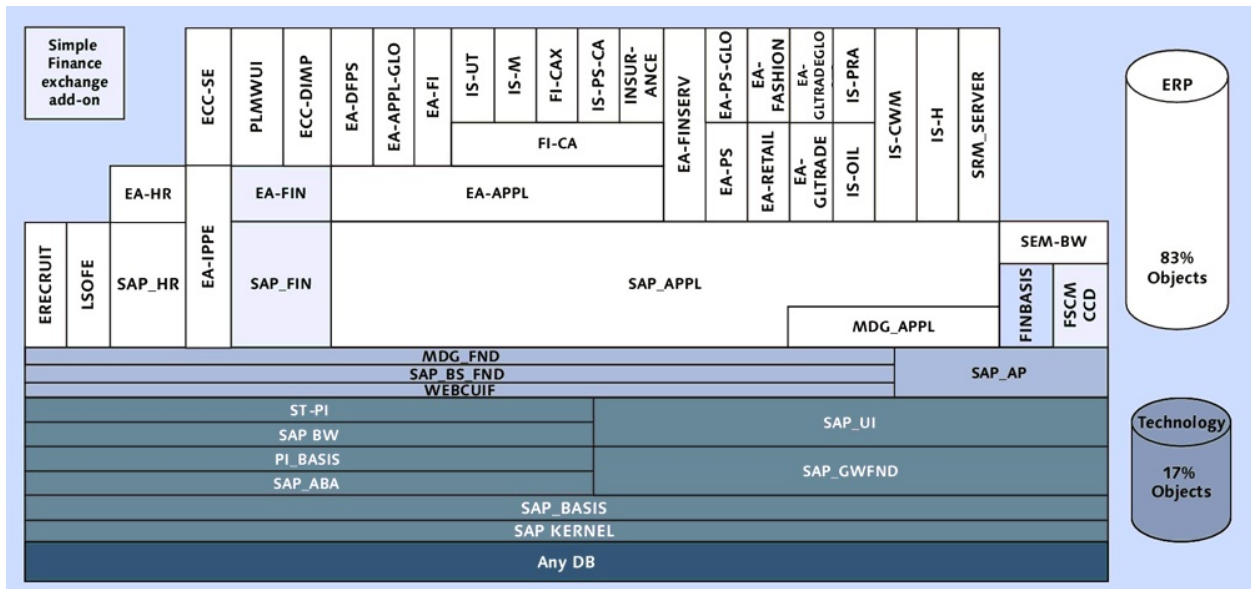
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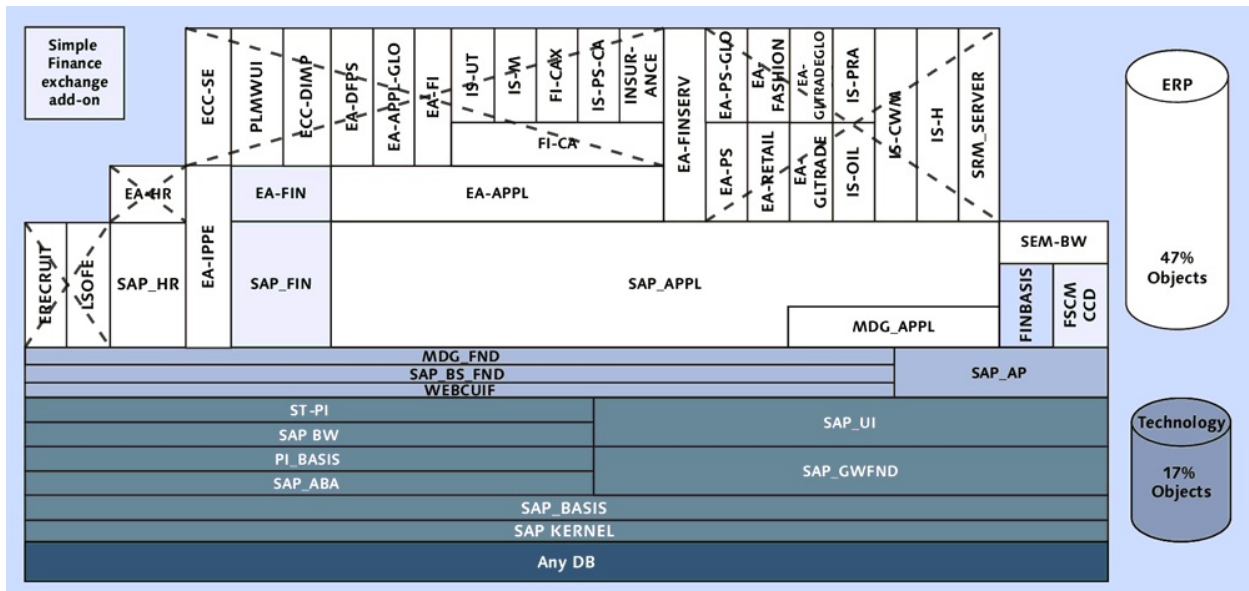
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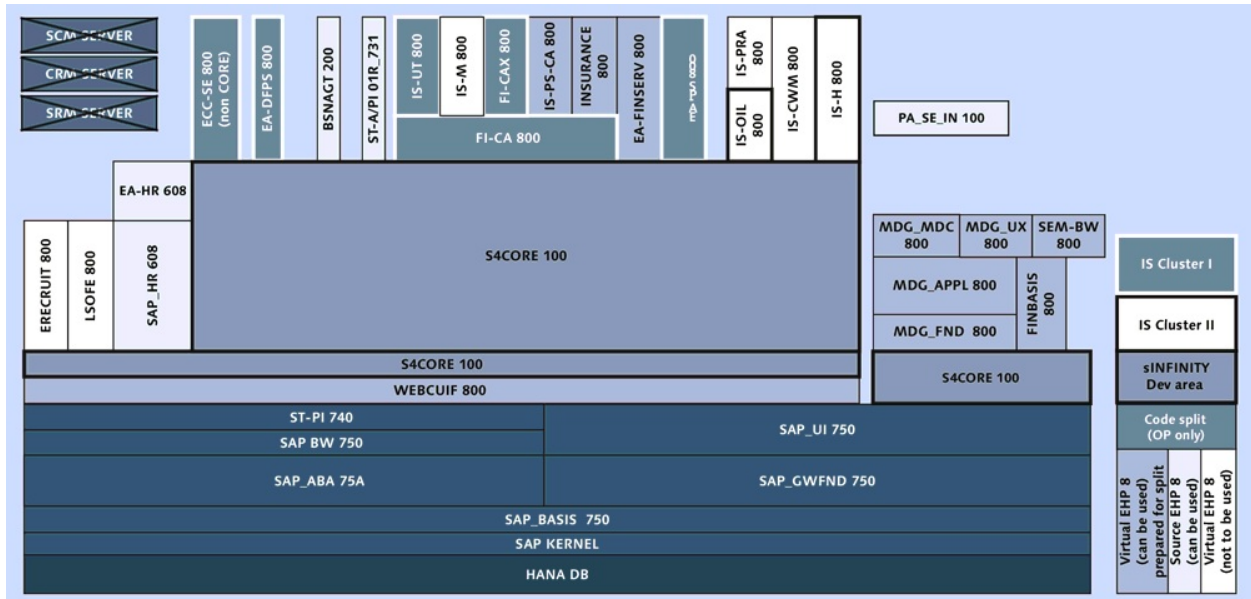
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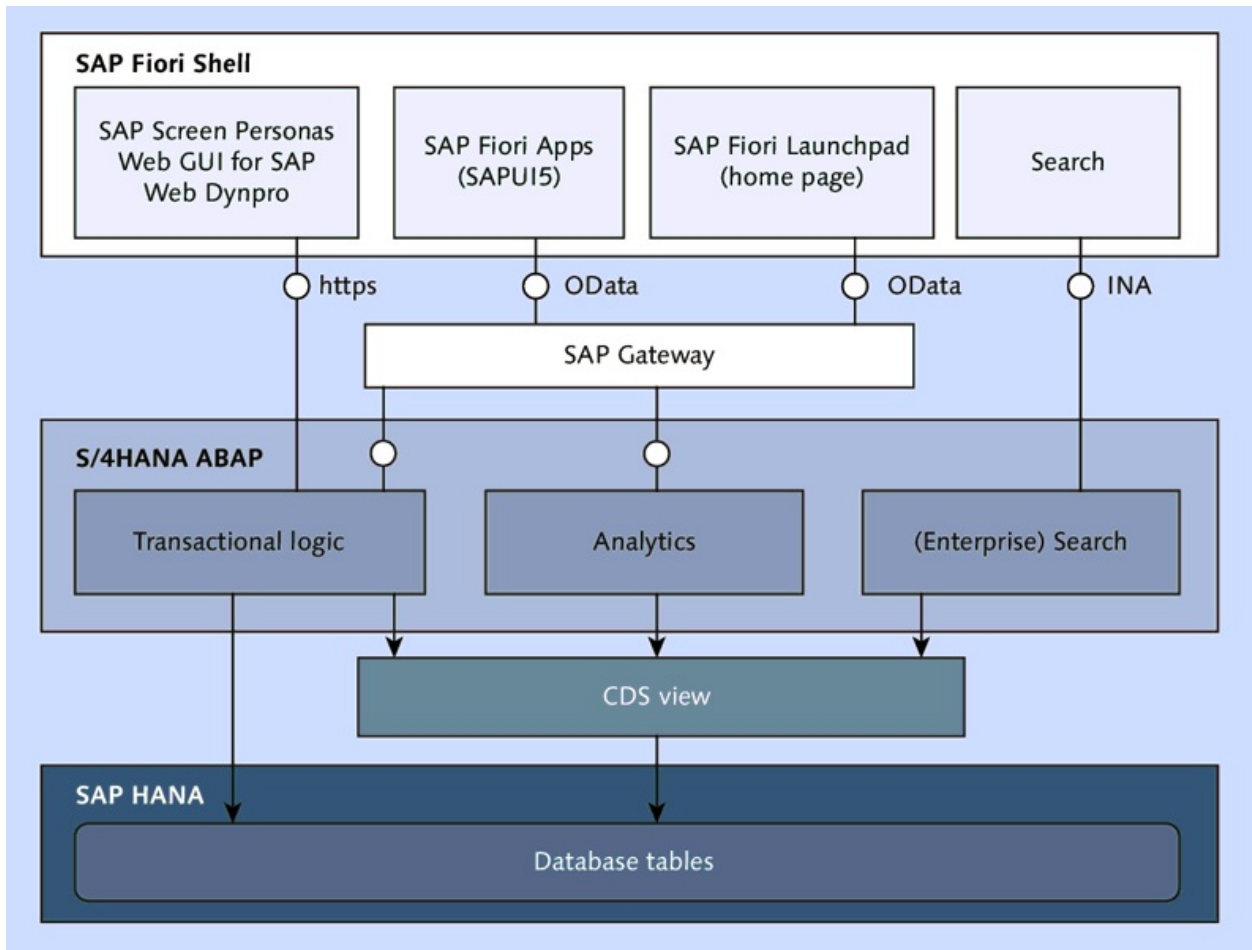
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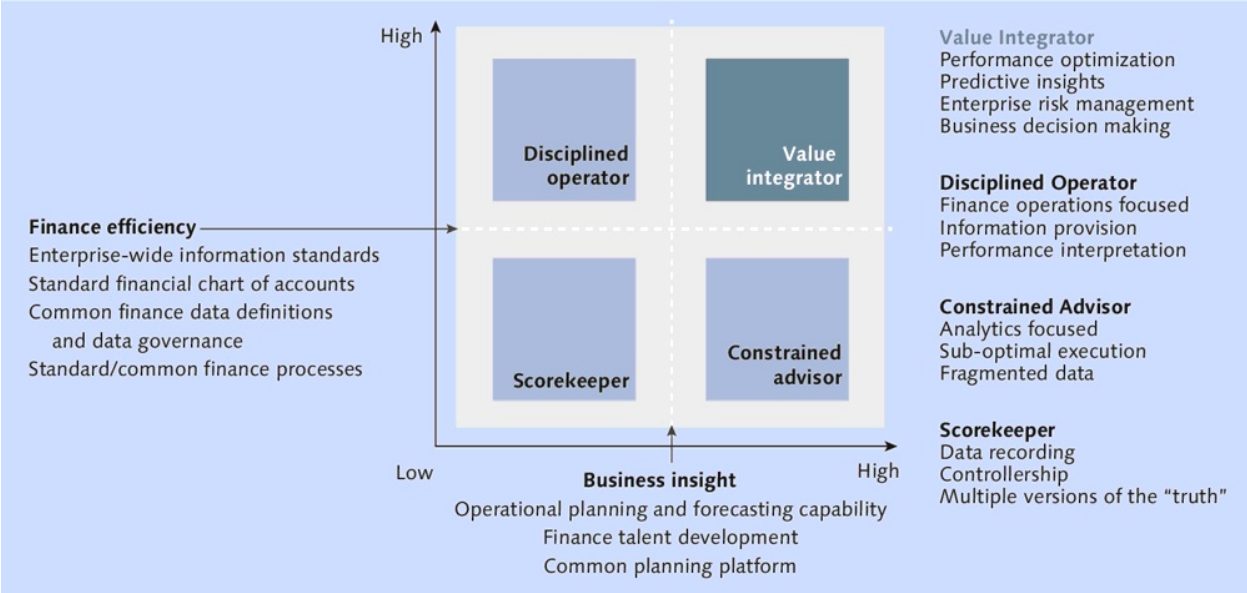
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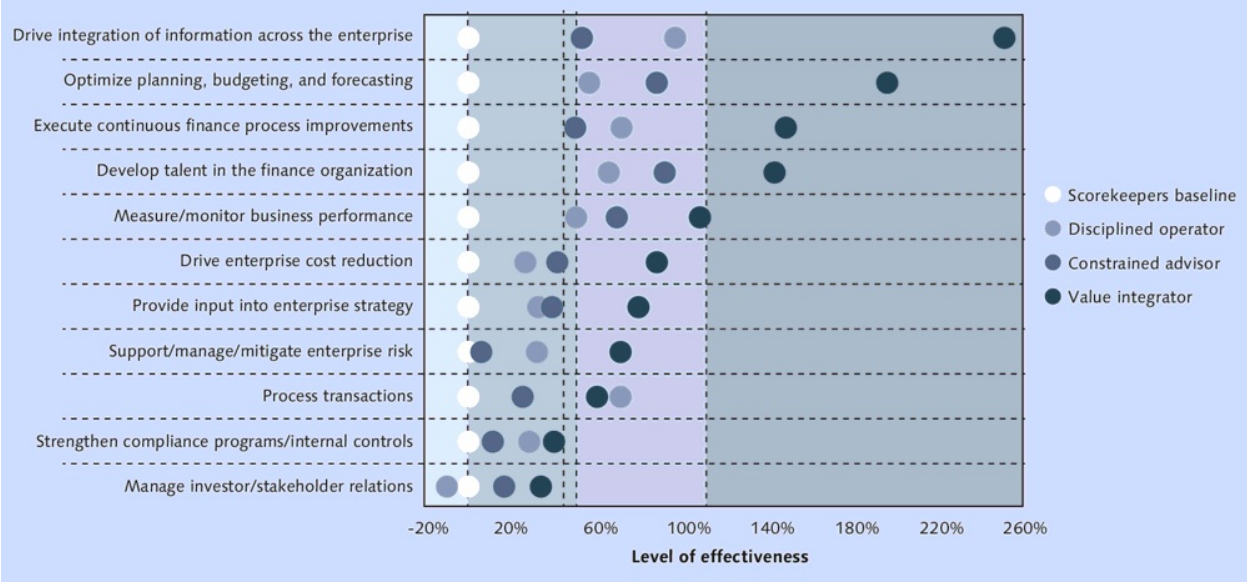
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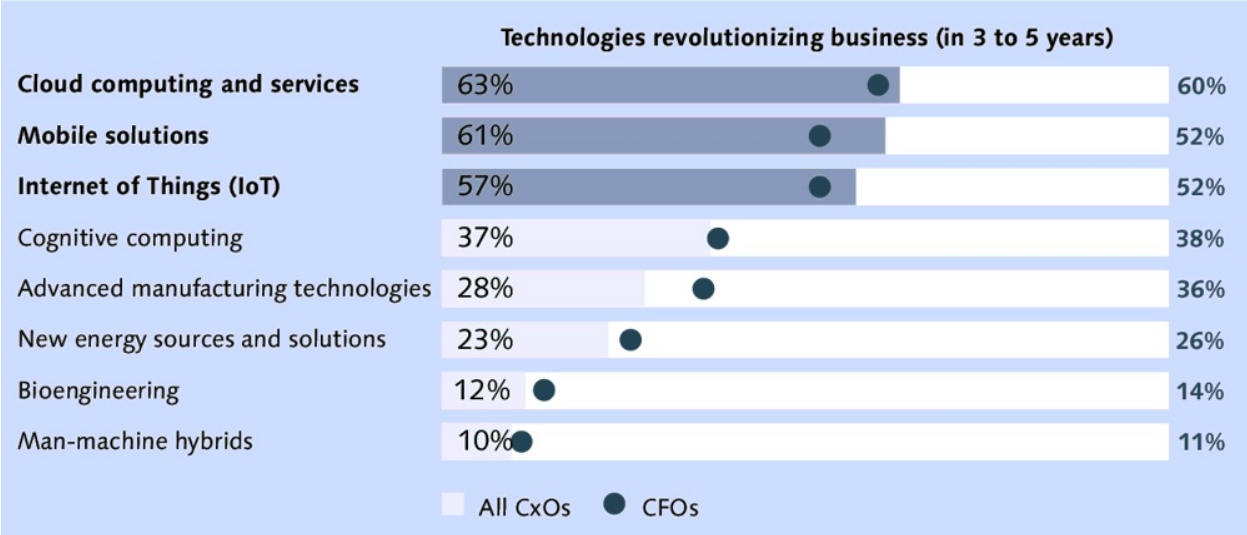
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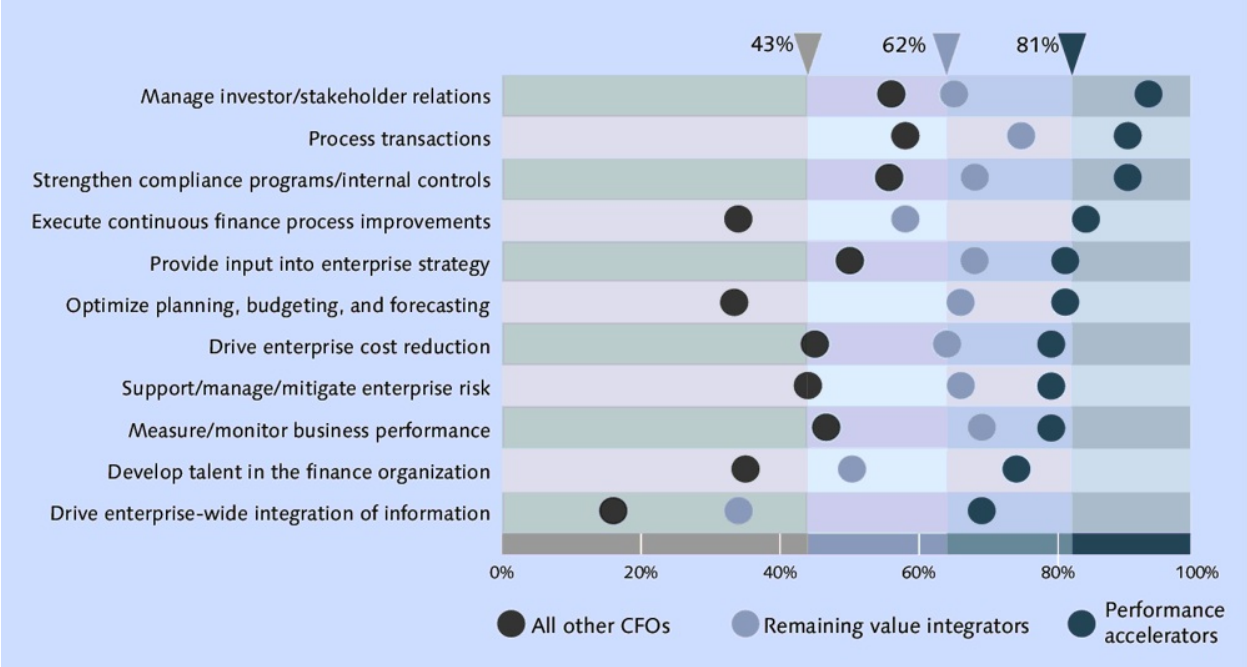
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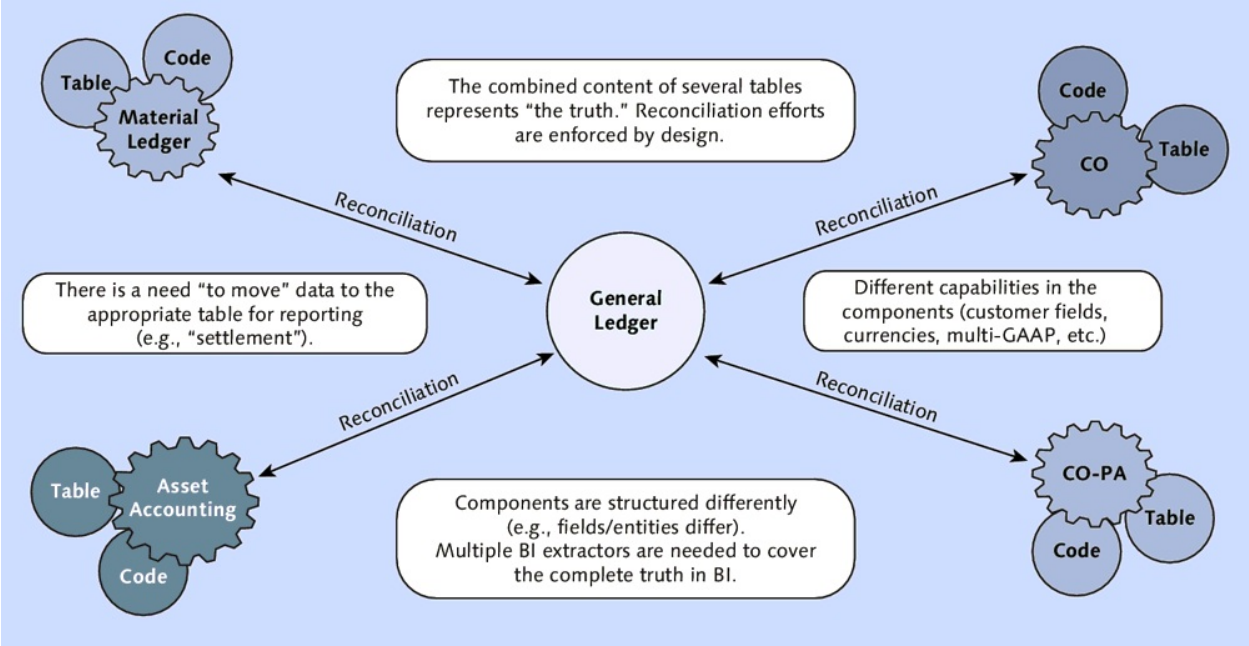
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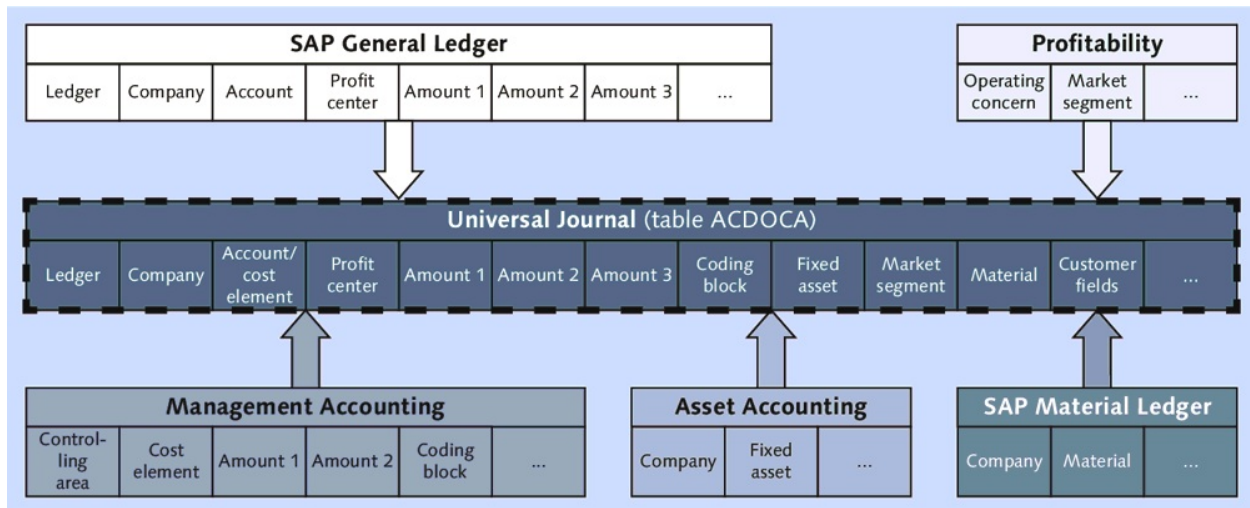
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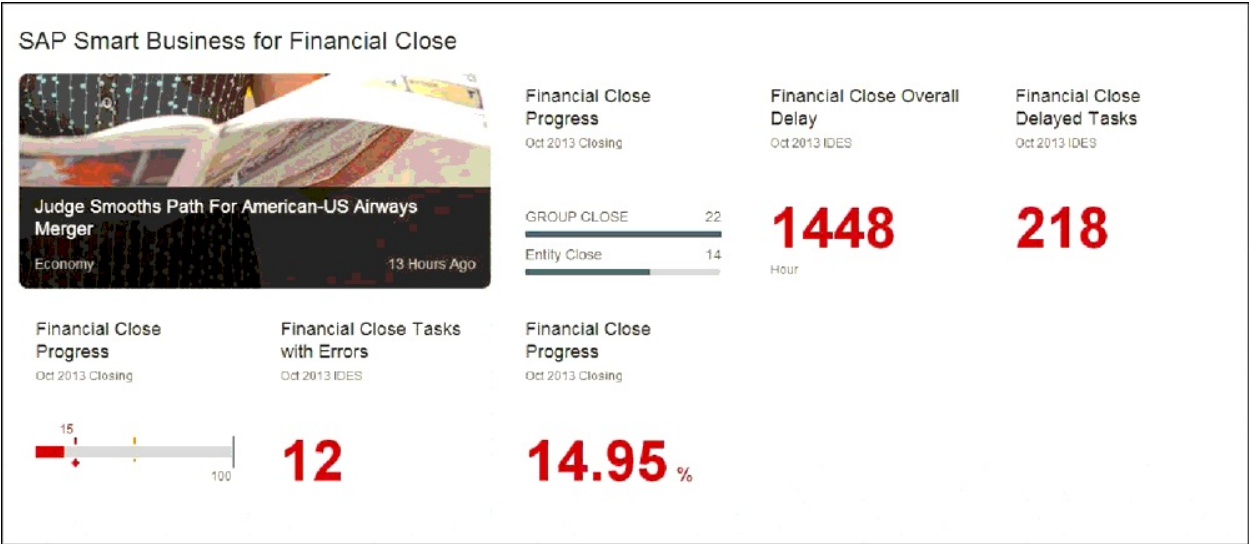
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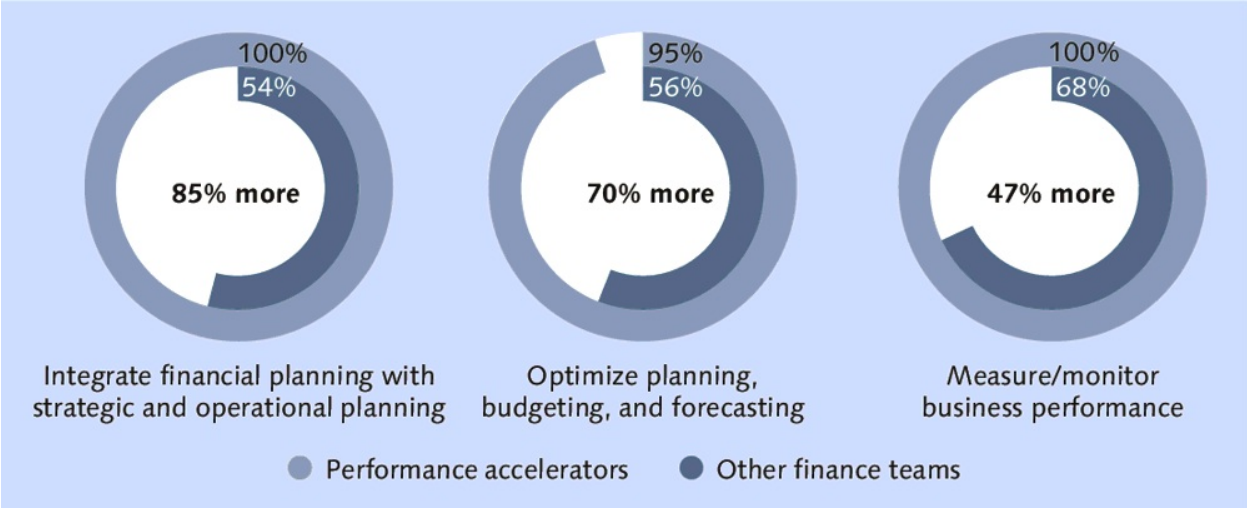
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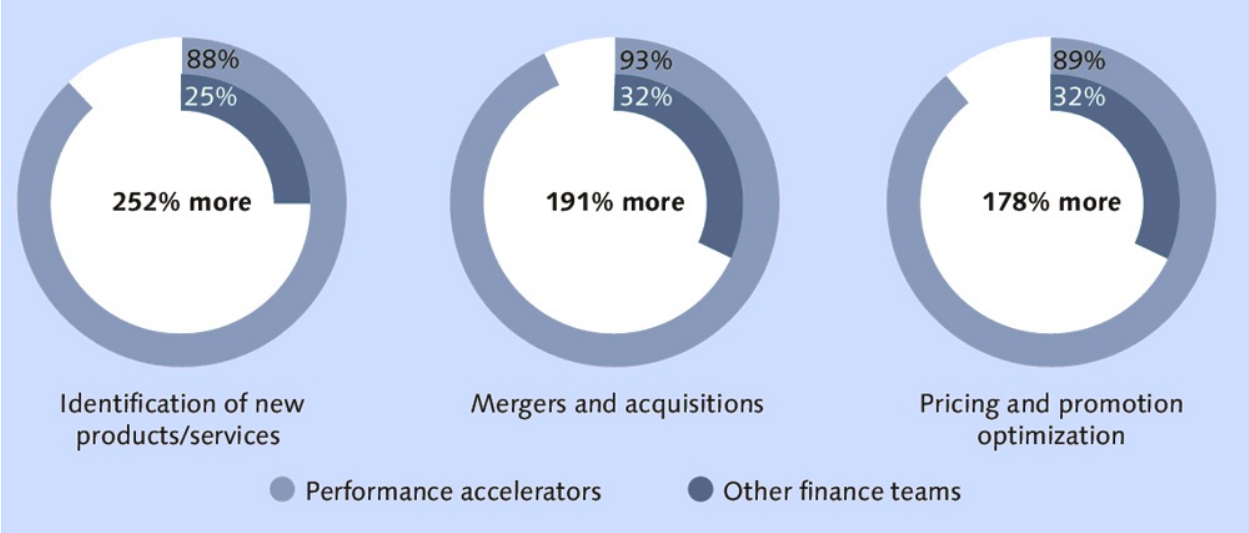
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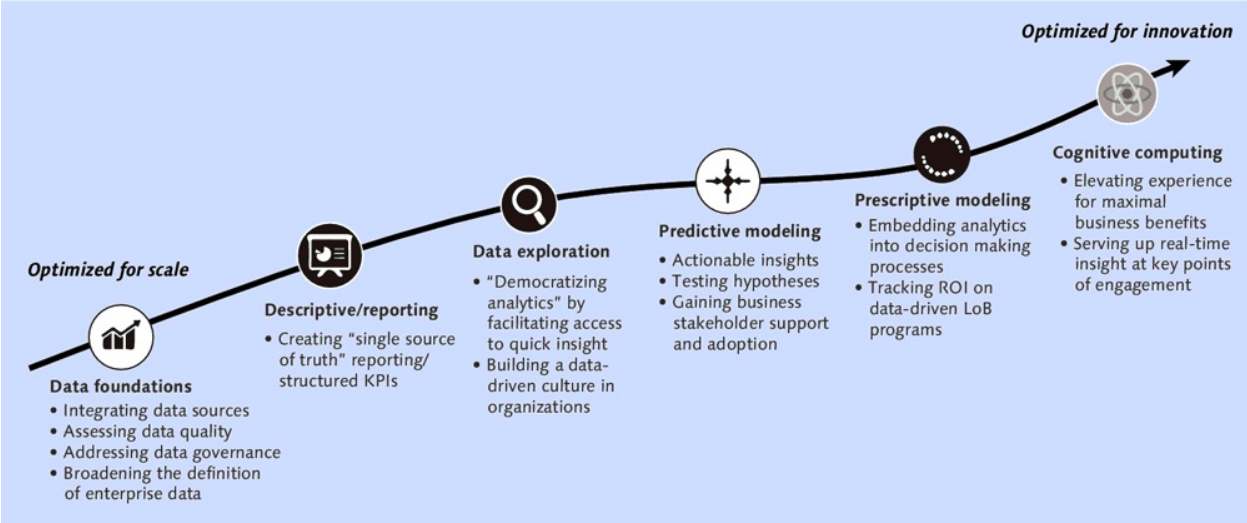
Figure 3.13 Progressing on the Analytics Journey

Figure 3.14   Coding Block Approach

Account	Description	Movement specifications	Chunk ID	Chunk	Glossary ID	Legal entity	OpCO	RepCO	General Ledger account DD	Material (master) DD	Material group (e.g., brand, COGS type) DD
A10100	Land and buildings	M_PPE	130	ASSETS		x	x	x	x		
A10200	Plant and equipment	M_PPE	171	ASSETS		x	x	x	x		
A10700	Other operating assets	M_PPE	163	ASSETS		x	x	x	x		
A10800	Not employed in business operations	M_PPE	151	ASSETS		x	x	x	x		
A10000	Property plant and equipment		176								
A20910	Trademarks, patents, and licenses	M_INT	211	ASSETS		x	x	x	x		
A20920	Software	M_INT	189	ASSETS		x	x	x	x		
A20930	Internal developed intangible assets	M_INT	122	ASSETS		x	x	x	x		
A20980	Intangible intercompany assets	M_IGW	119	ASSETS		x	x	x	x		
A20990	Miscellaneous intangible assets	M_INT	144	ASSETS		x	x	x	x		
A20900	Other intangible assets	M_INT	158								
A20100	Goodwill	M_INT	112	ASSETS		x	x	x	x		
A20000	Intangible assets	M_INT	118								
A30910	Non-current derivative assets		146	OTHER ASSETS		x	x	x	x		
A30920	Securities		185	OTHER ASSETS		x	x	x	x		
A30990	Miscellaneous financial assets		143	OTHER ASSETS		x	x	x	x		
A30900	Other non-current financial assets		162								
A30200	Pension assets		168	OTHER ASSETS		x	x	x	x		
A30300	Deferred tax assets	M_TAX	95	OTHER ASSETS		x	x	x	x		
A30400	Investments in subsidiaries	M_INV	126	OTHER ASSETS		x	x	x	x		
A30600	Investments in associates	M_INV / ASS	125	OTHER ASSETS		x	x	x	x		
A30700	Loans to group companies	M_NON	134	OTHER ASSETS		x	x	x	x		
A30800	Non-current receivables		150	OTHER ASSETS		x	x	x	x		

Figure 3.15   Example of a Coding Block

Figure 3.16 SAP Material Ledger Tables

Figure 3.17   Top-Down Distribution Value Fields

Figure 3.18 Detailed Price Difference Accounts

Figure 3.19 Customizing Additional Quantity Fields in Table ACDOCA

Figure 3.20   Central Journal Concept
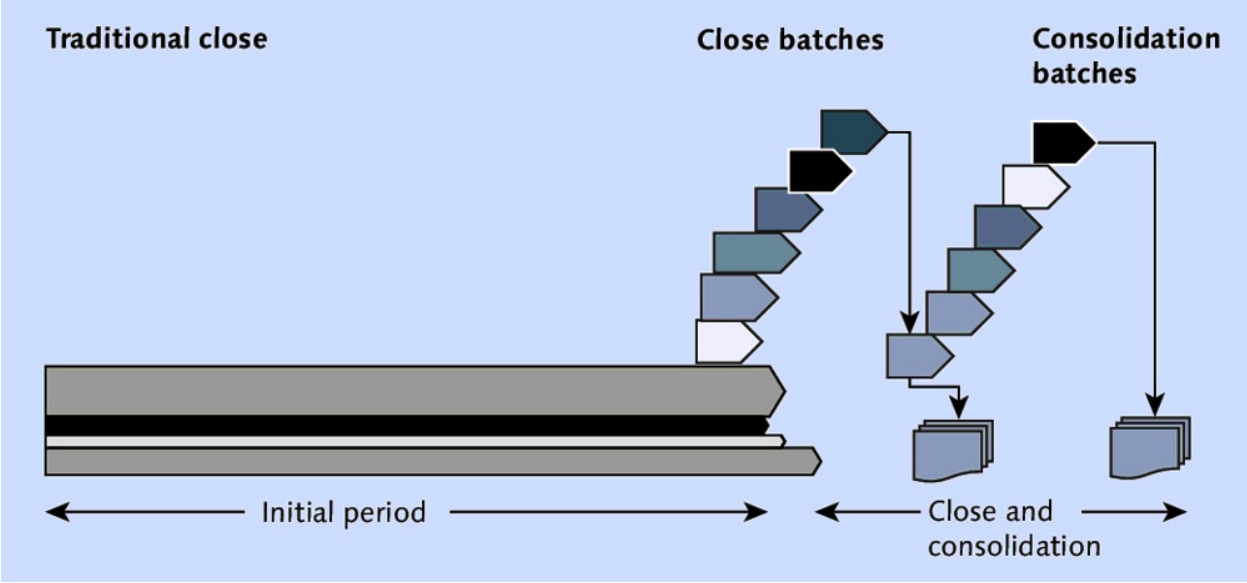
Figure 3.21   Traditional Financial Close
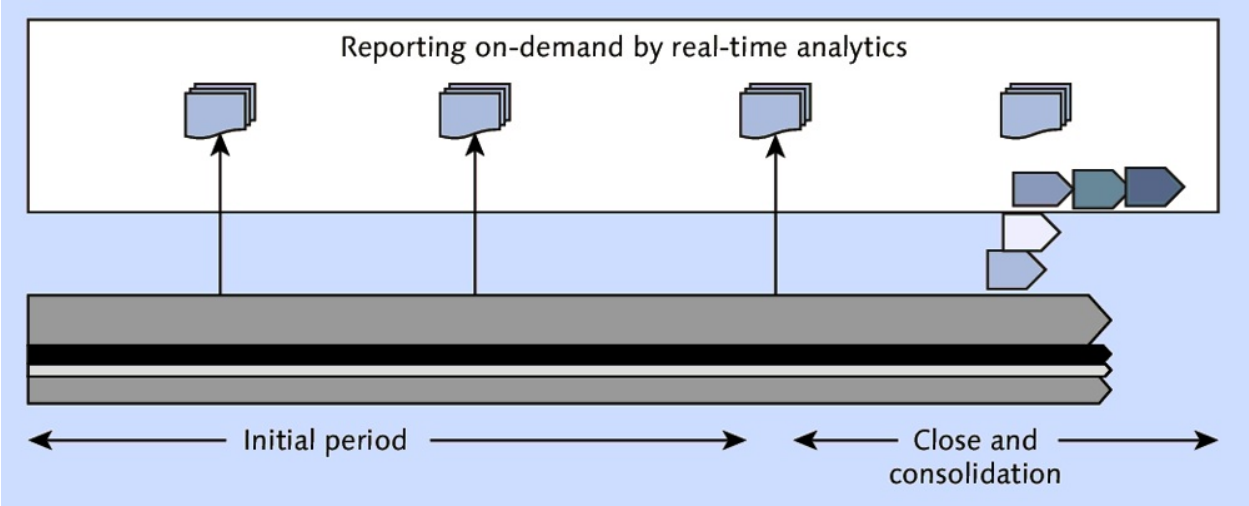
Figure 3.22   Financial Close with S/4HANA Finance

Figure 3.23 SAP S/4HANA Support for Two Code Lines: SAP S/4HANA Finance and SAP S/4HANA Enterprise Management

Ledger	Company	CURTP (local)	CURTP (global)	CURTP1	CURTP2	
0L	1000	10	30			Legal view
GR	1000	11	31			Group view
PC	1000	12	32			Profit center view

Figure 3.24 Currency Support in SAP S/4HANA Finance 1503 and SAP S/4HANA Enterprise Management (Parallel Single Valuation)

Ledger	Company	CURTP (local)	CURTP (global)	CURTP1	CURTP2	CURTP3	CURTP4
GL	1000	10	30	11	31	12	32
		Legal view		Group view		Profit center view	

Figure 3.25 Currency Support in SAP S/4HANA Finance 1503 and SAP S/4HANA Enterprise Management (Multivaluation)
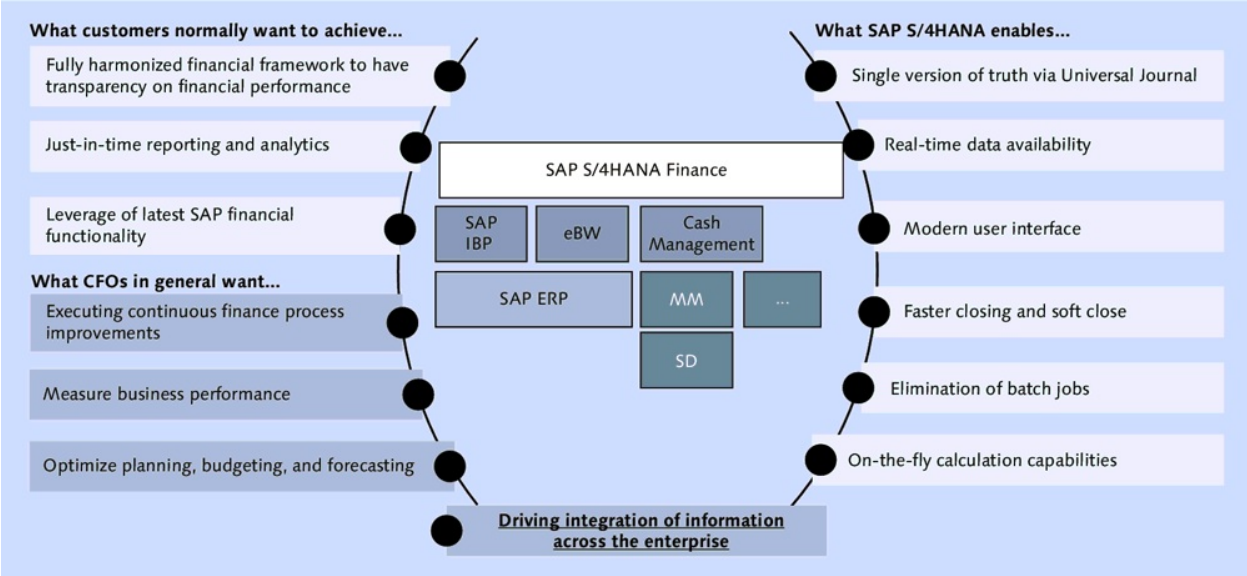
Figure 3.26 The Business Case for SAP S/4HANA Finance
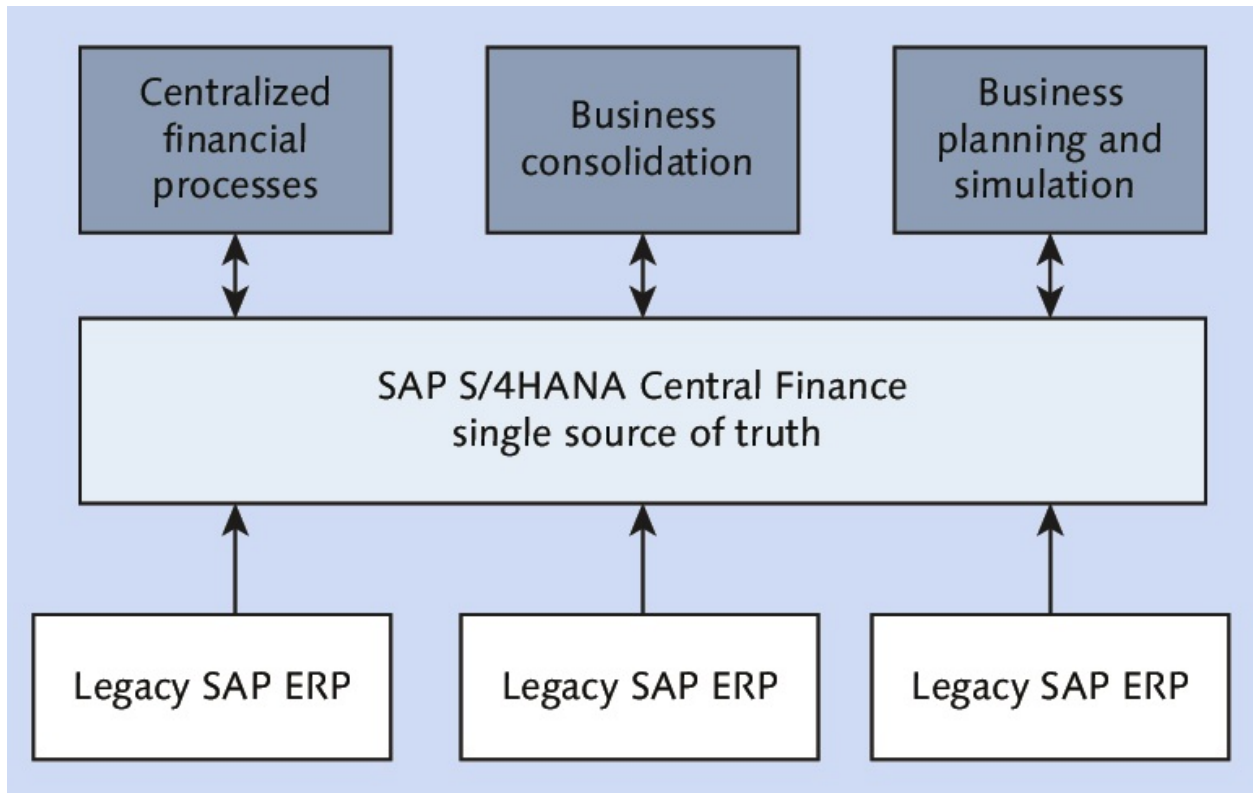
Figure 3.27 Expected Future Architecture of Central Finance
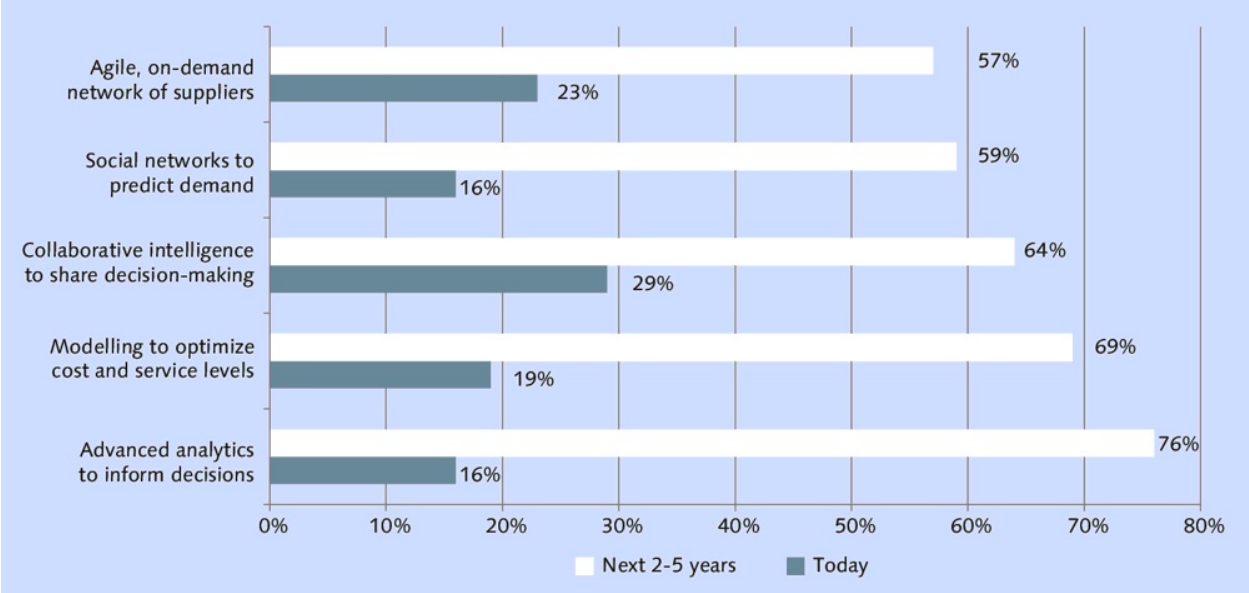
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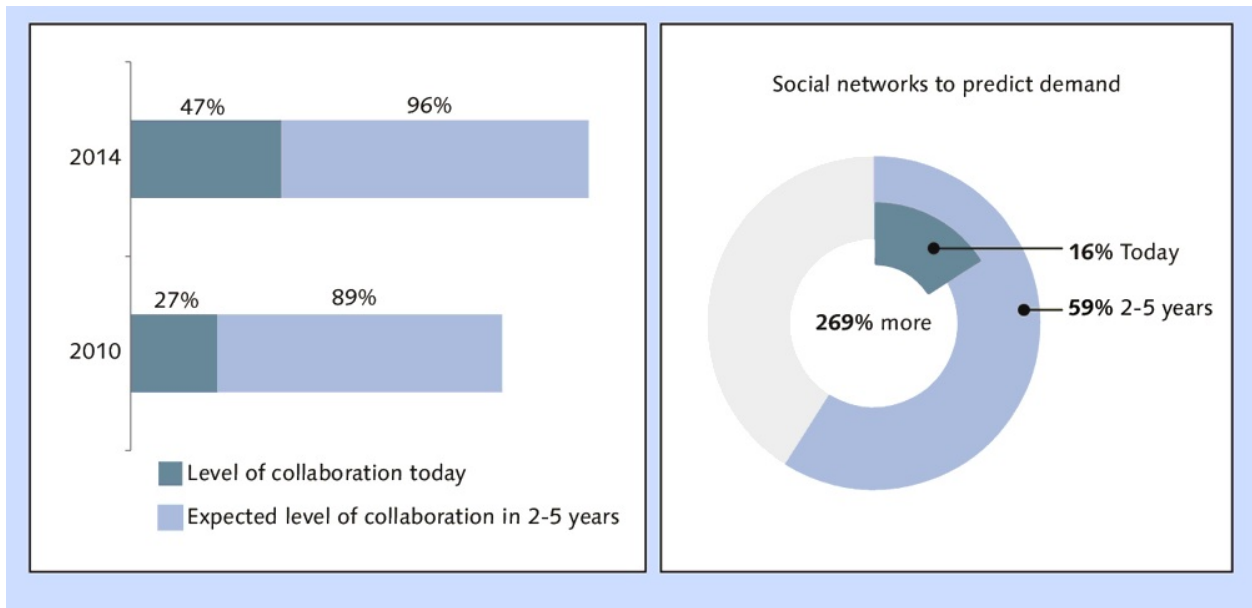
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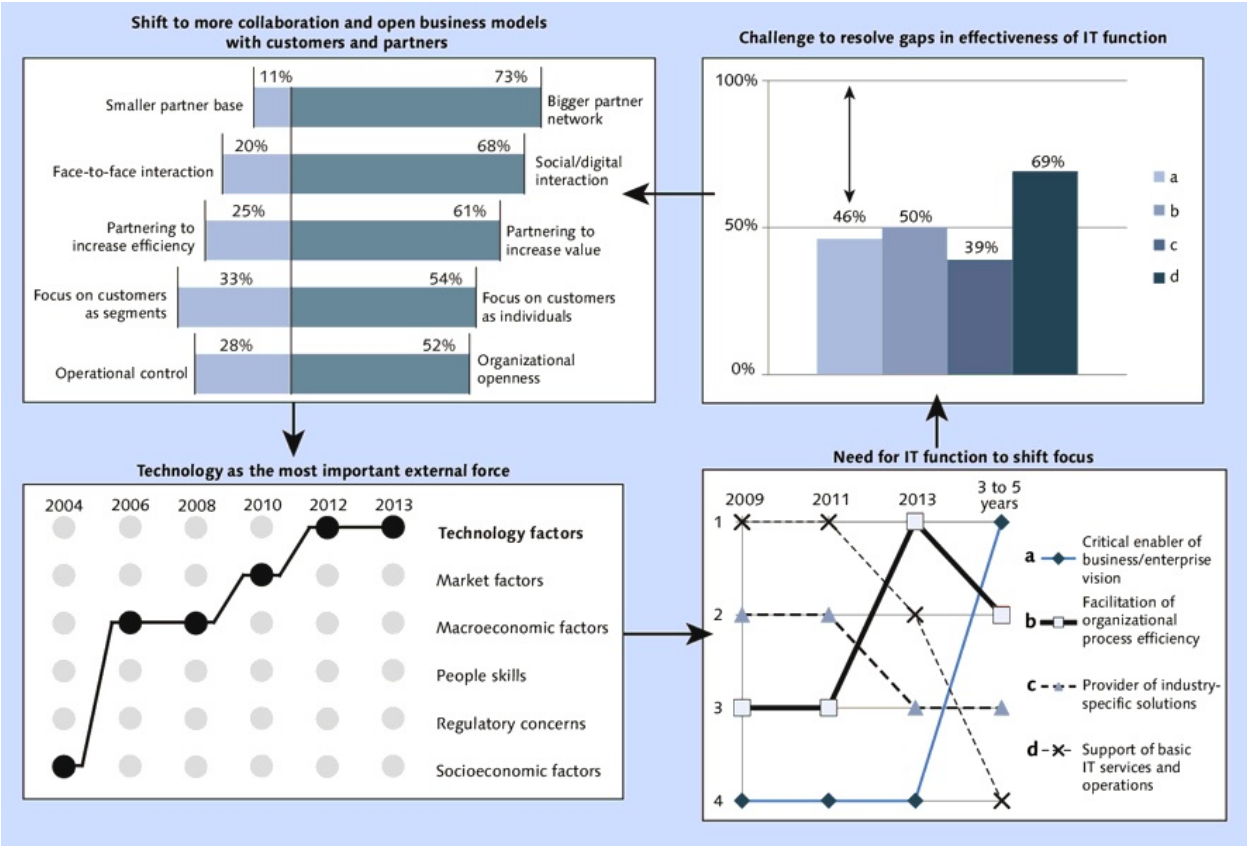
Figure 4.3 The Need for Digital Transformation and the Need to Shift Focus for the Corporate IT Function

Figure 4.4 Areas Where Torchbearers Are Outperforming
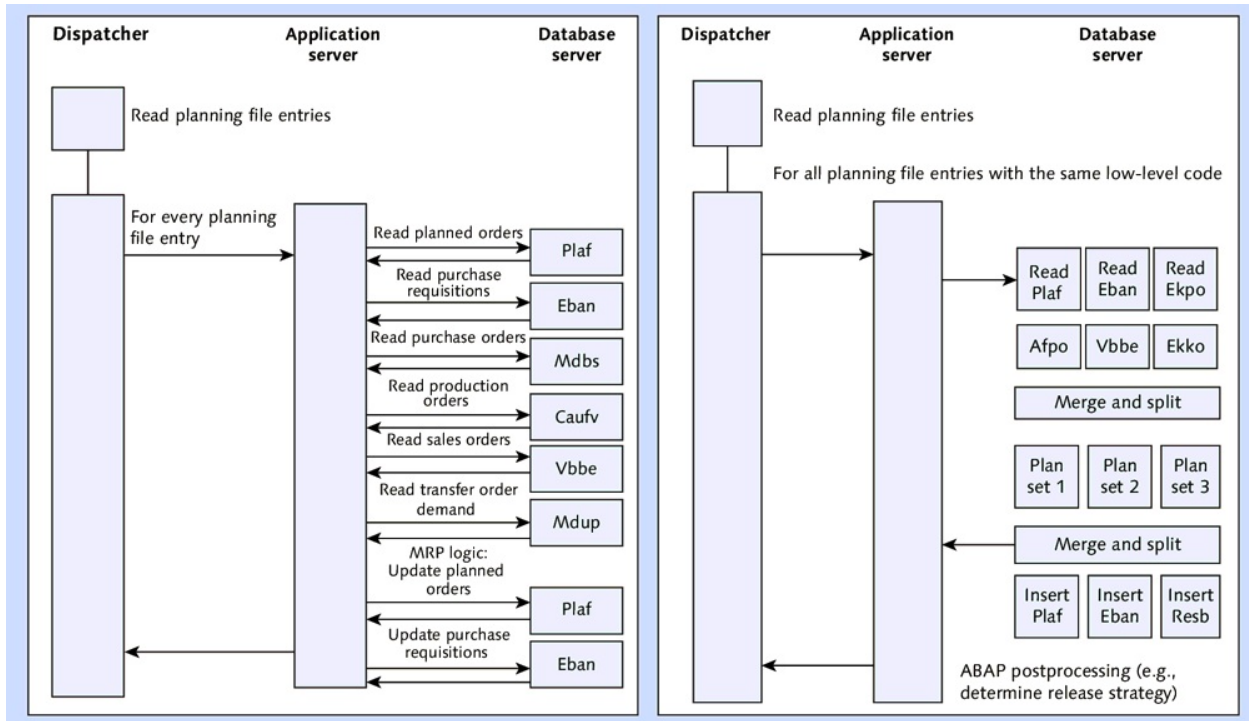
Figure 4.5   Classic MRP vs. MRP Live
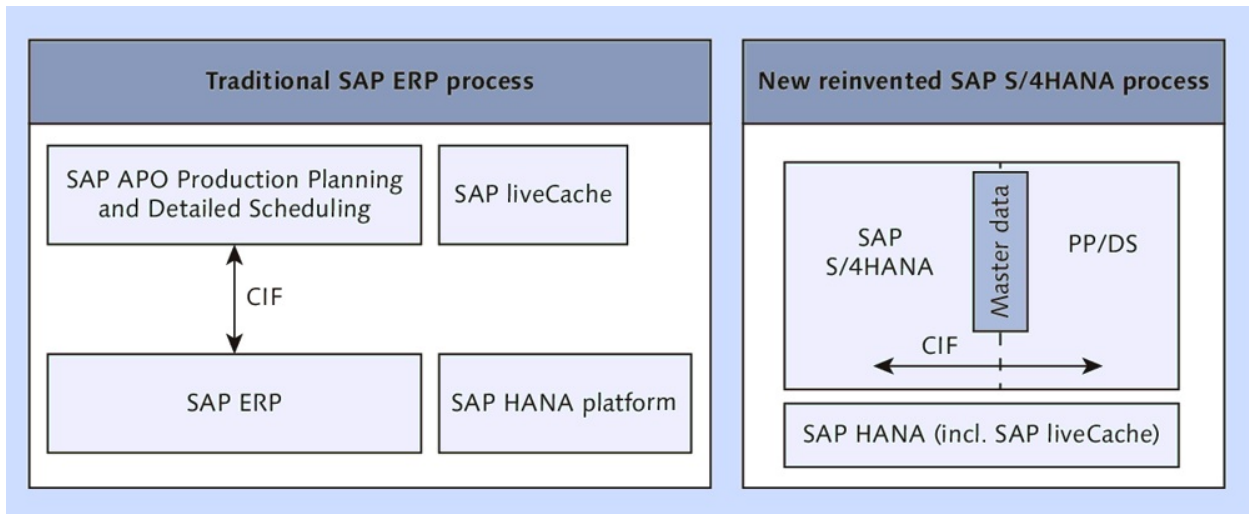
Figure 4.6 Production Planning and Detailed Scheduling:
Traditional SAP ERP vs. SAP S/4HANA
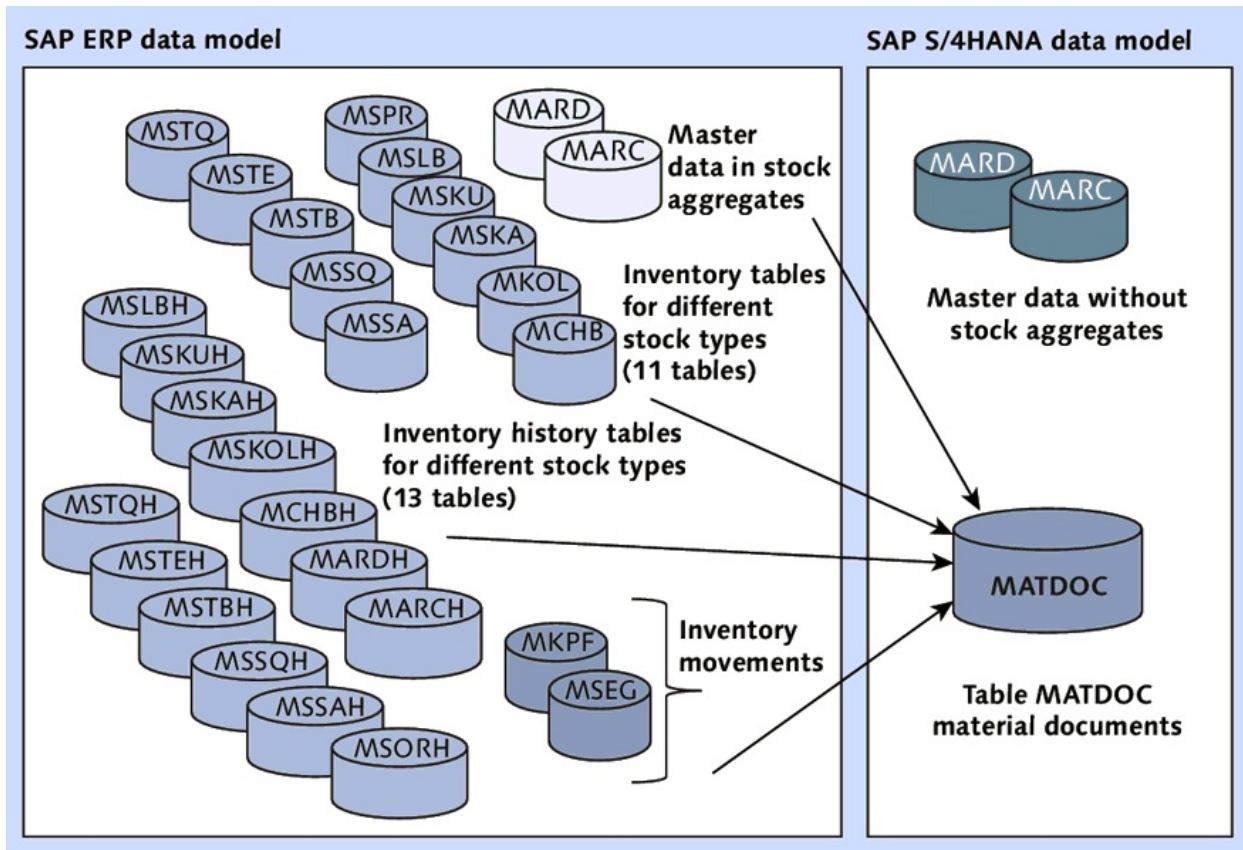
Figure 4.7 Inventory Management: Data Model Design
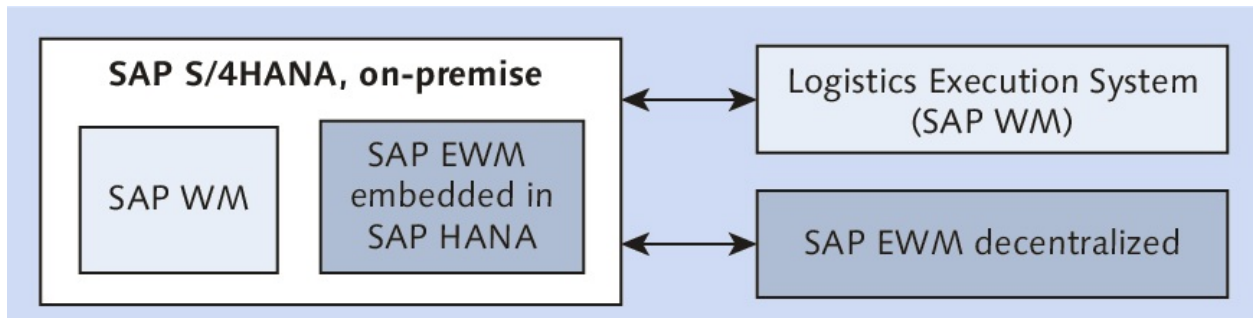
Figure 4.8   Warehouse Management Deployment Options in SAP S/4HANA
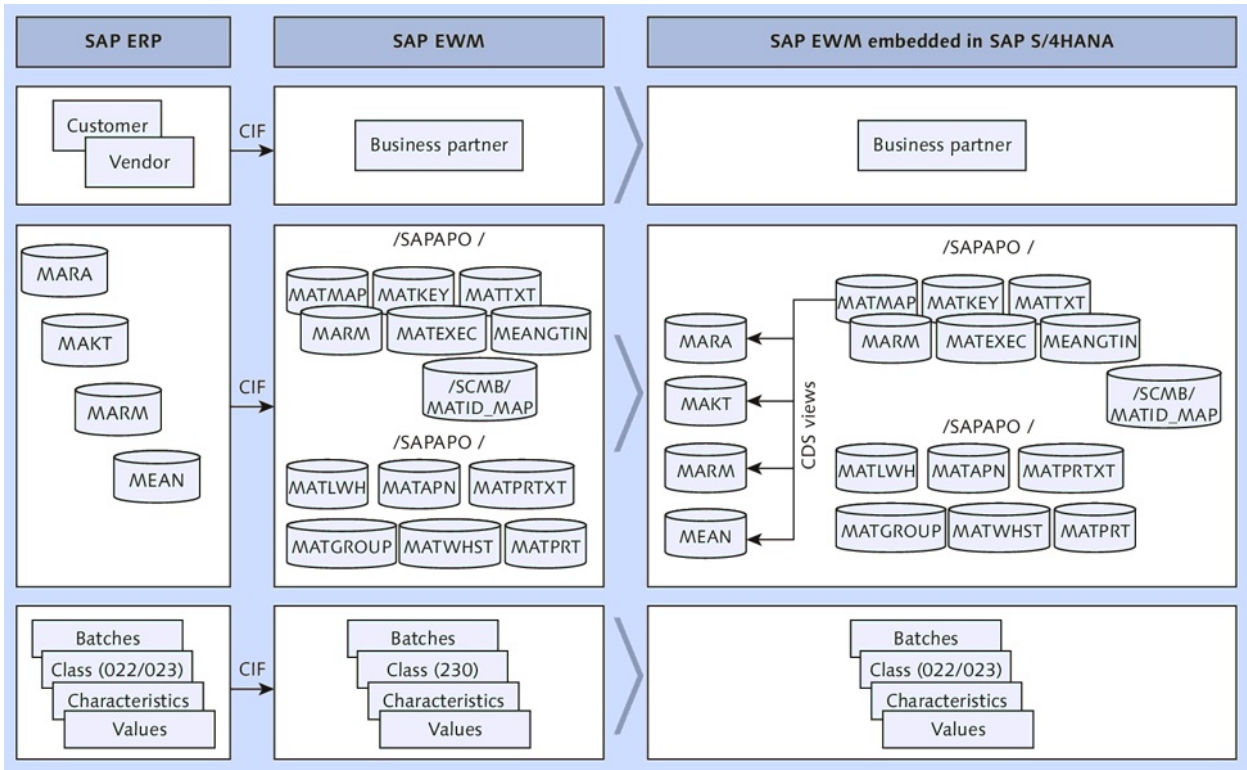
Figure 4.9   Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA
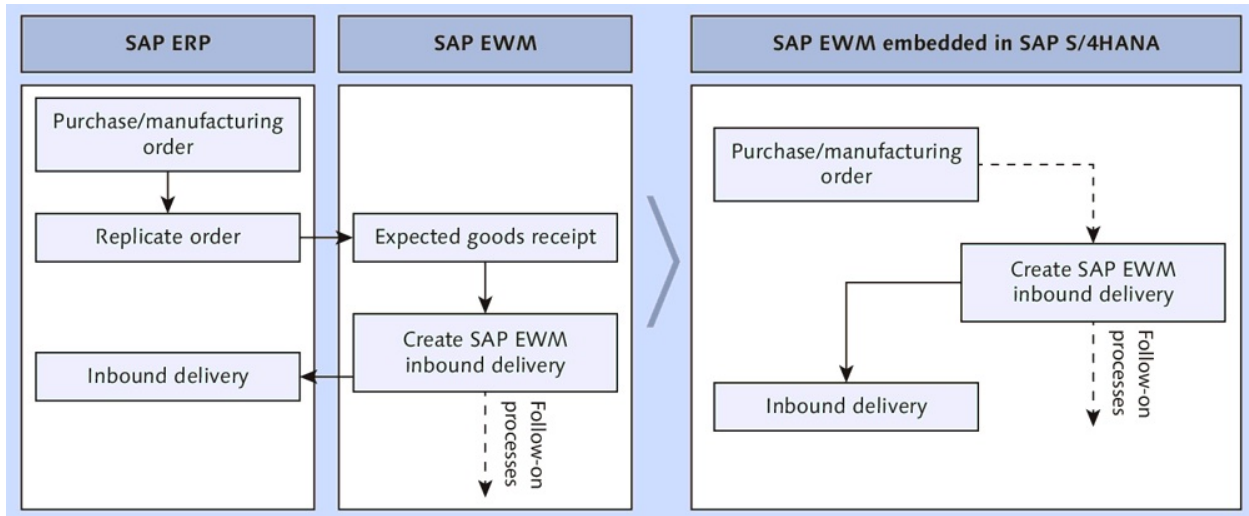
Figure 4.10   Expected Goods Receipt in Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA
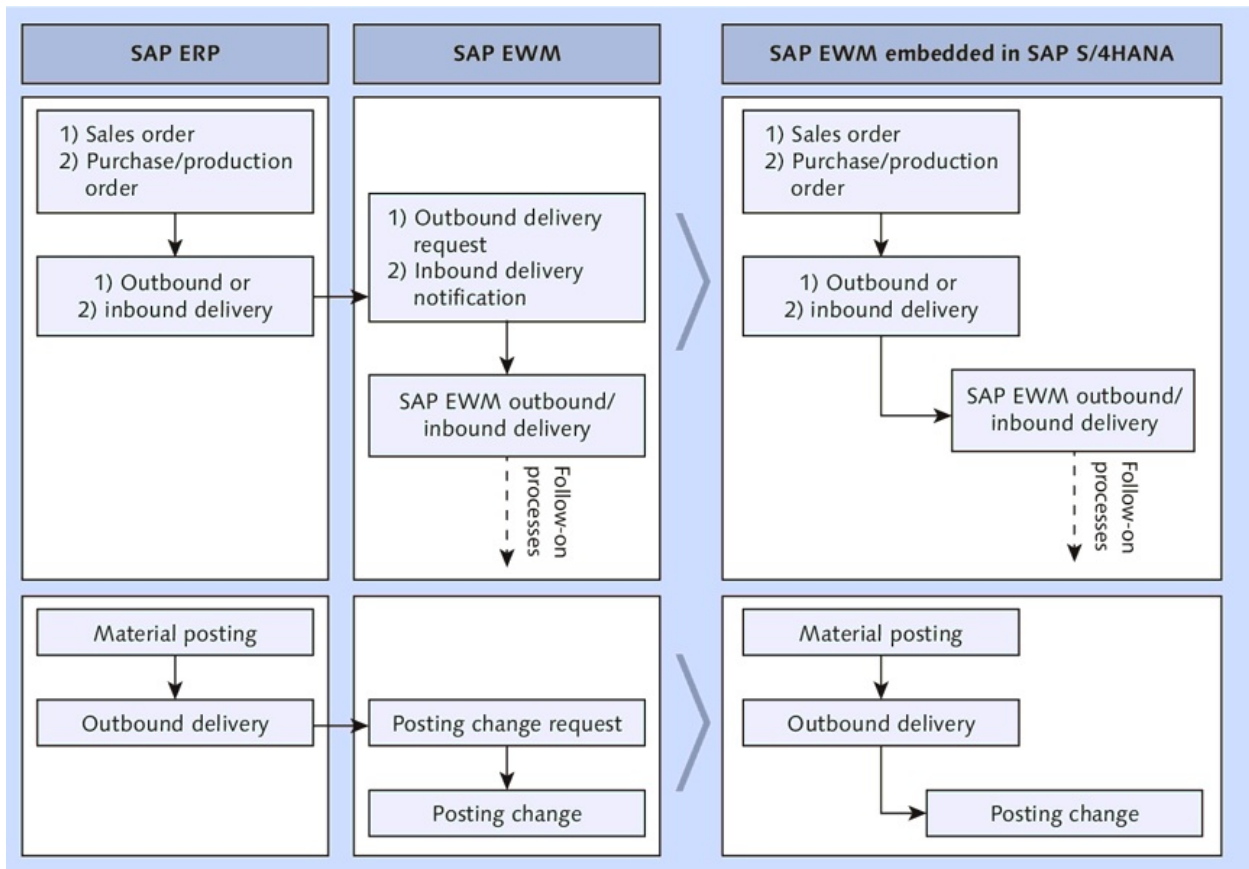
Figure 4.11 Delivery Request (Notifications) and Posting Change Request Documents in Classic SAP EWM vs. SAP EWM Embedded in SAP S/4HANA
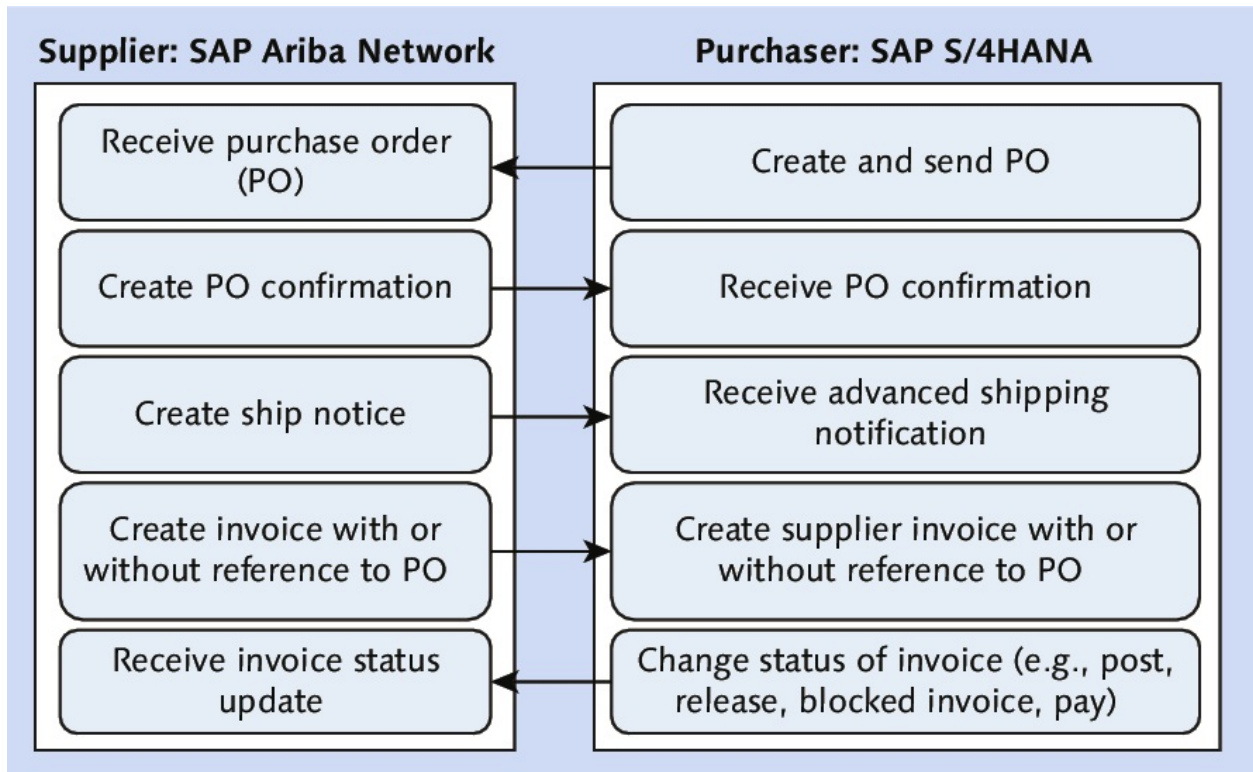
Figure 4.12 SAP Ariba and SAP S/4HANA
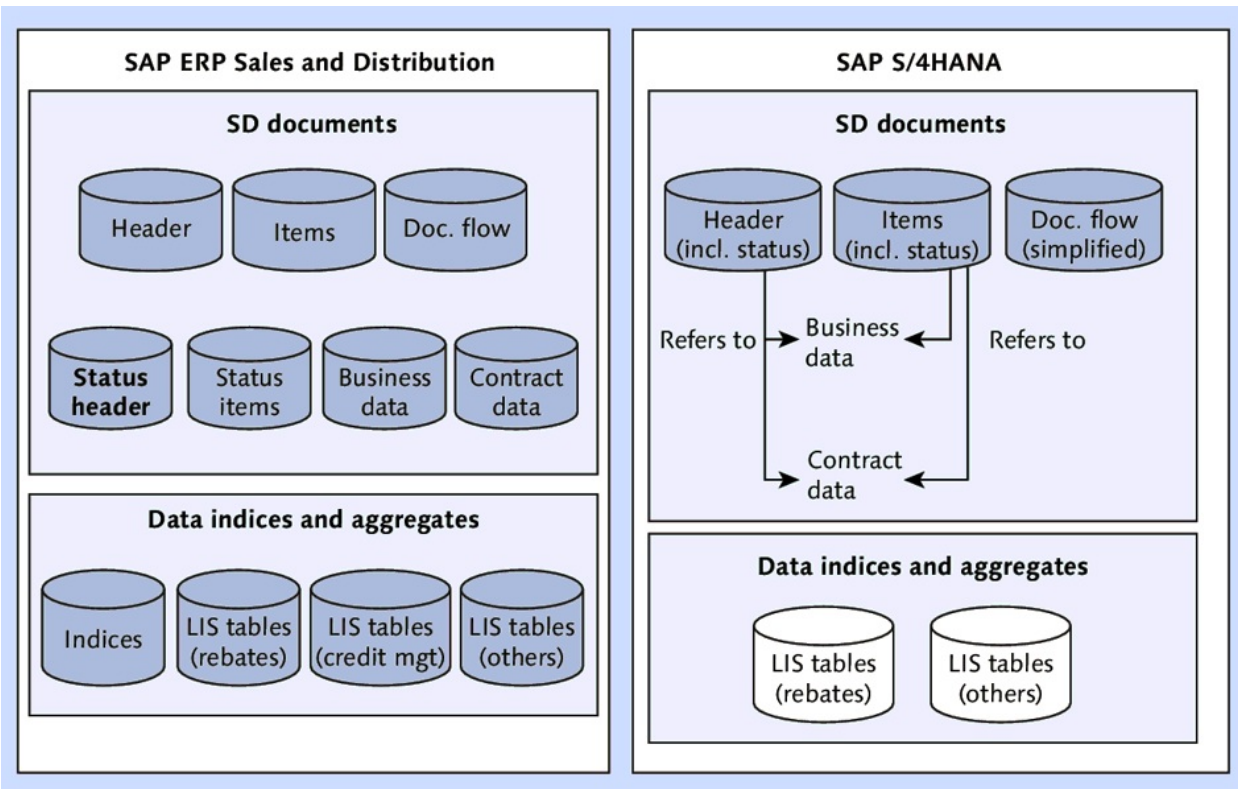
Figure 4.13 SD Data Model Simplification
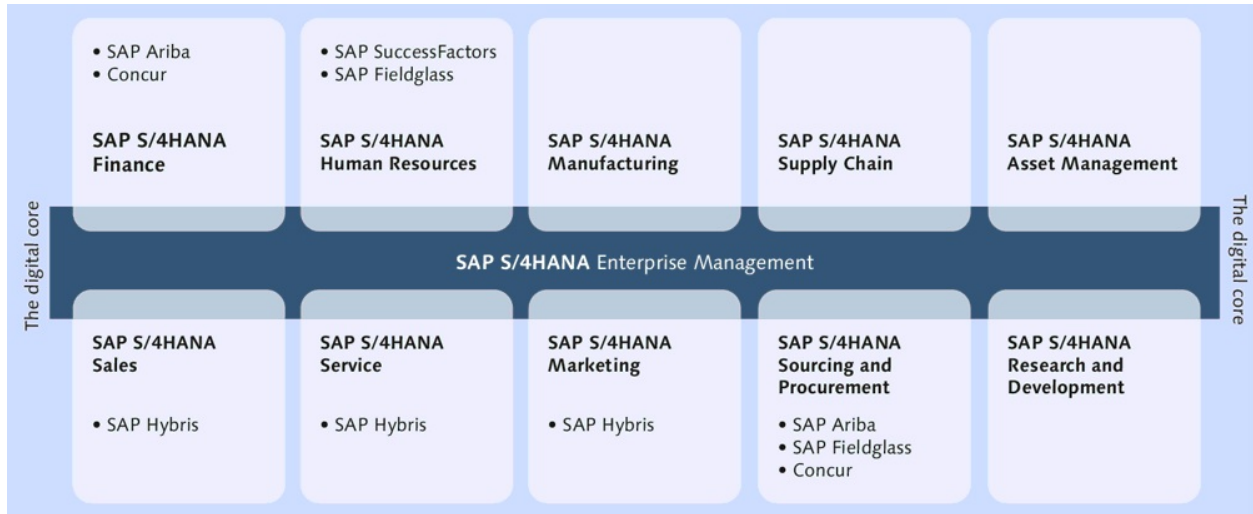
Figure 5.1   SAP S/4HANA Suite and Line of Business Solutions
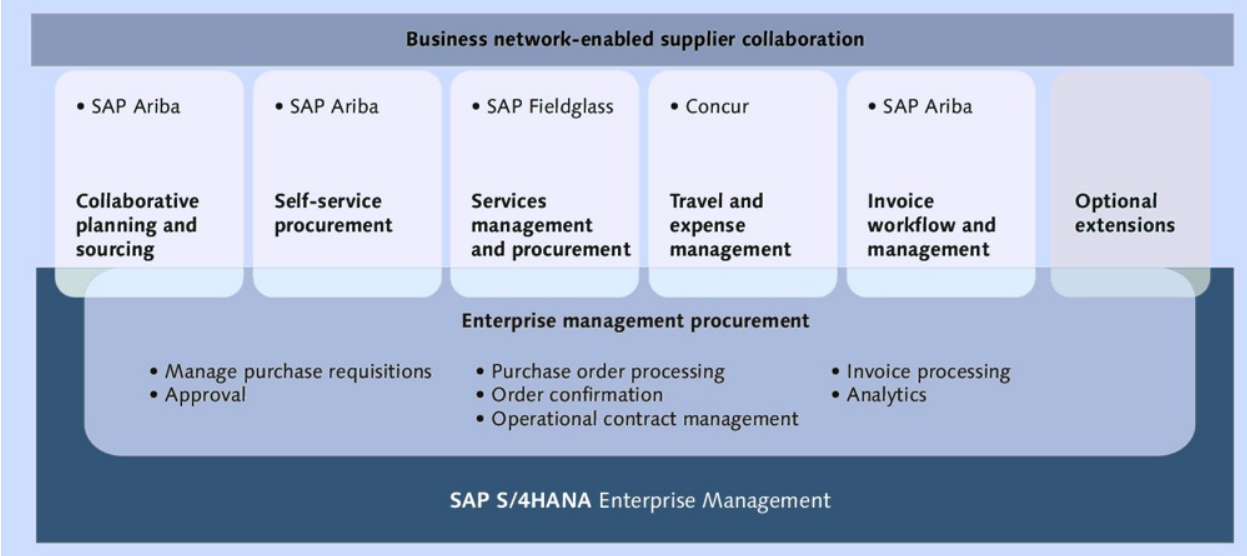
Figure 5.2　SAP S/4HANA Suite and Lines of Business
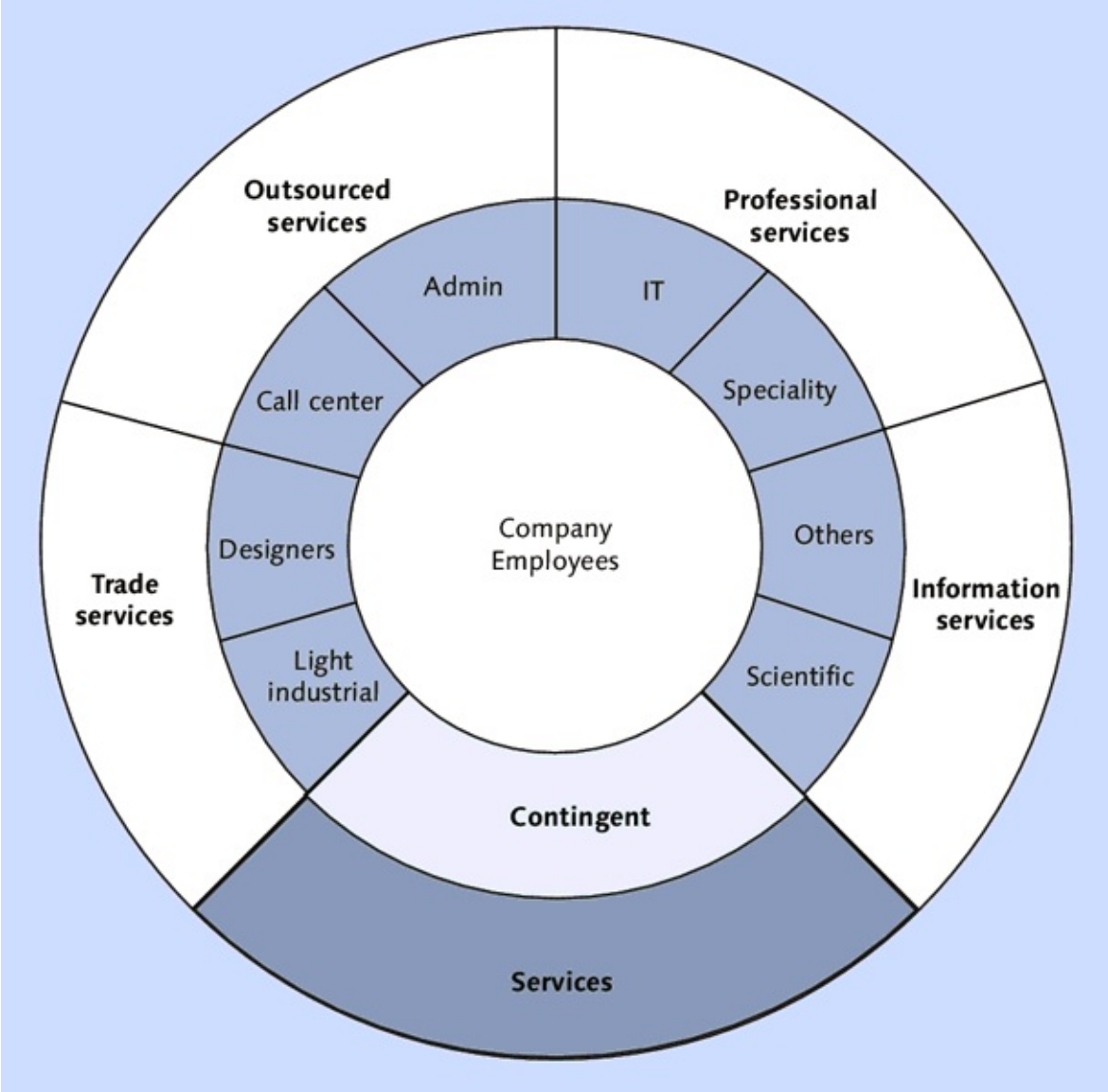
Figure 5.3 Overview of the SAP Fieldglass Services
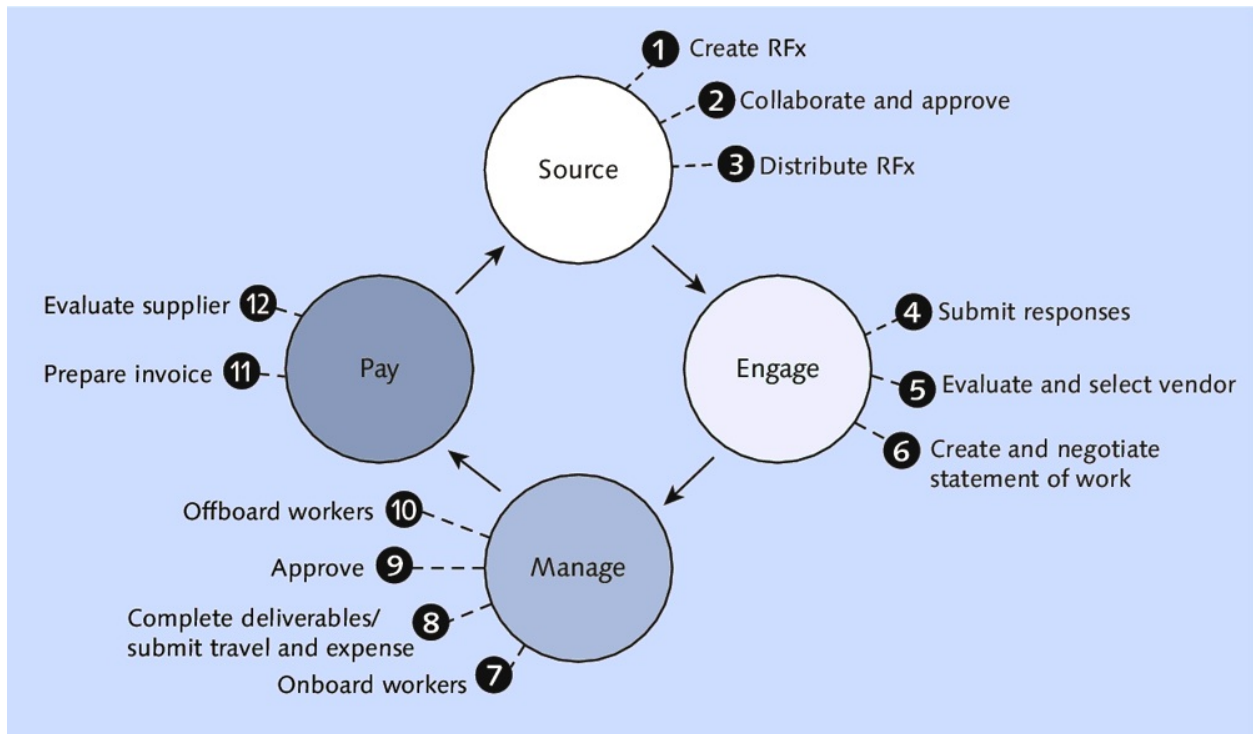
Figure 5.4   Typical Overview of a Service Engagement
Lifecycle
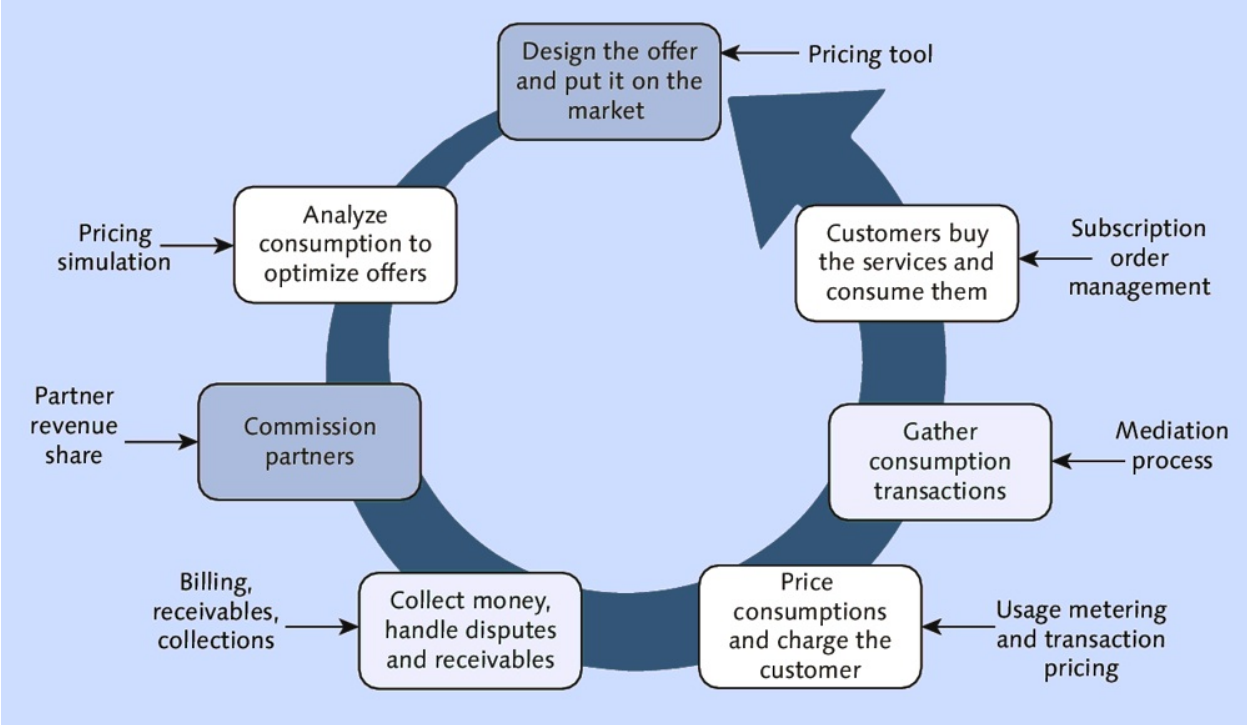
Figure 5.5   SAP Hybris Billing Solution Overview
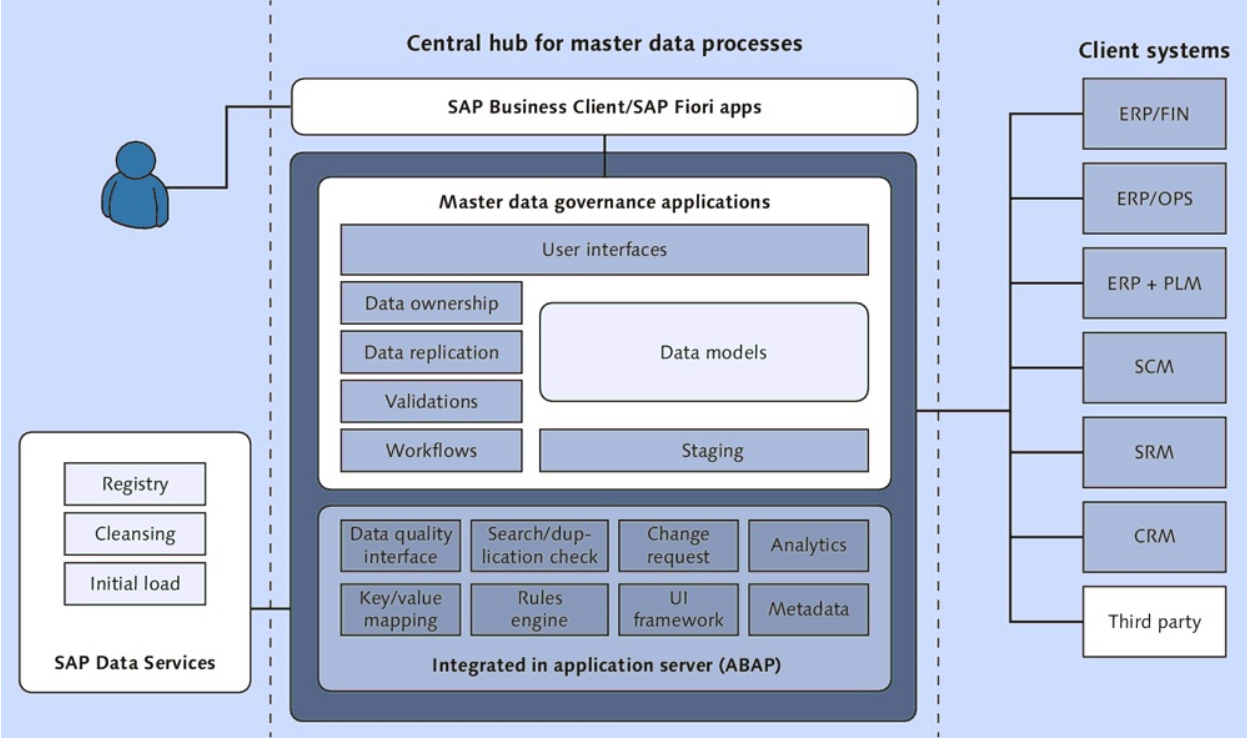
Figure 5.6 Sample Landscape with SAP MDG
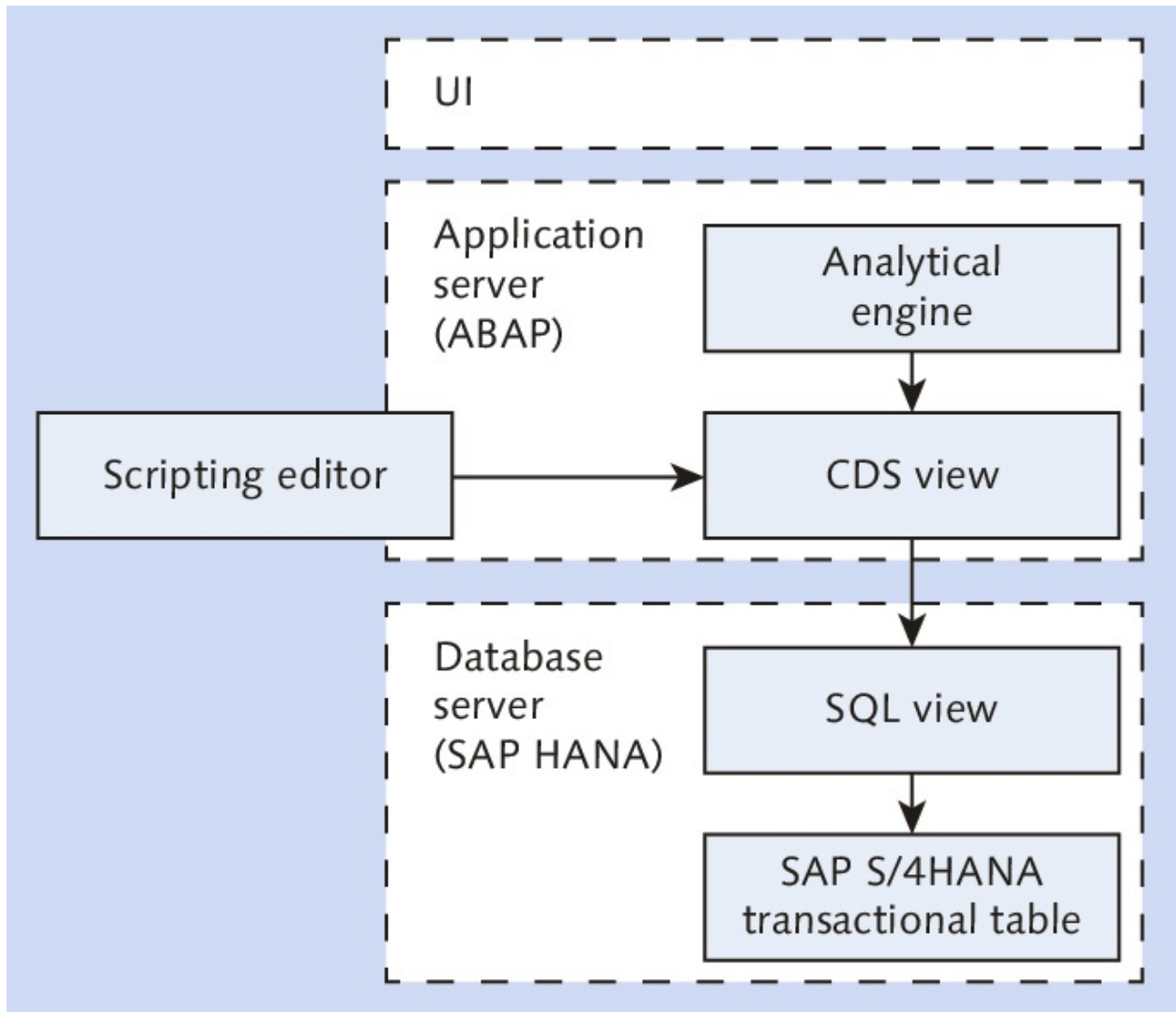
Figure 5.7 CDS Views Are the Models for Business Entities
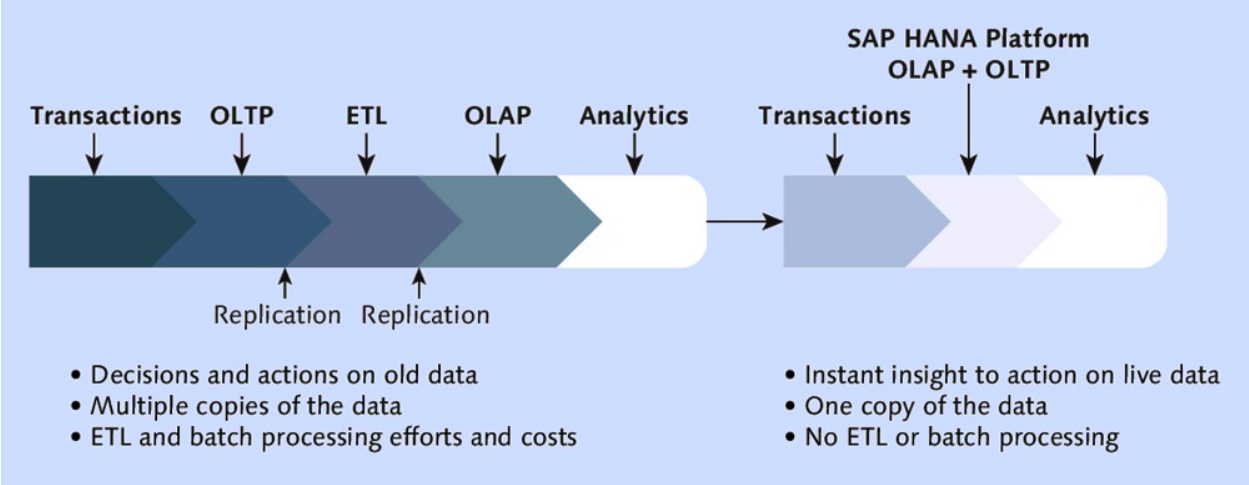
Figure 5.8 Traditional Analytics vs. Embedded Analytics

Figure 6.1   Virtual Data Model

Figure 6.2 CDS Query Sample Result

Figure 6.3 SAP S/4HANA Architecture

Figure 6.4   SAP S/4HANA: Changes in Tables
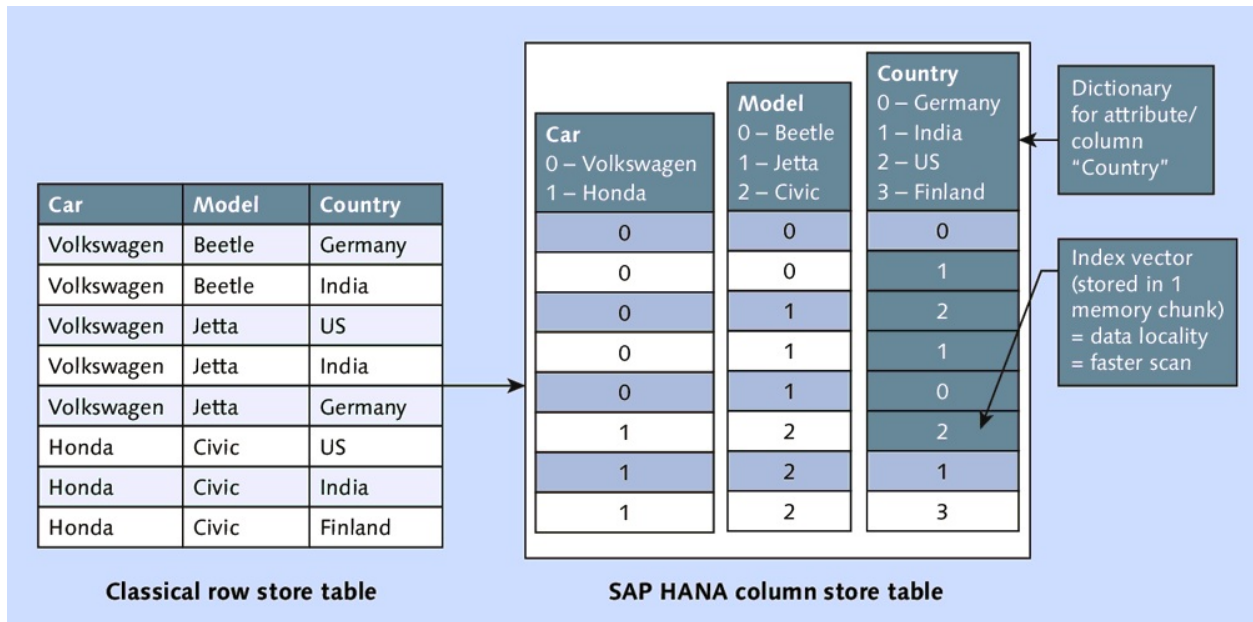
Figure 6.5   Example of Columnar Data Store
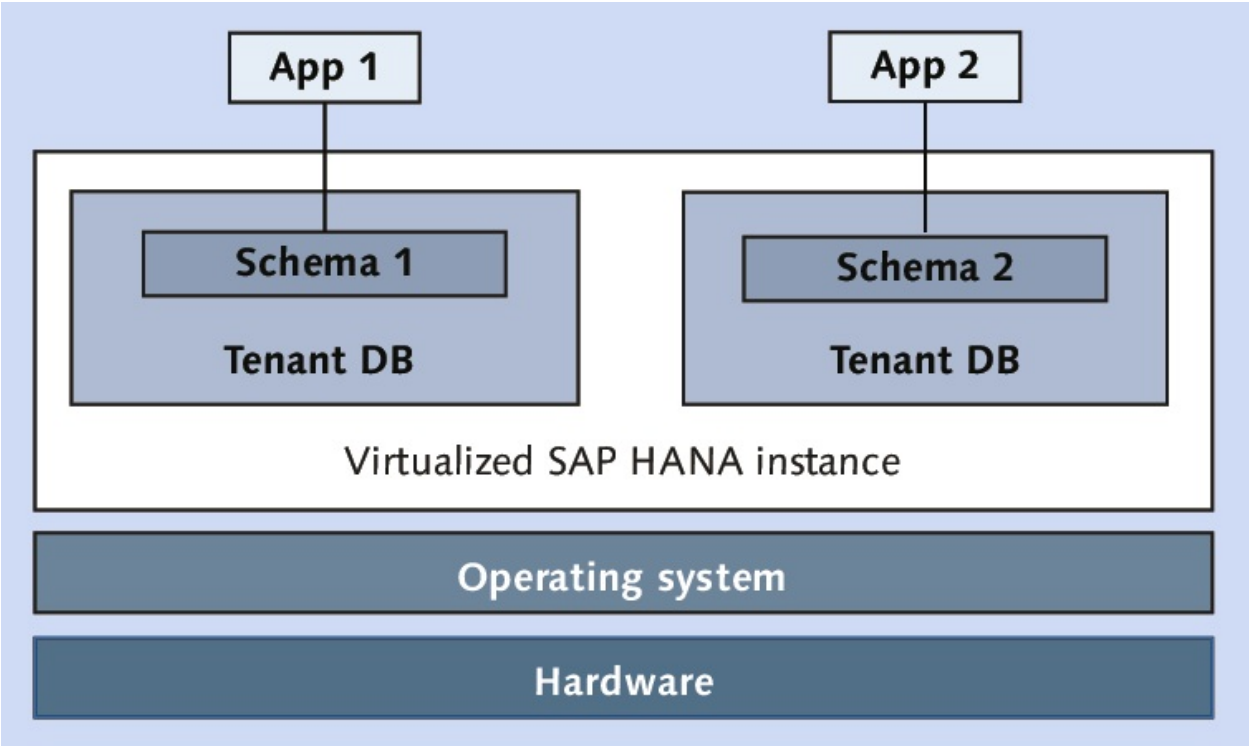
Figure 6.6   Virtualized SAP HANA System
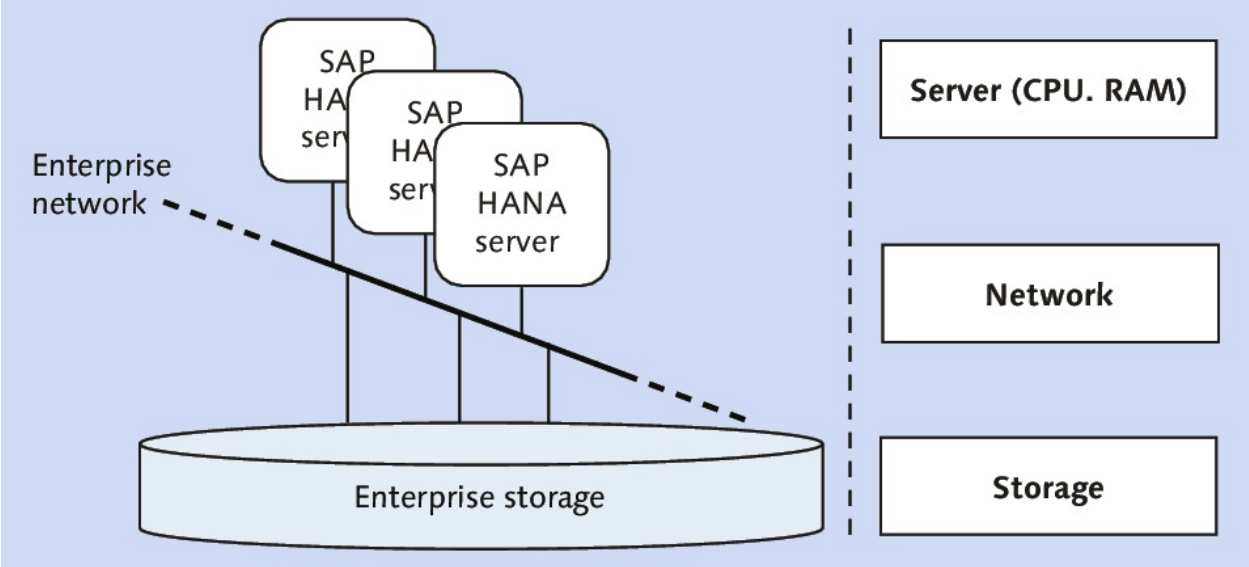
Figure 6.7   Tailored Data Center Integration Components
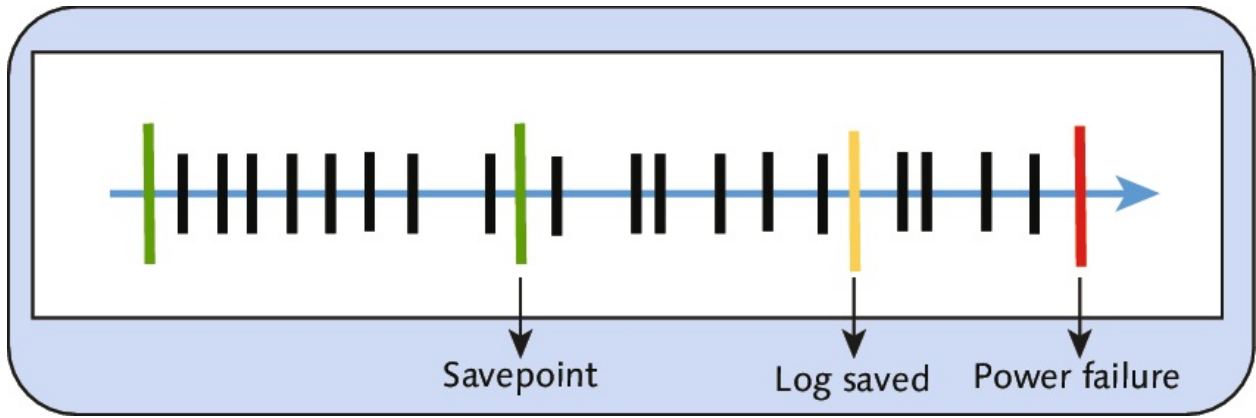
Figure 6.8 Persistence in SAP HANA
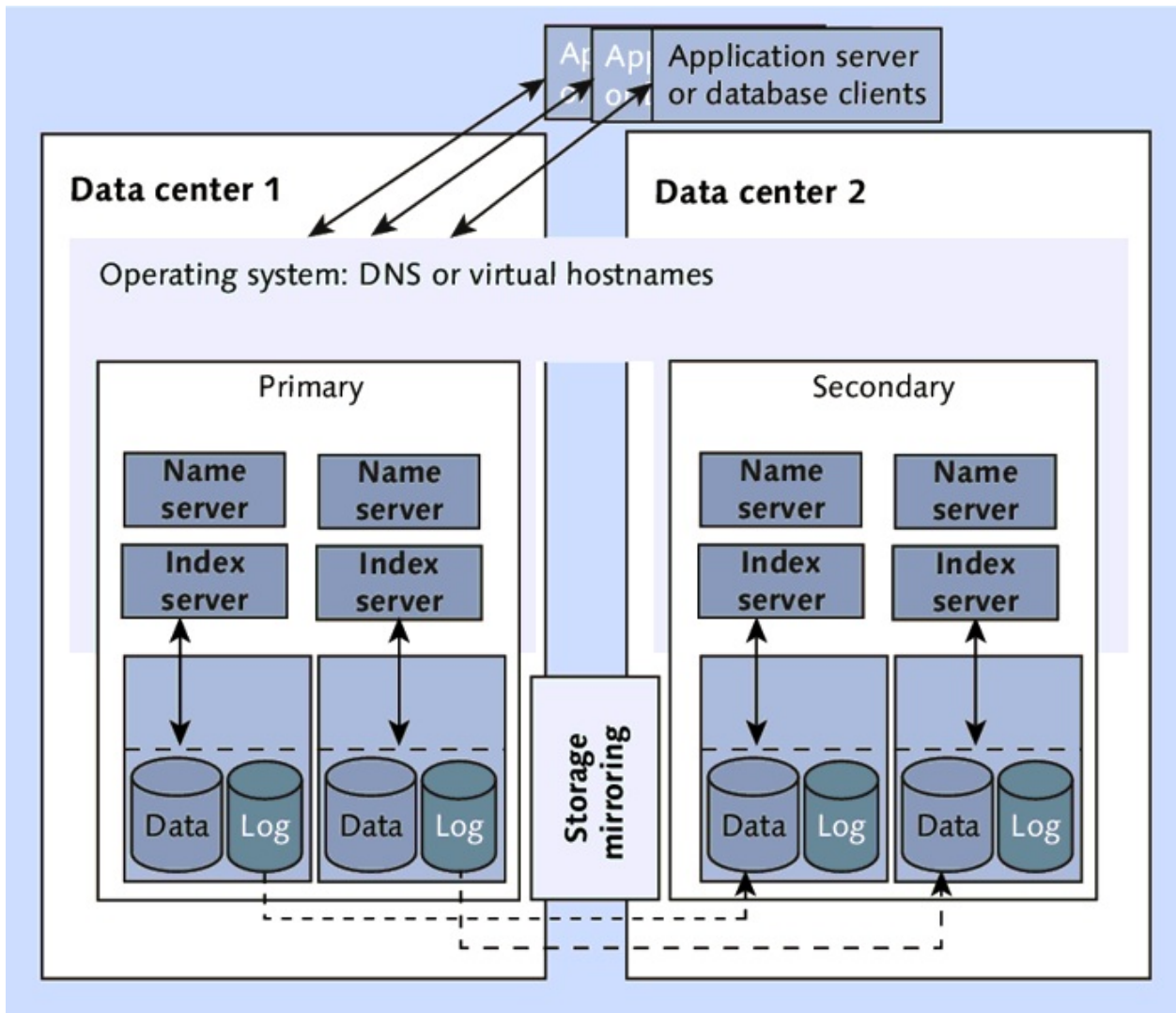
Figure 6.9   Storage Replication
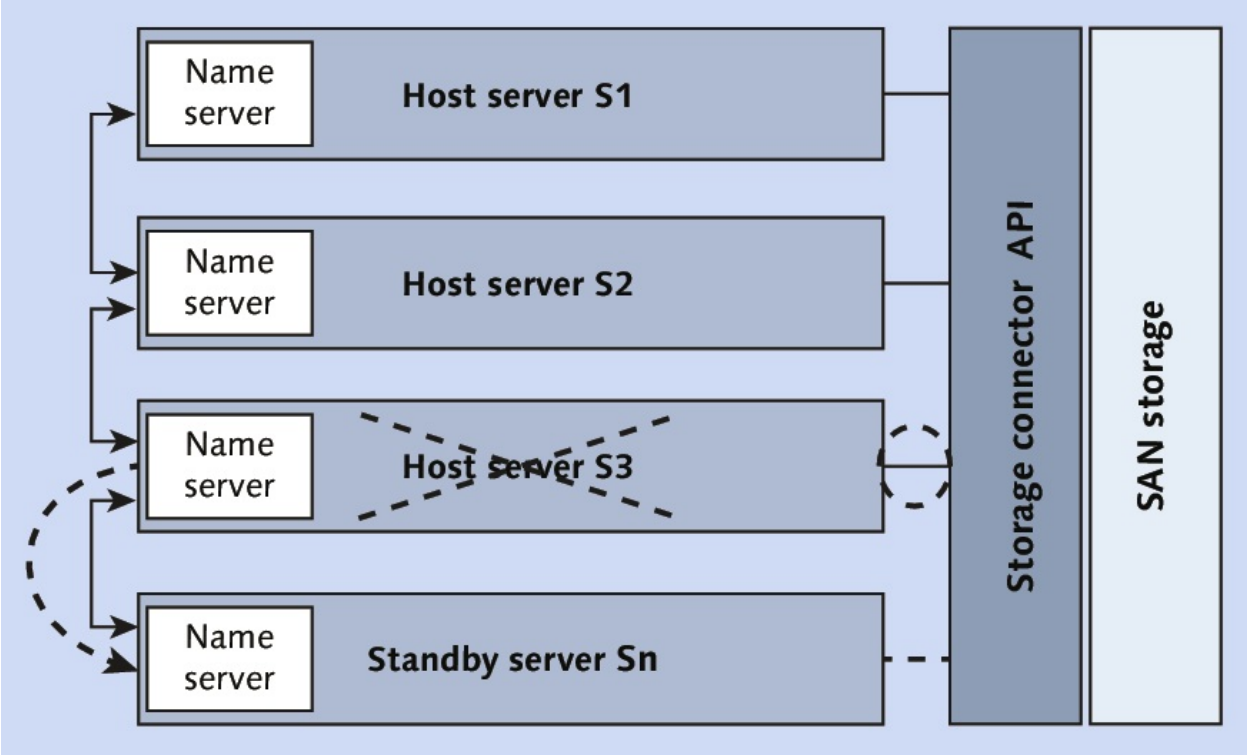
Figure 6.10   SAP HANA Host Auto-Failover
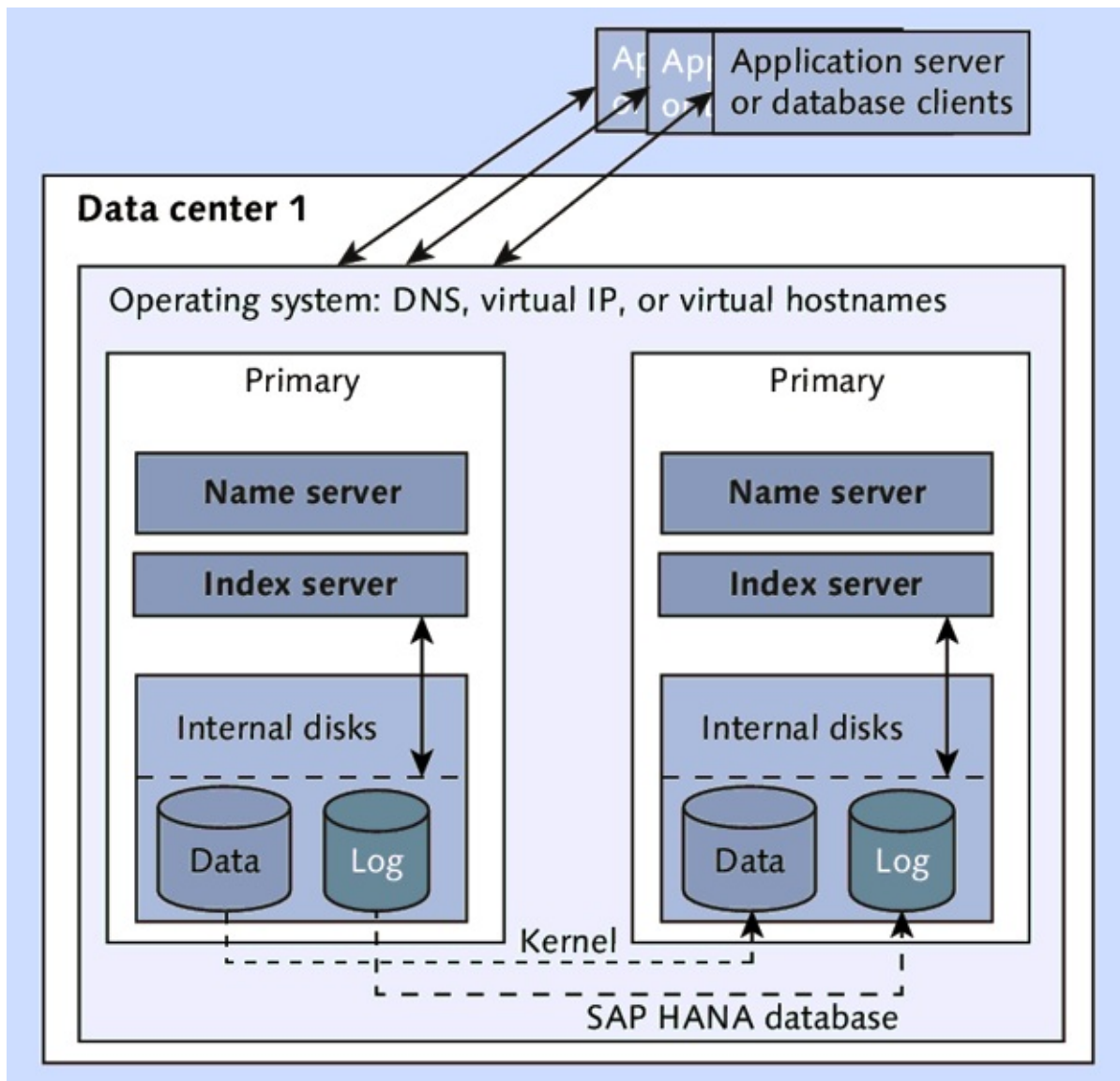
Figure 6.11   SAP HANA System Replication

Figure 6.12   SAP HANA Cockpit

Figure 6.13 Alert Status in SAP Solution Manager

EarlyWatch Alert-EP - Business Monitoring

1 Service Summary

This EarlyWatch Alert session detected issues that could potentially affect your system. Take corrective action as soon as possible.

Alert Overview

⚡	Based on the data size and growth rate, problems regarding Data Volume Management are expected.
‼	There are aborted postings (errors in UPDATE). Reprocess them to ensure consistent data.
‼	We found more than 30 ABAP dumps in your system.
‼	Hardware resources may have been exhausted with the risk of performance degradation.
‼	Expensive SQL statements cause load on the database server.
‼	Standard users have default password.
‼	Secure password policy is not sufficiently enforced.
‼	A high number of users has critical authorizations
‼	Protection of Passwords in Database Connections

Perform the following Guided Self Services.

Guided Self Service	FAQ SAP Note
SQL Statement Tuning	1601951
Security Optimization Service	696478
Data Volume Management	1904491

Figure 6.14 Sample SAP EarlyWatch Report
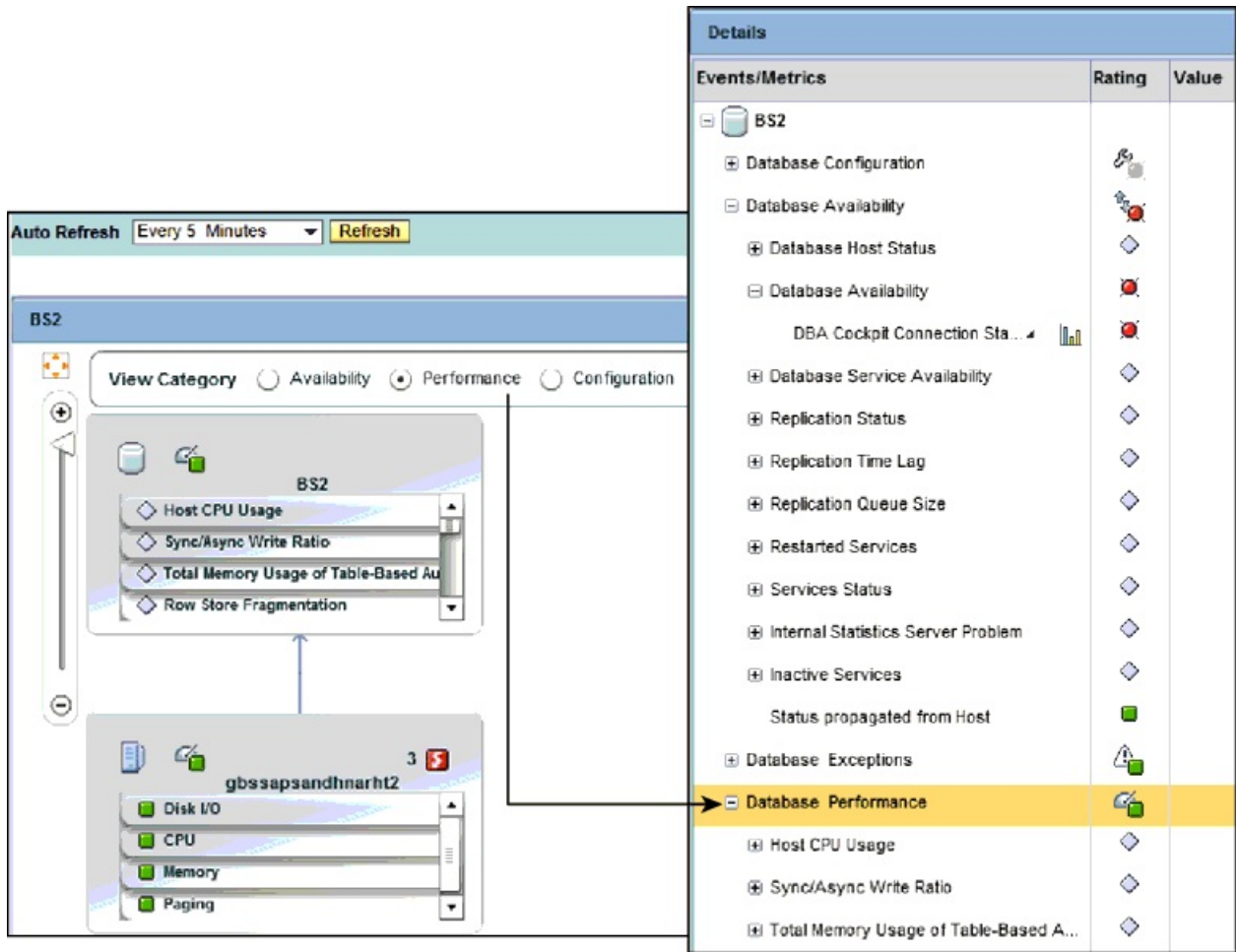
Figure 6.15　Technical Monitoring: SAP HANA Technical KPIs
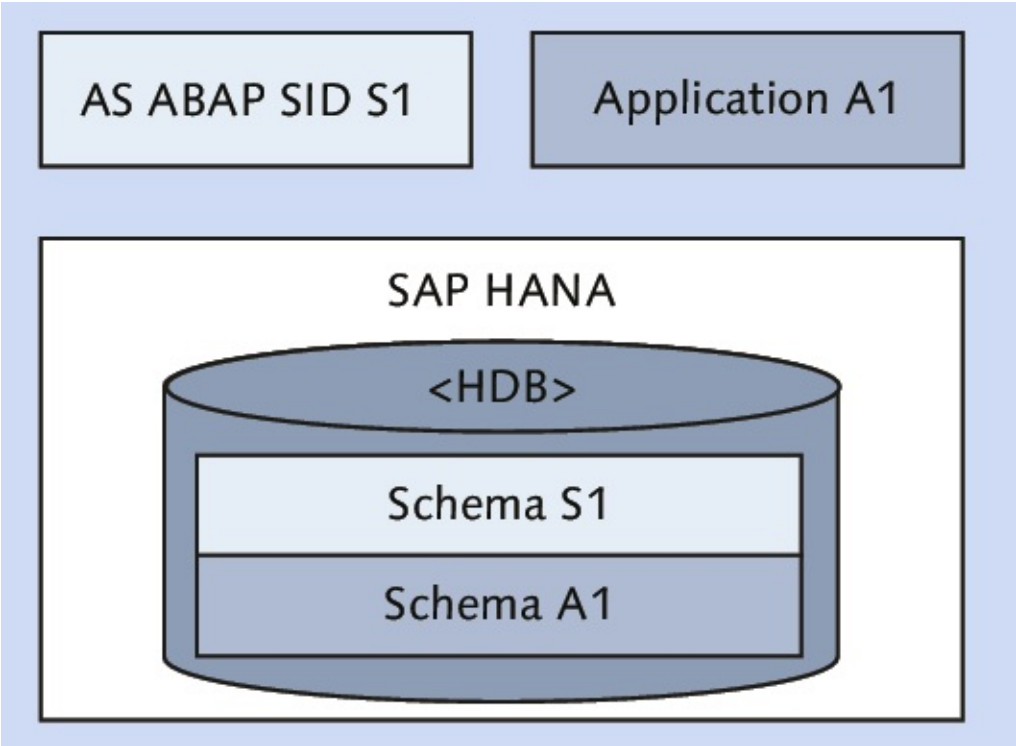
Figure 6.16   MCOD Scenario
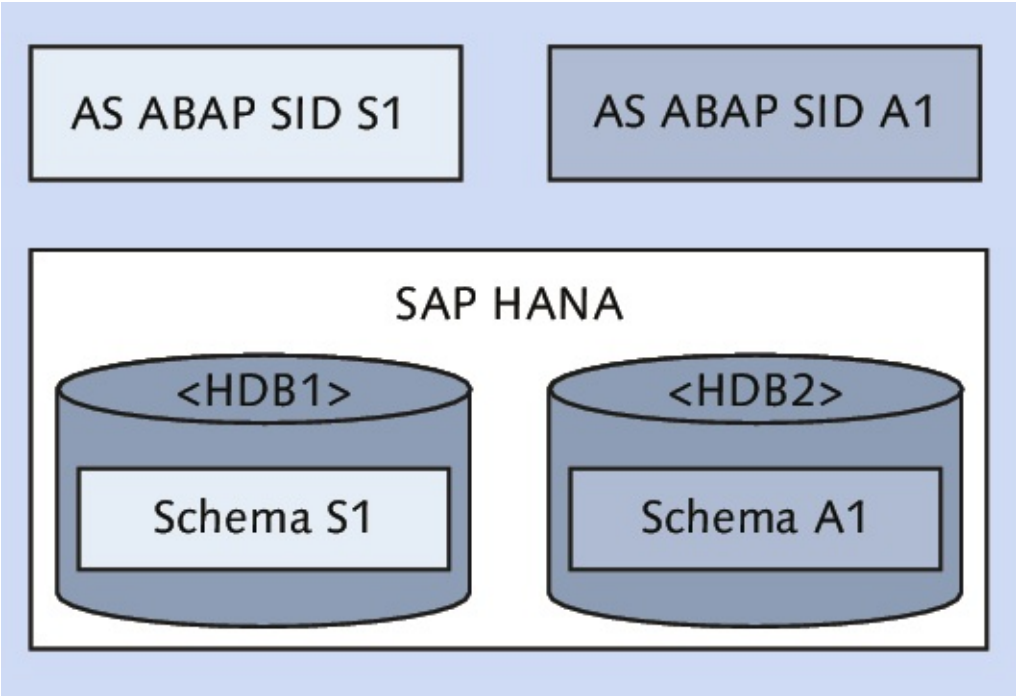
Figure 6.17   MCOS Scenario
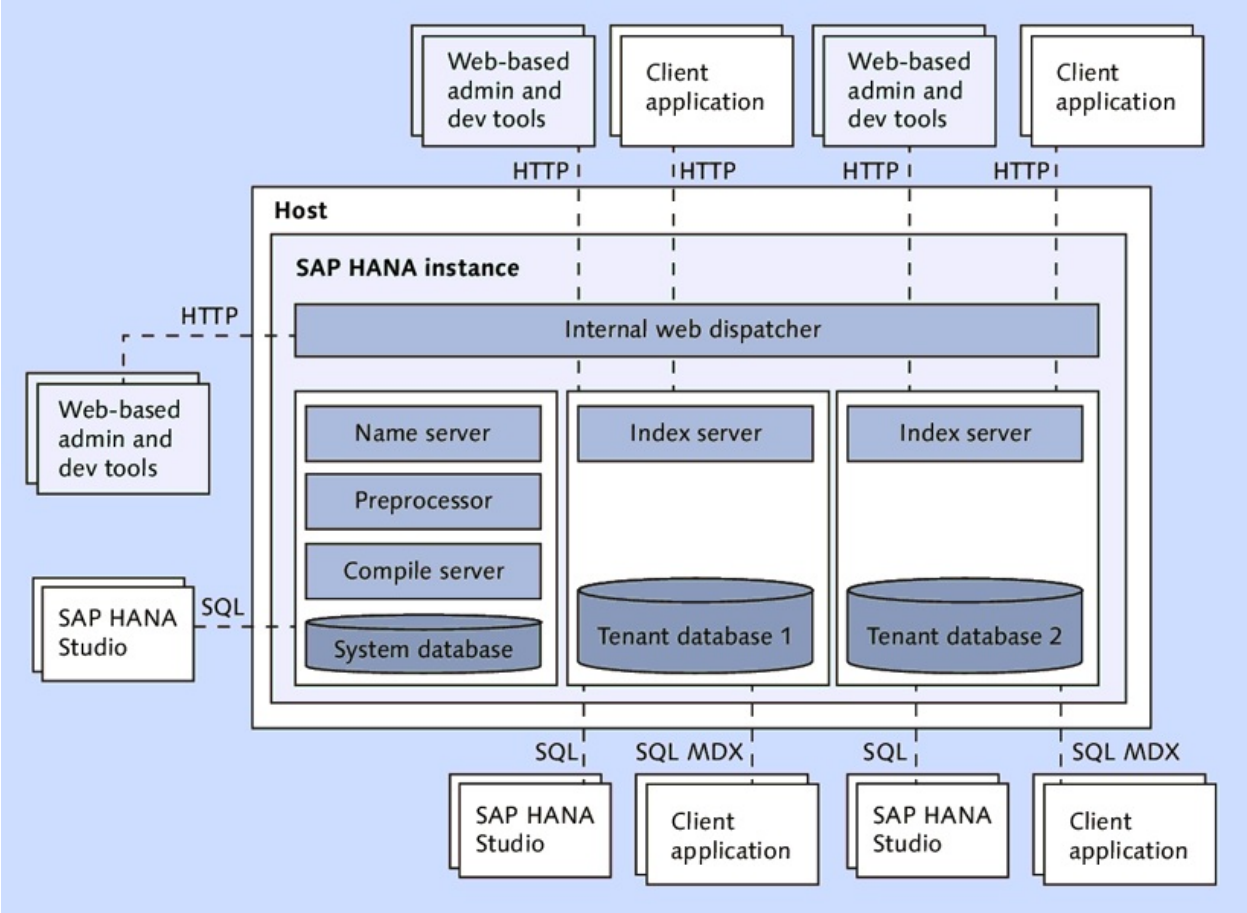
Figure 6.18   MDC Scenario
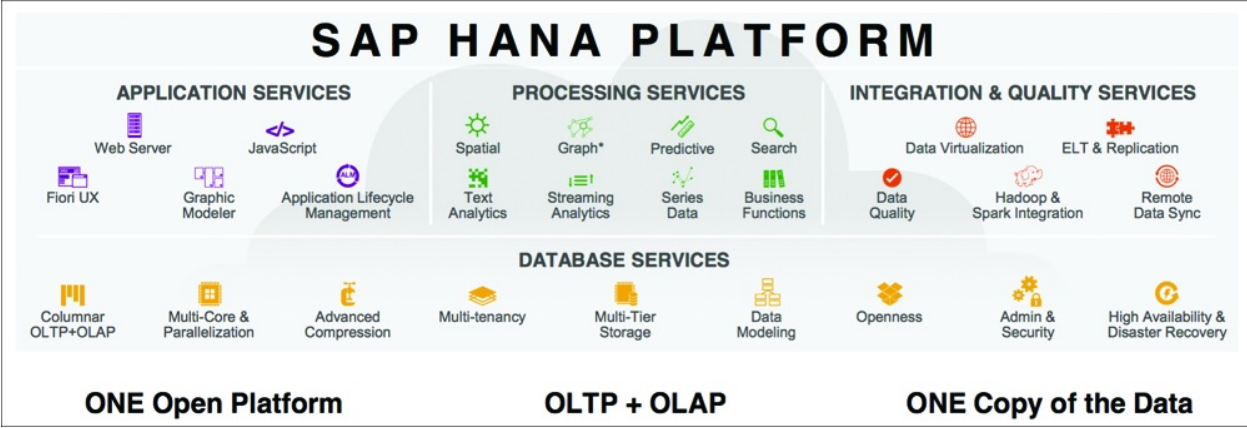
Figure 6.19   SAP HANA Platform Capabilities
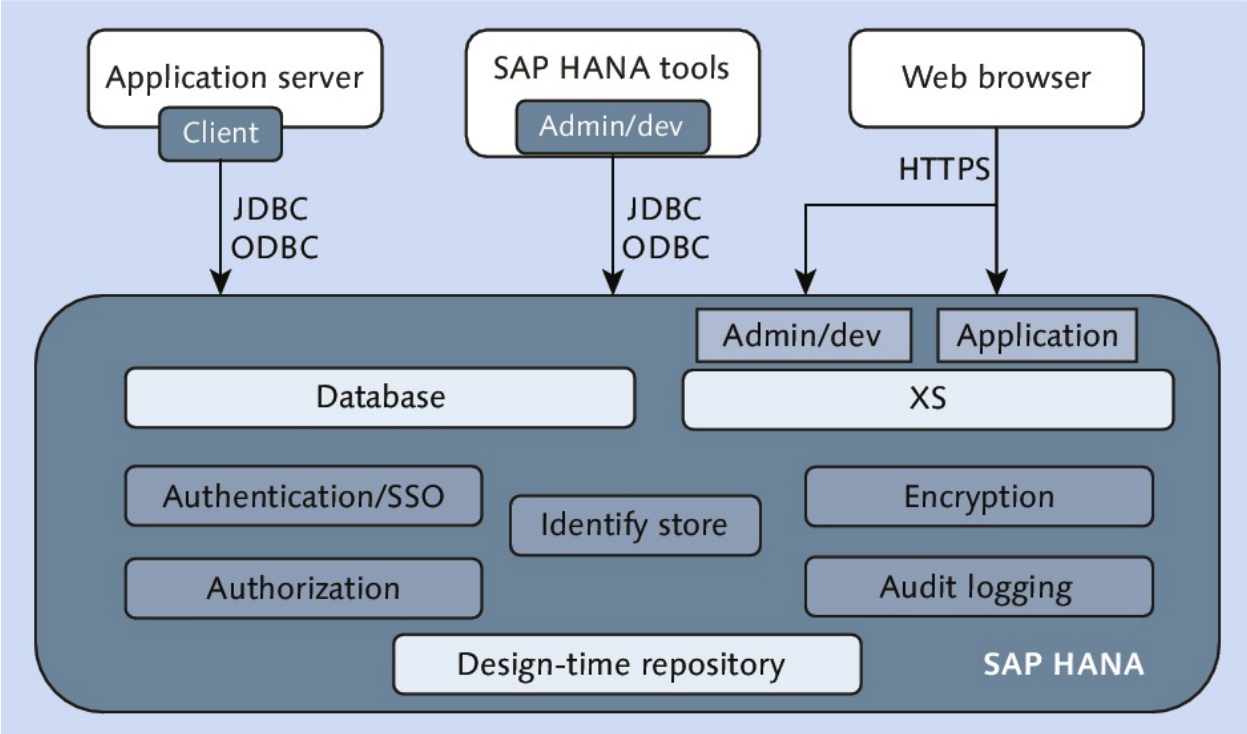
Figure 6.20 SAP HANA Security Model
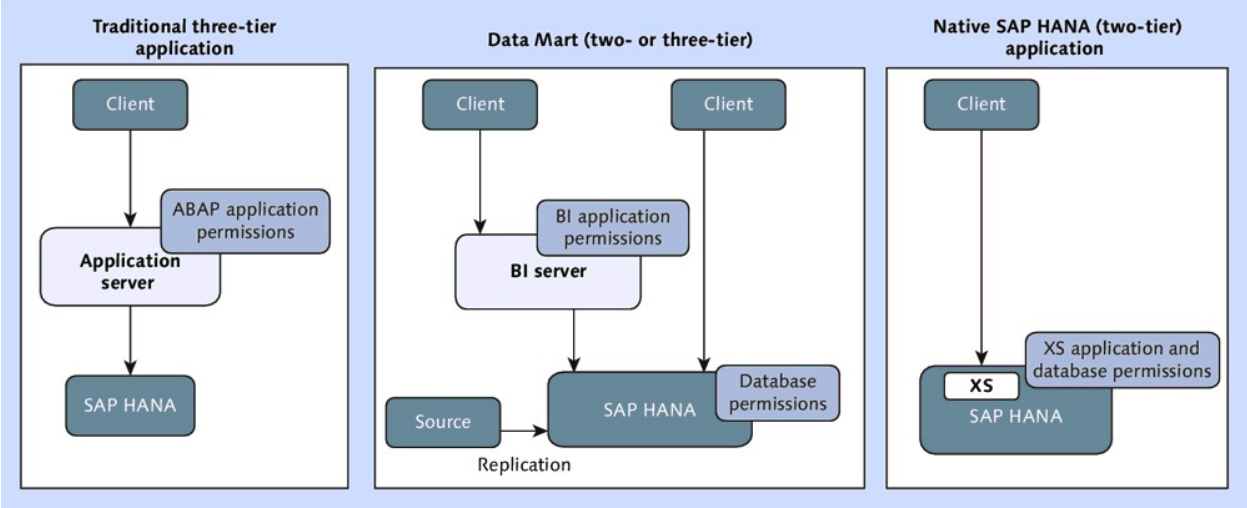
Figure 6.21 SAP HANA User Scenarios
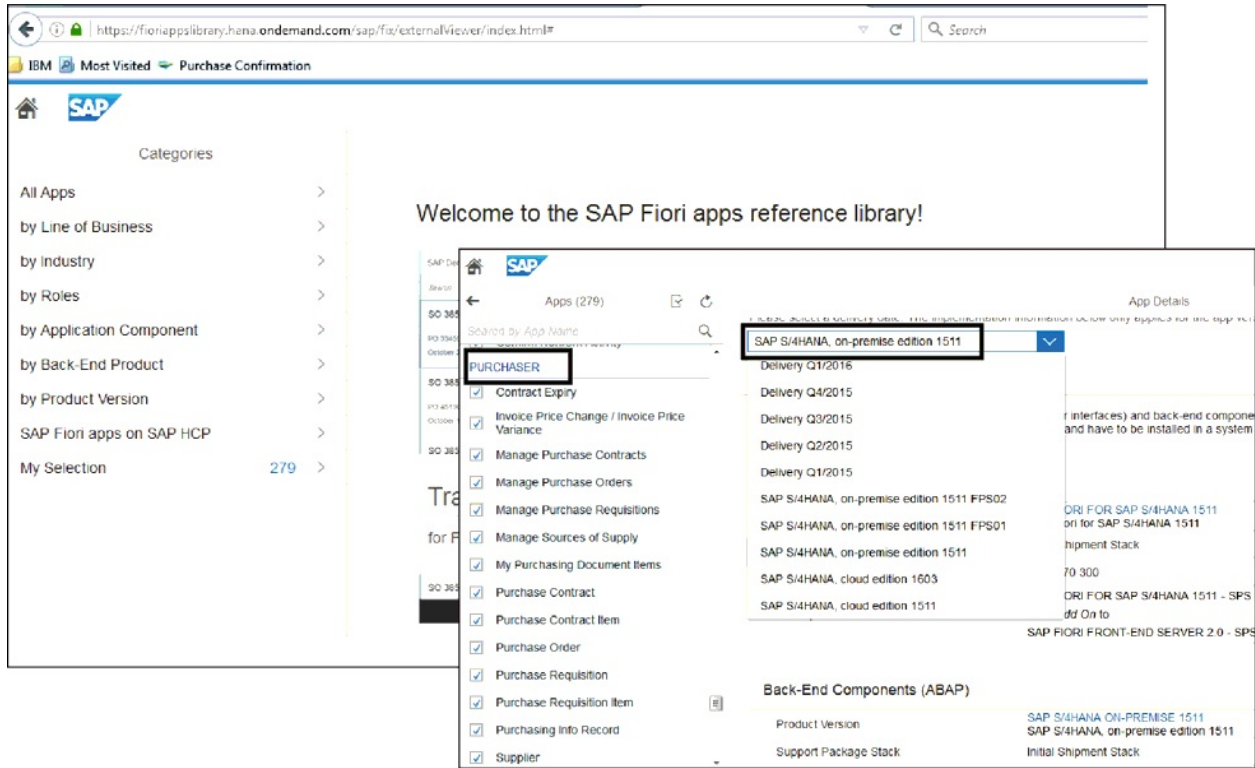
Figure 6.22 SAP Fiori Apps Reference Library
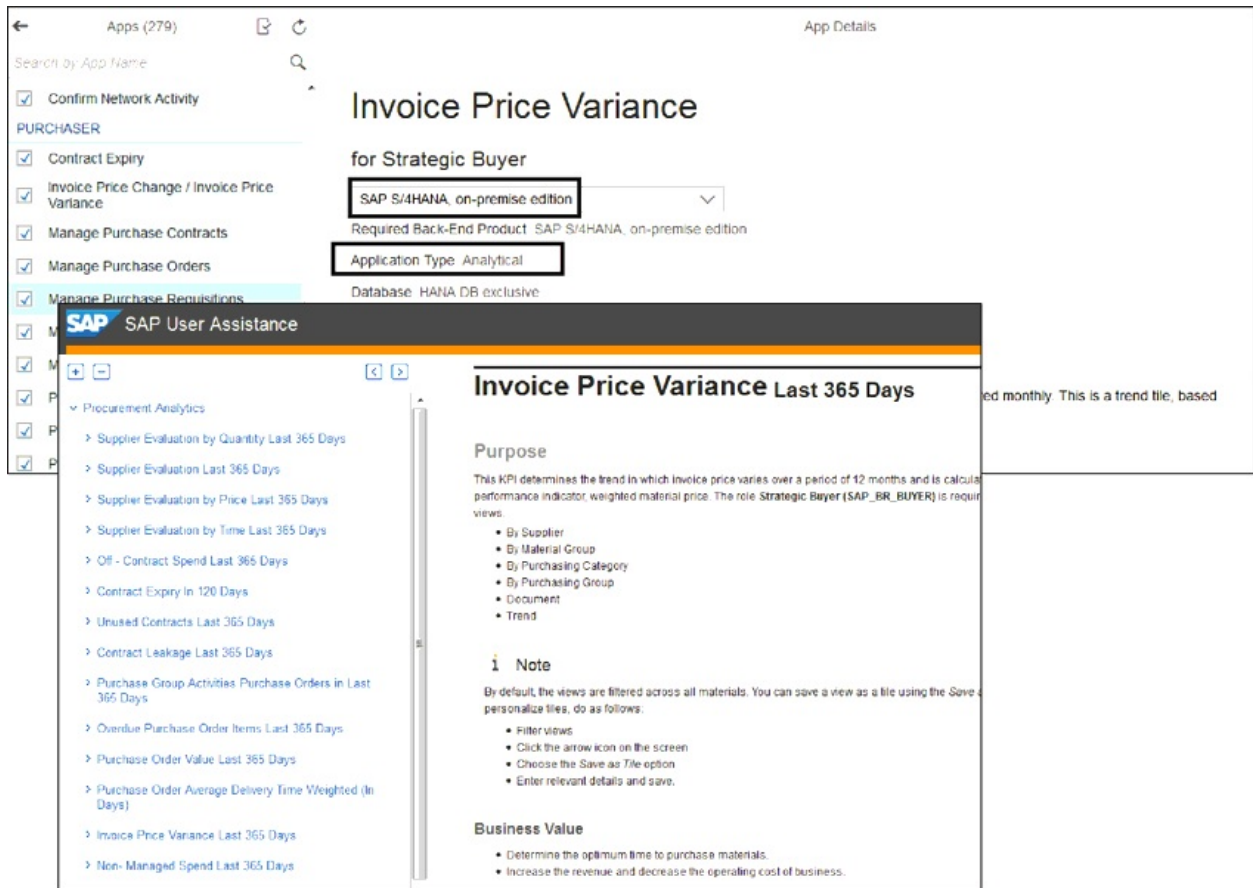
Figure 6.23   SAP Fiori App Details
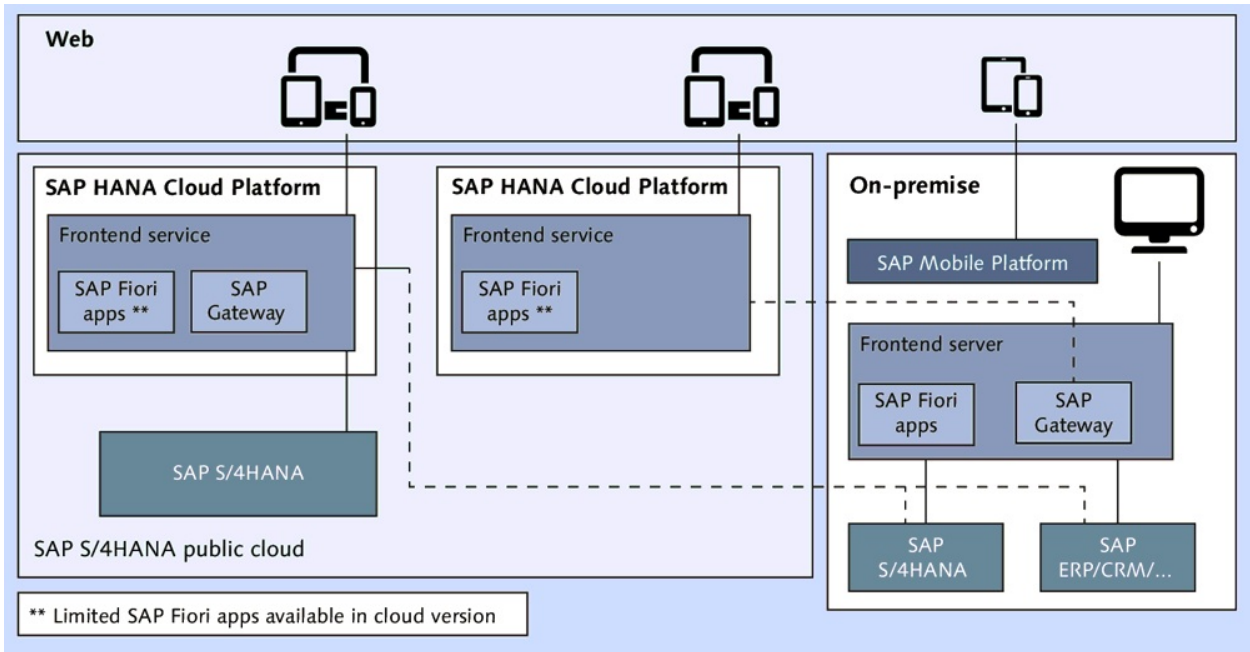
Figure 6.24   SAP Fiori Architecture
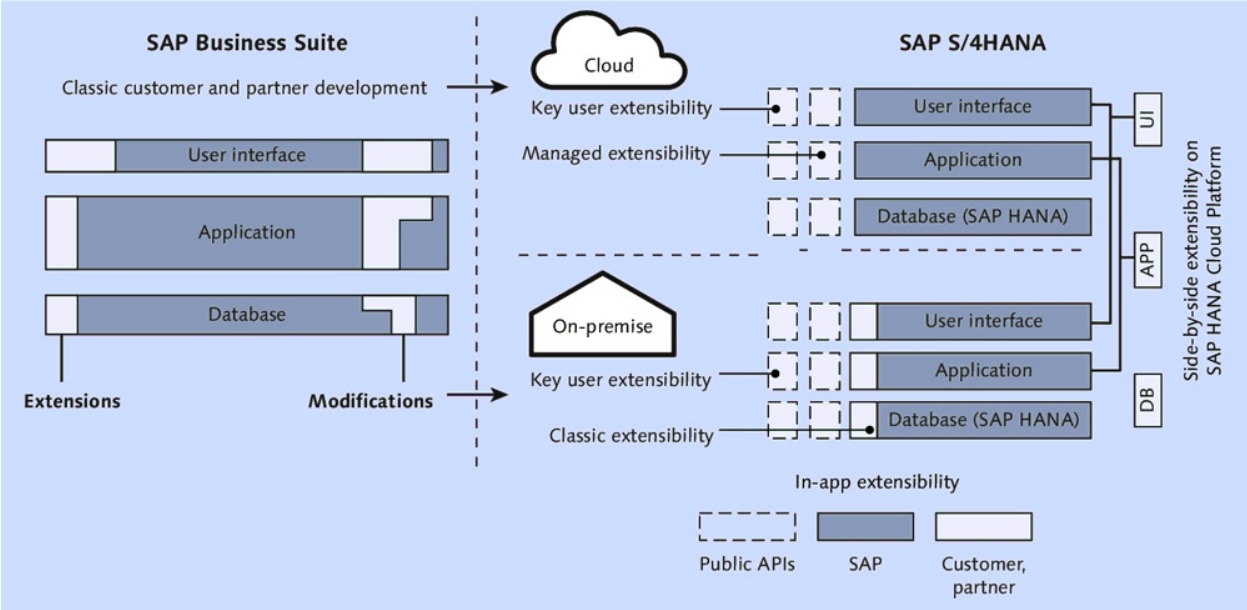
Figure 7.1 Comparison of SAP Business Suite and SAP S/4HANA Extensibility Options
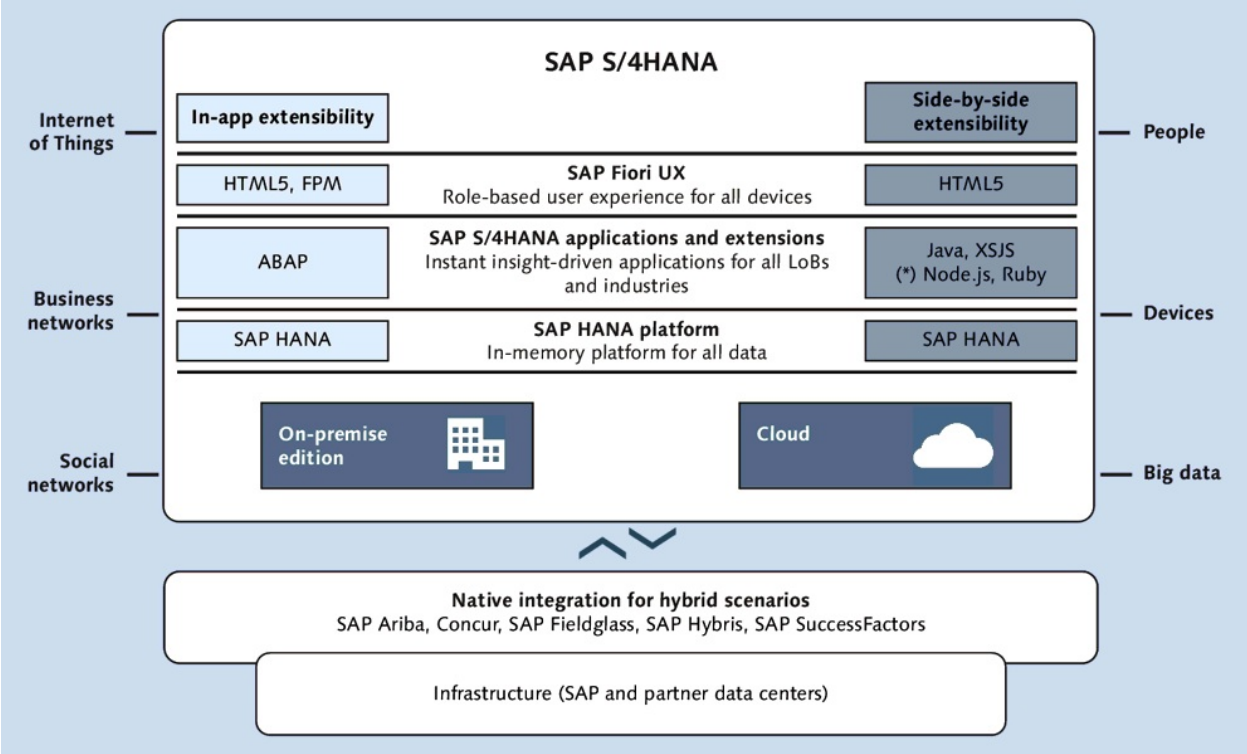
Figure 7.2 Possible Technologies to Adopt or Extend Business Applications
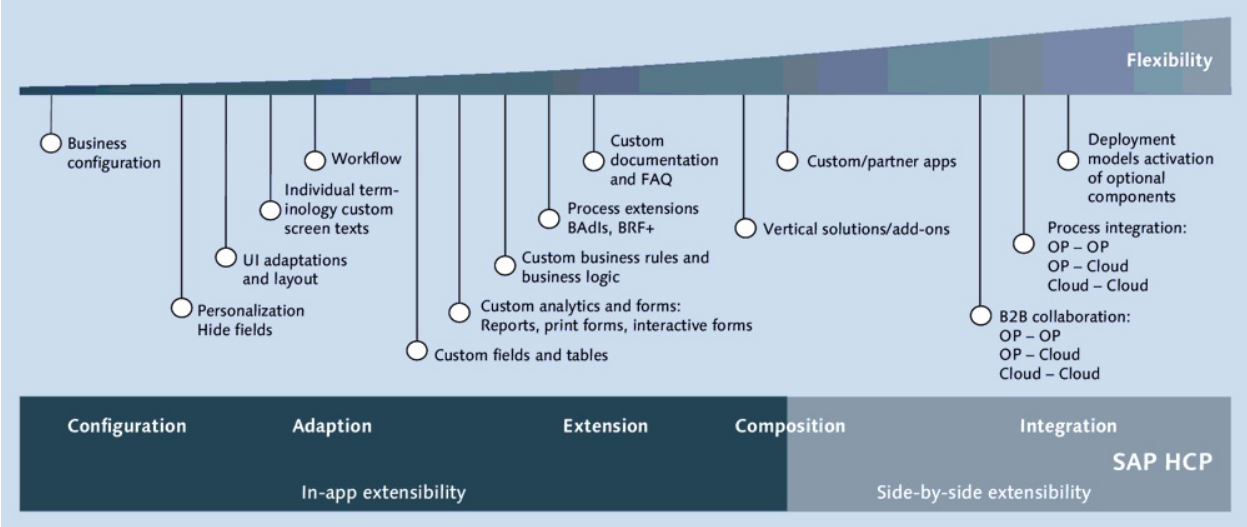
Figure 7.3 Technology Overview for In-App and Side-by-Side Extensions
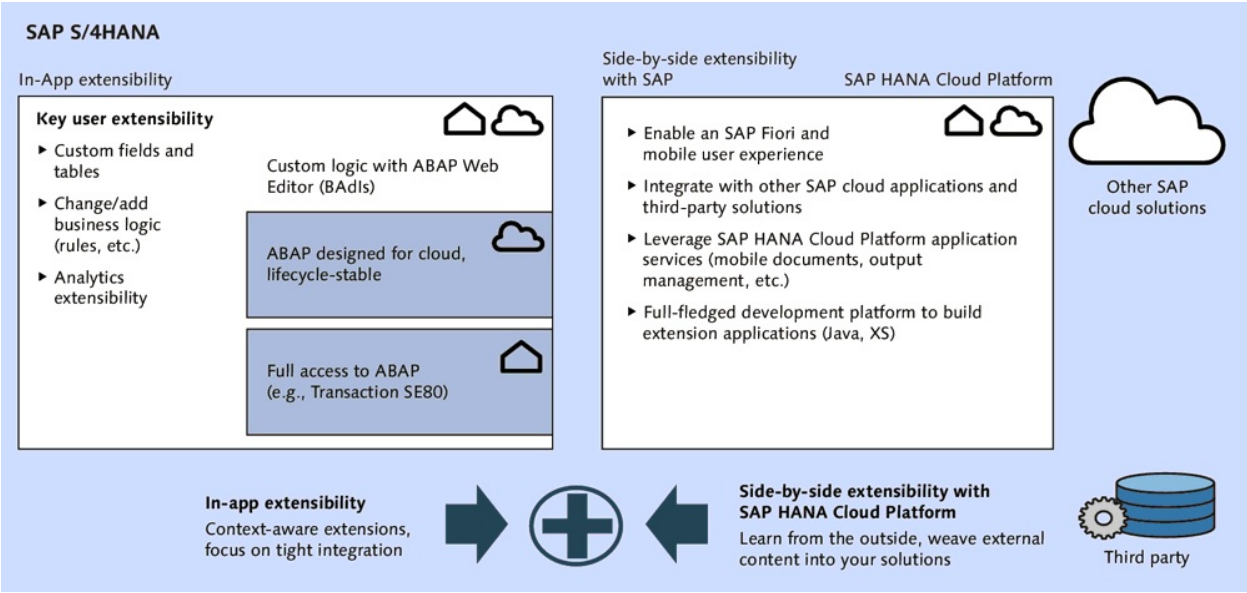
Figure 7.4 Comparison of In-App Extension and Side-by-Side Extension Possibilities
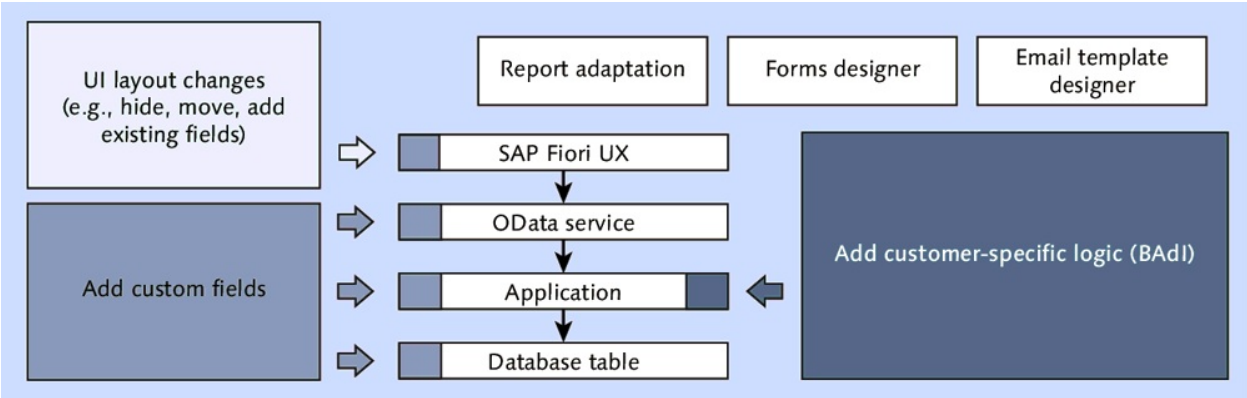
Figure 7.5 Key User Extensibility
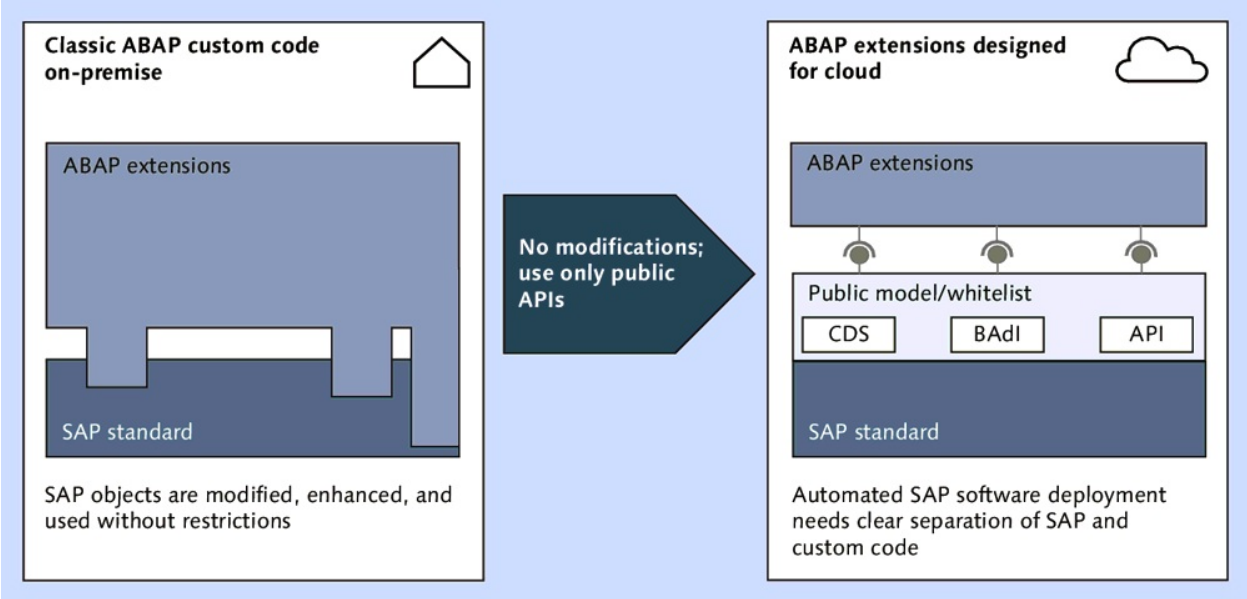
Figure 7.6 Managed Extensibility via Whitelisted APIs
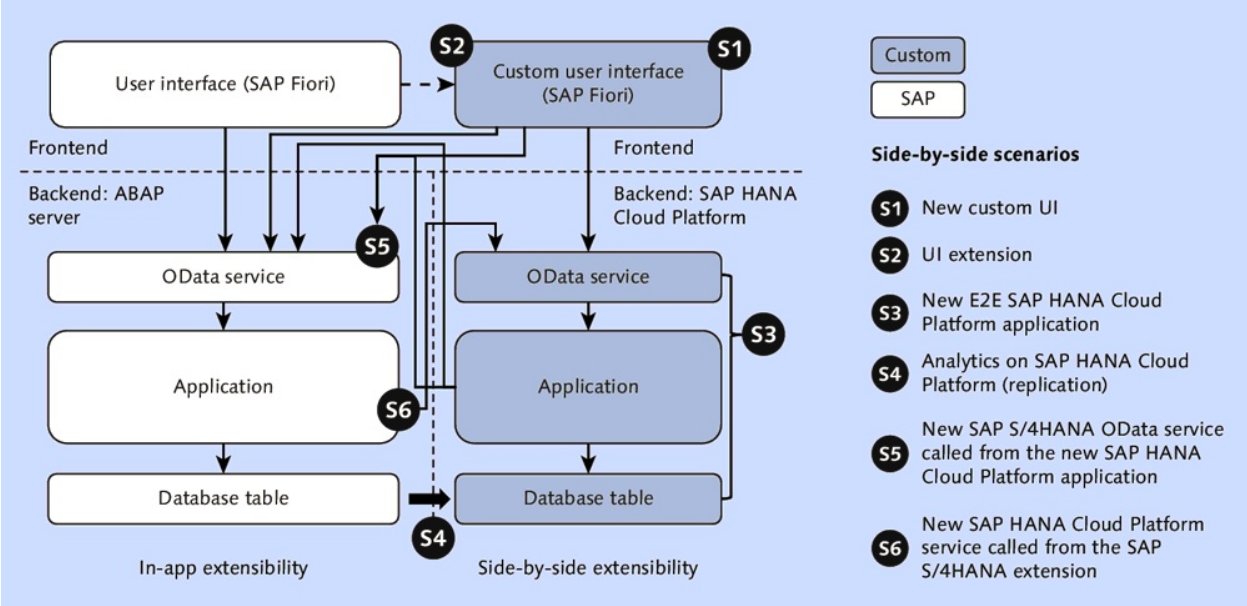
Figure 7.7 Side-by-Side Extension Scenarios
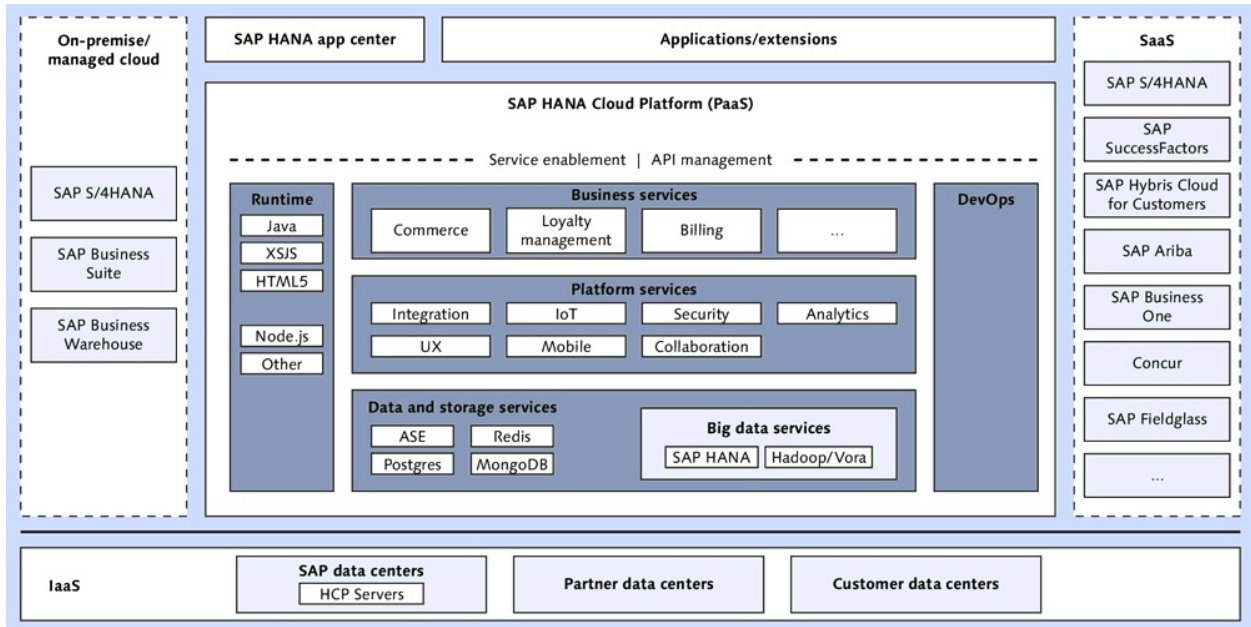
Figure 7.8   SAP HANA Cloud Platform Overview
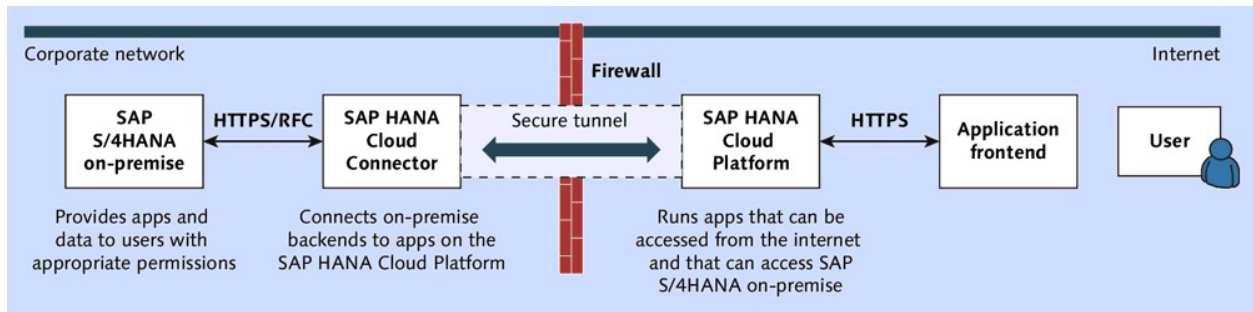
Figure 7.9 Integrating SAP S/4HANA with the SAP HANA Cloud Connector
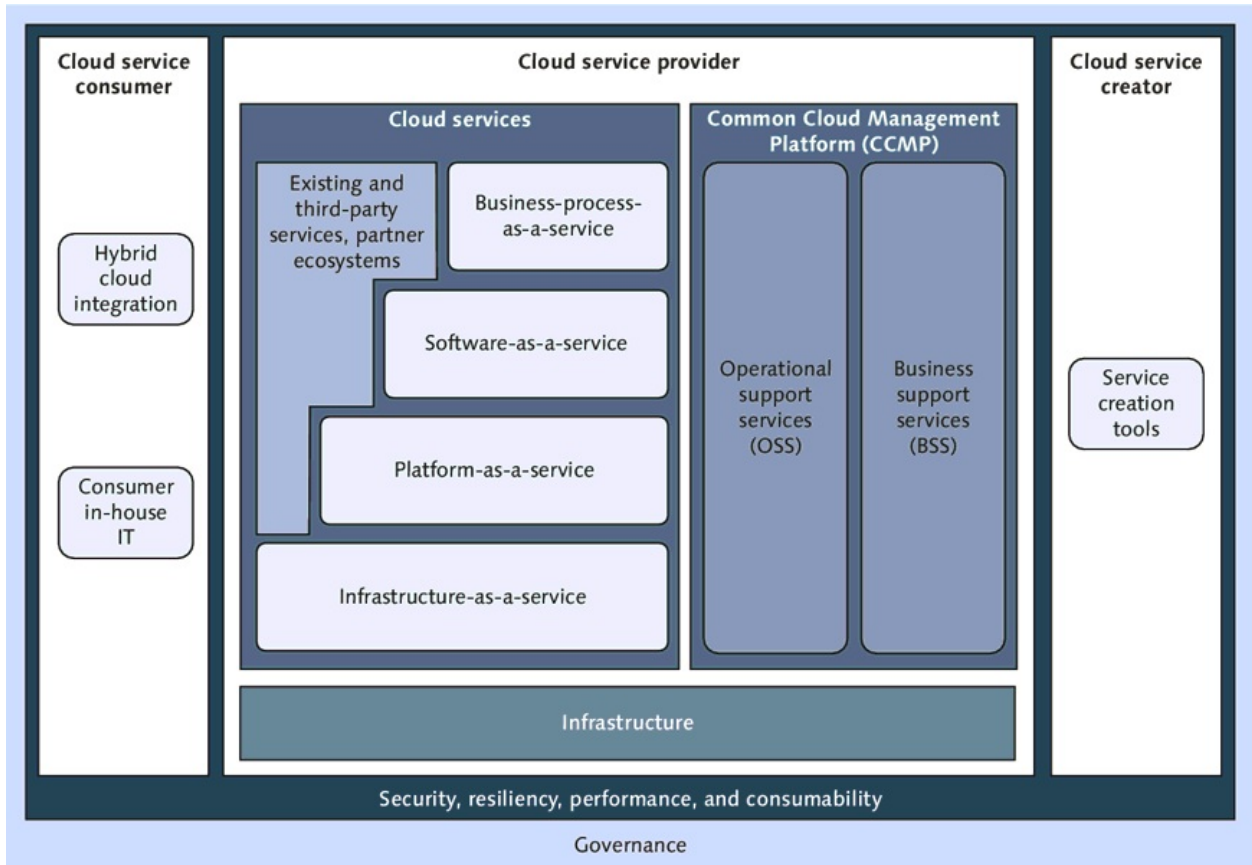
Figure 8.1 Cloud Computing Reference Architecture Overview
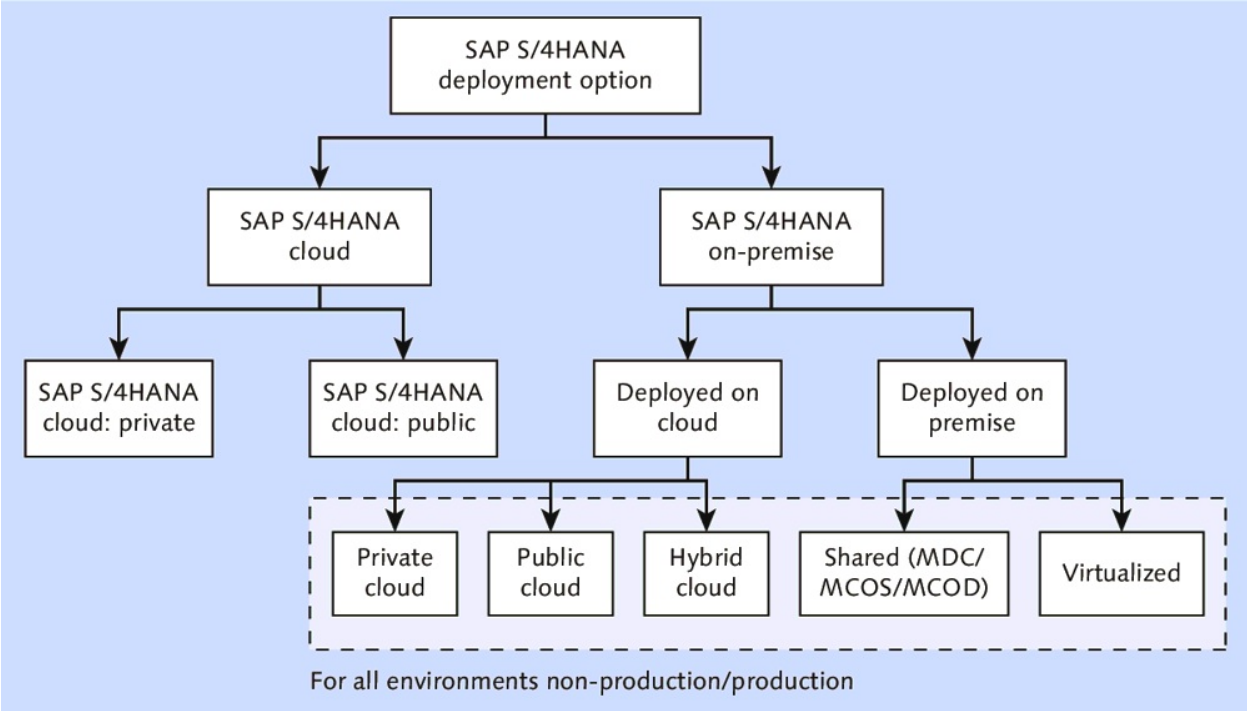
Figure 8.2 Decision Tree for SAP S/4HANA Deployment
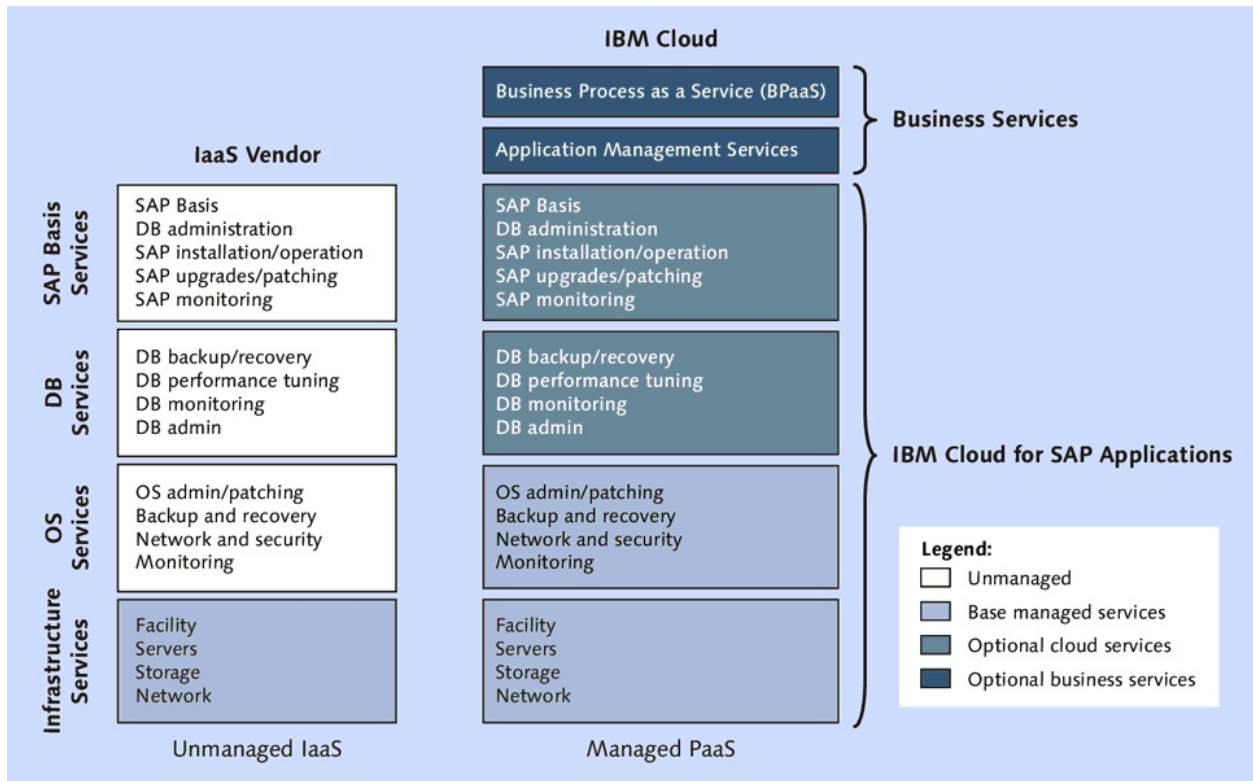
Figure 8.3 Service Options for IaaS and PaaS: Managed and Unmanaged
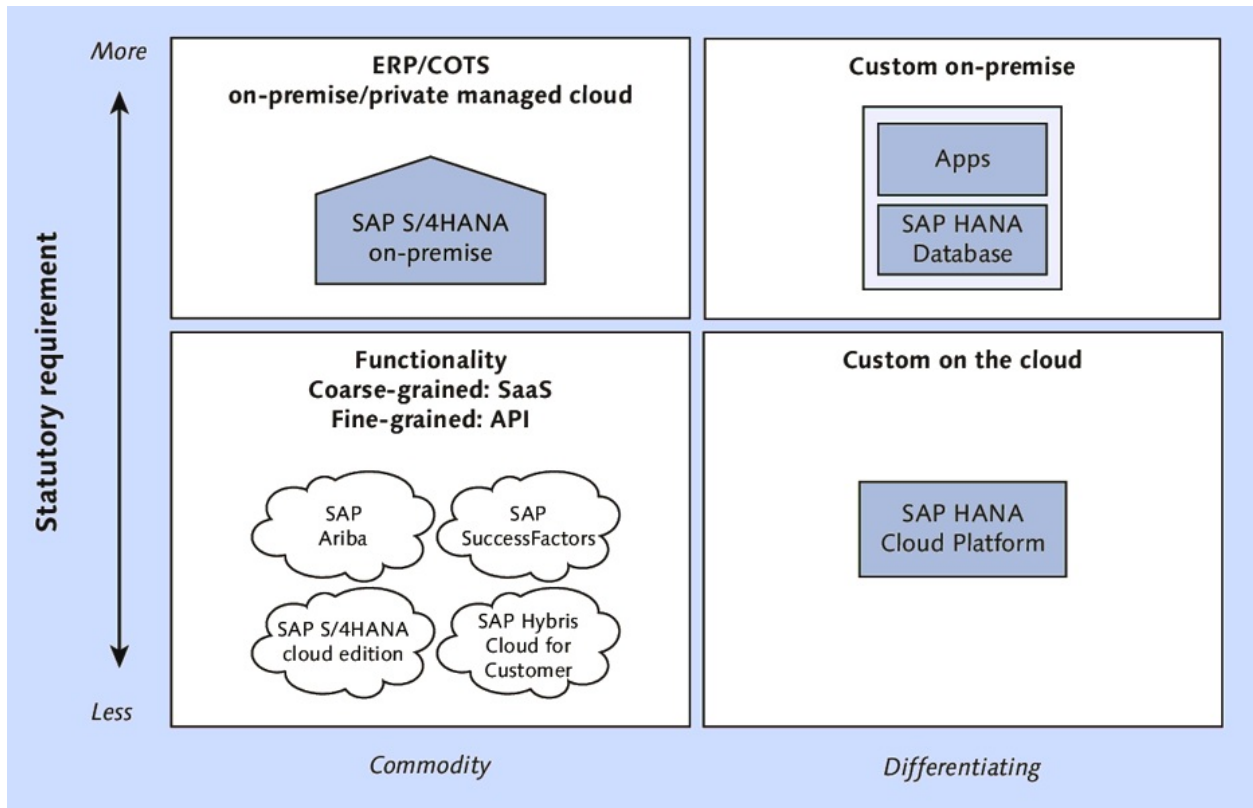
Figure 8.4   Cloud Decision Influencers for SAP ERP Solutions
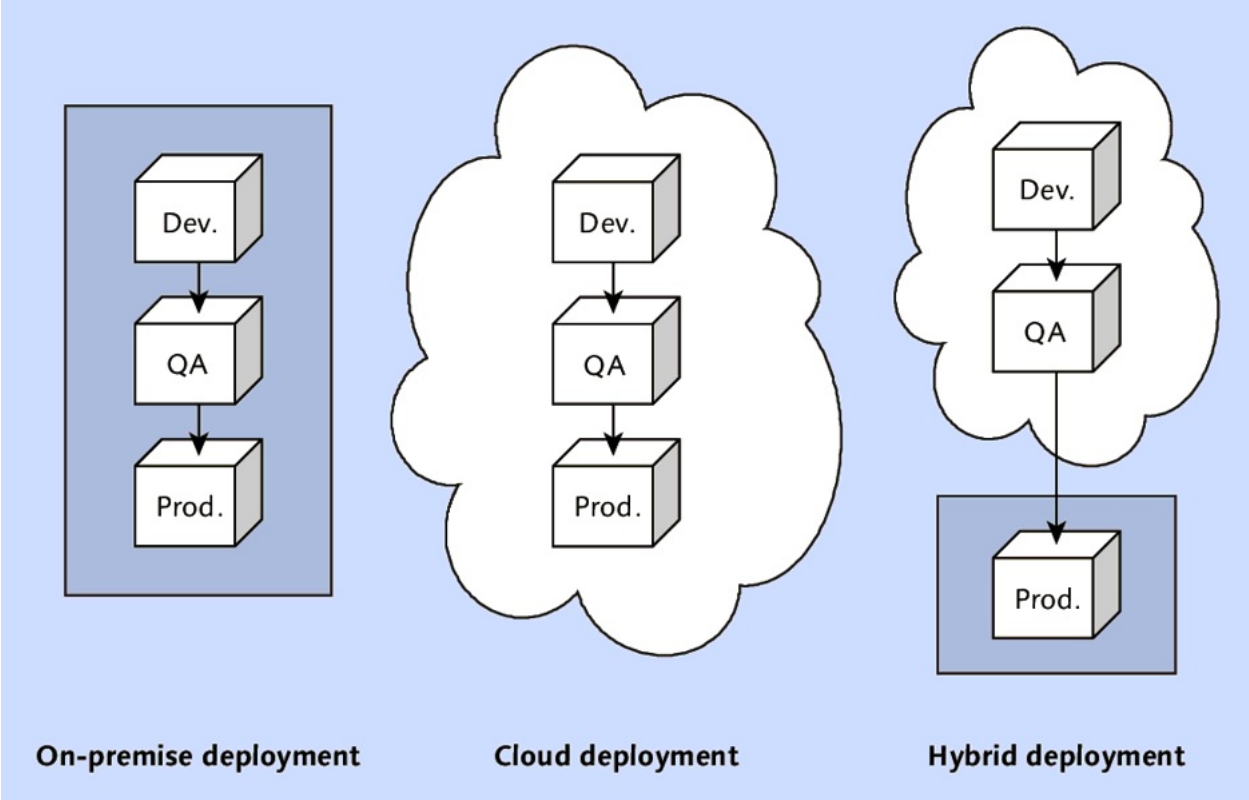
Figure 8.5   Example of a Hybrid Cloud Scenario
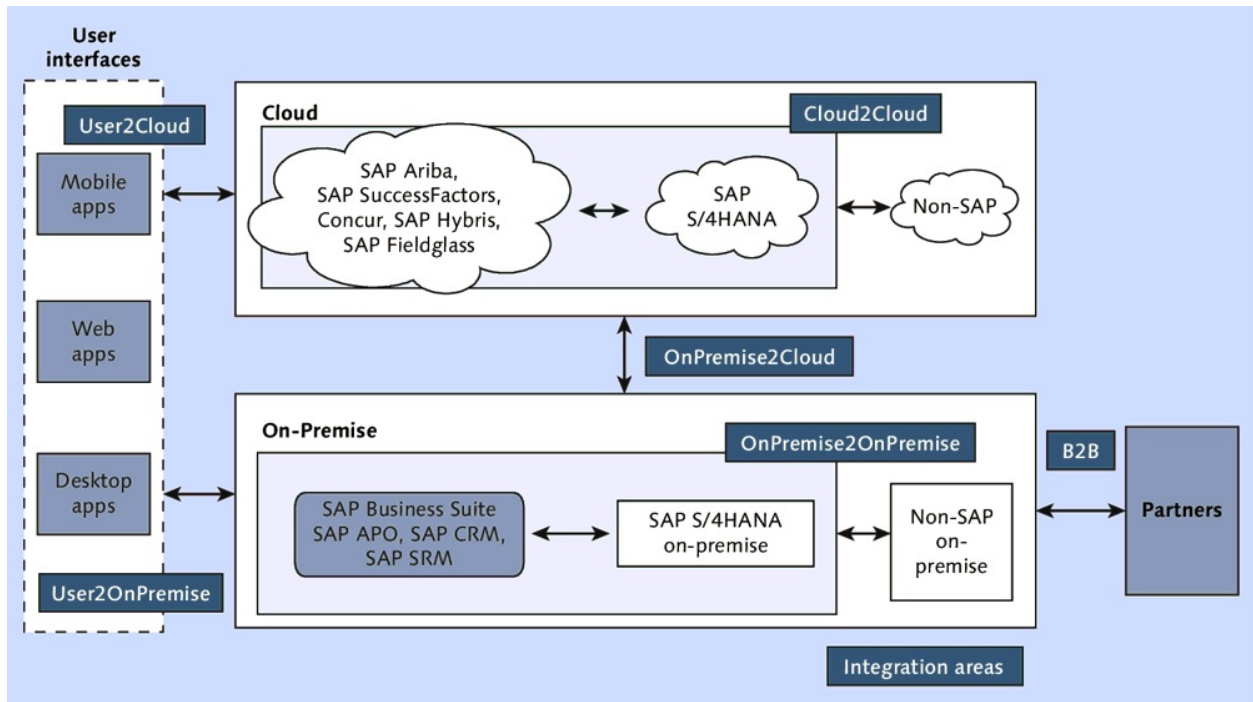
Figure 8.6 Integration Scenarios for SAP S/4HANA

Figure 9.1 SAP S/4HANA Transformation from Current State

Figure 9.2 Sample Output from SAP Business Scenarios Recommendations

Figure 9.3   High-Level Stack Architecture of SAP S/4HANA
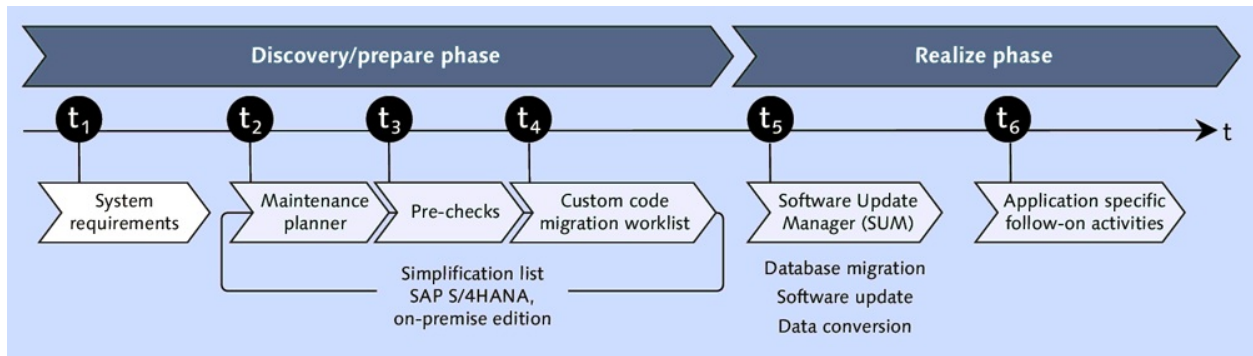
Figure 9.4   On-Premise SAP S/4HANA: System Conversion Sequence
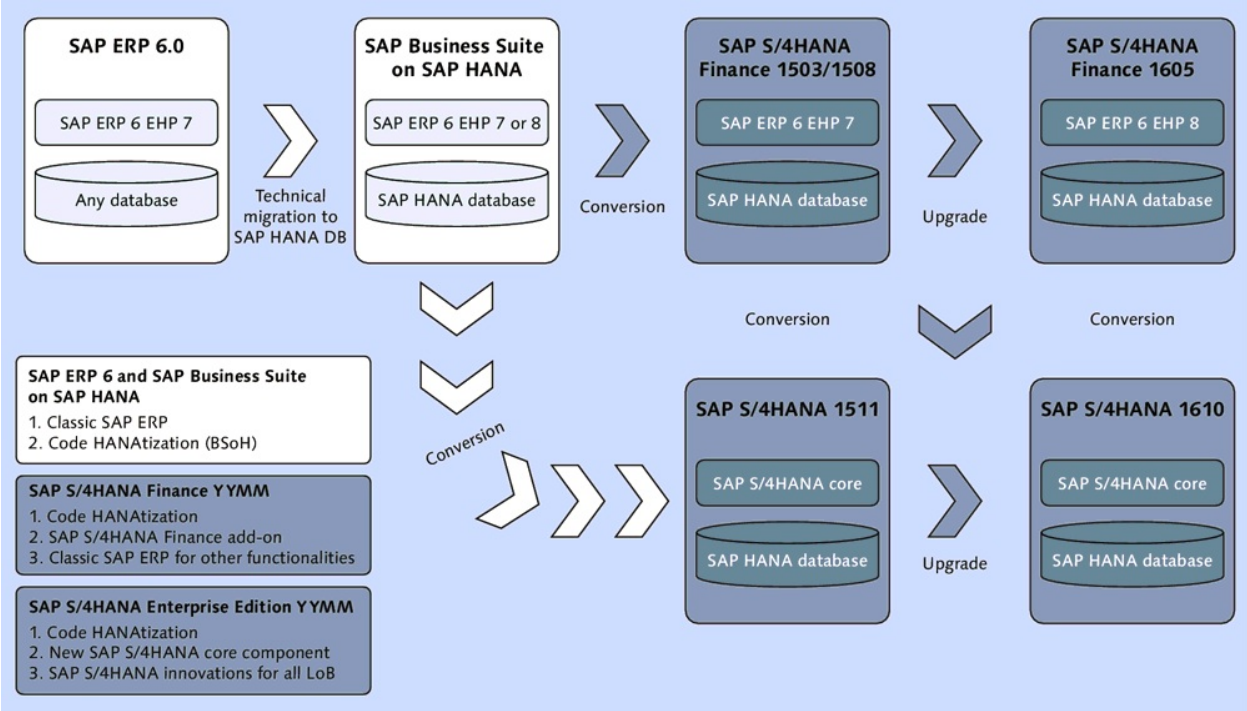
Figure 9.5   System Conversion Scenarios for SAP S/4HANA

Figure 9.6   System Conversion Tasks for SAP S/4HANA

Figure 9.7 Sample Output for Report R_S4_PRE_TRANSITION_CHECKS

Figure 9.8   SAP S/4HANA Custom Code Migration Worklist

Figure 9.9   SAP Code Inspector Screen Selection

```
215          where a~buffered   = 'X'
216            and b~ddlanguage = 'EN'
217            and c~fieldname  = 'CLIENT'
218    %_hints oracle 'merge join'.
```

Figure 9.10   Example of a Database Oracle Hint

```
42
43    * 3. DOKCLU
44         DELETE from DOKCLU
45           WHERE  ID = 'TX'
46             AND  OBJECT = 'ZLOGIN_SCREEN_INFO'
47             AND  LANGU = 'E' AND TYP = 'E'.
48
```

Figure 9.11   Example of Database Operation on a Pool and Cluster Table (Table Clusters)

```
65      SELECT * FROM MSKU into table it_msku
66            WHERE MATNR = MATNR
67            AND    KUNNR = KUNNR
68            AND    SOBKZ = KONSIKUNDE.
69   ♀  elseif werks ne ' ' and matnr eq ' '.
```

Figure 9.12   Example of Depooling/Declustering

Tests	Error	Warn...	Infor...
List of Checks	94	97	1320
Security Checks	0	0	0
Robust Programming	94	97	1320
Search DB Operations in Pool/Cluster Tables	0	0	0
Search problematic statements for result of SELECT/OPEN CURSOR without ORDER BY	94	97	1320
Errors	94	0	0
Warnings	0	97	0
Information	0	0	1320
Search Functs.	0	0	0

Figure 9.13   Sample of SAP Code Inspector Output

Figure 9.14   SAP S/4HANA, On-Premise Base Technology
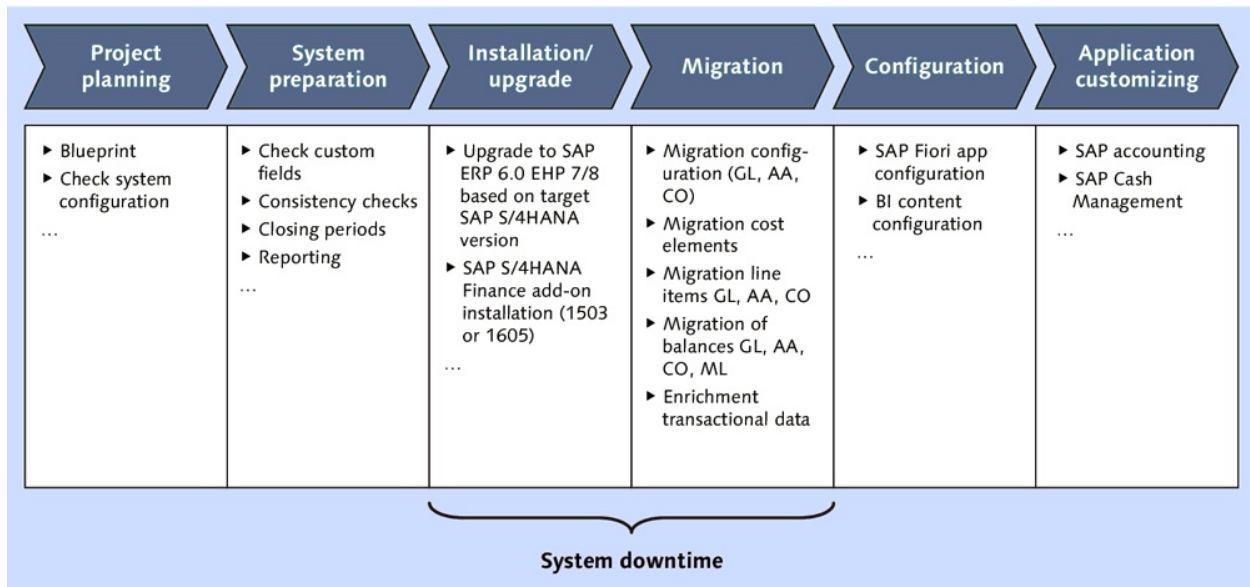
Figure 9.15 Standard Conversion Process for SAP S/4HANA Finance
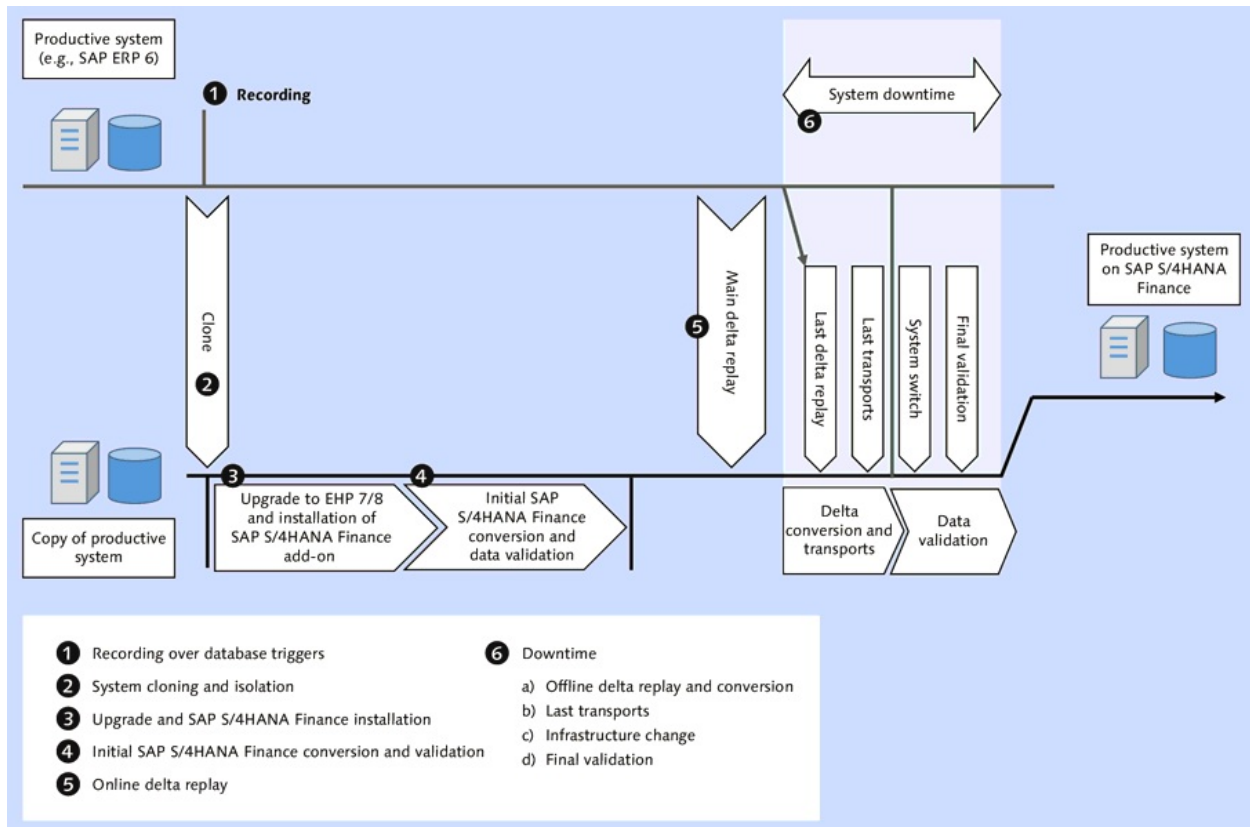
Figure 9.16 SAP S/4HANA Finance, On-Premise Edition, Downtime Reduction with NZDT
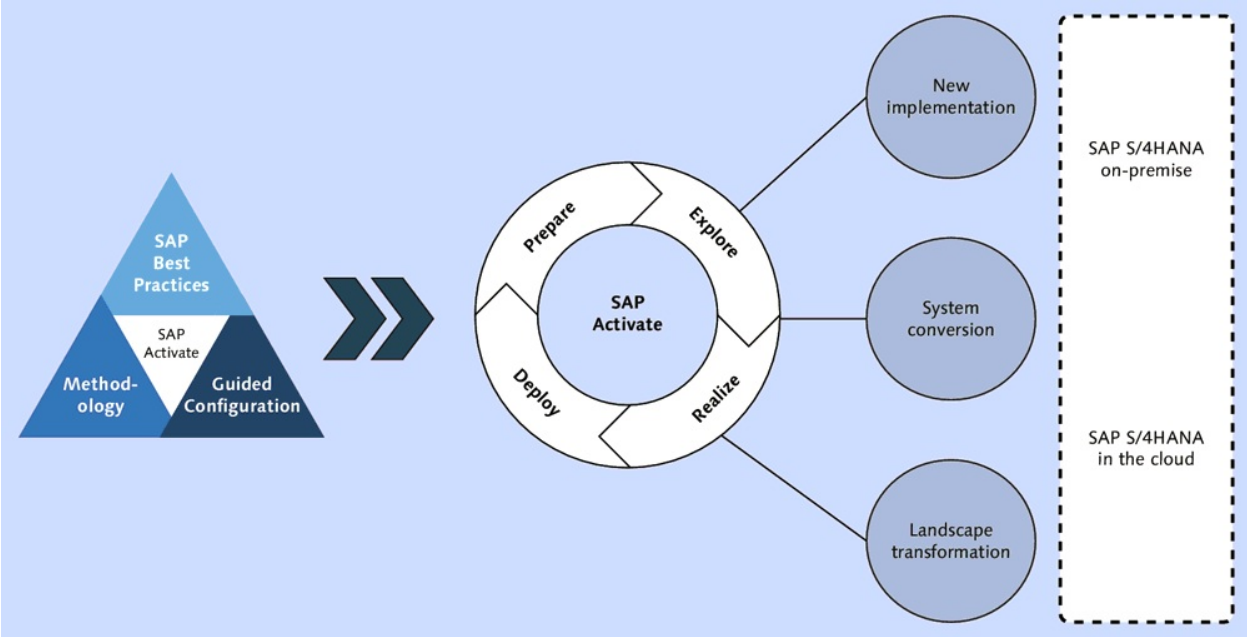
Figure 10.1   SAP Activate Overview and Deployment Options
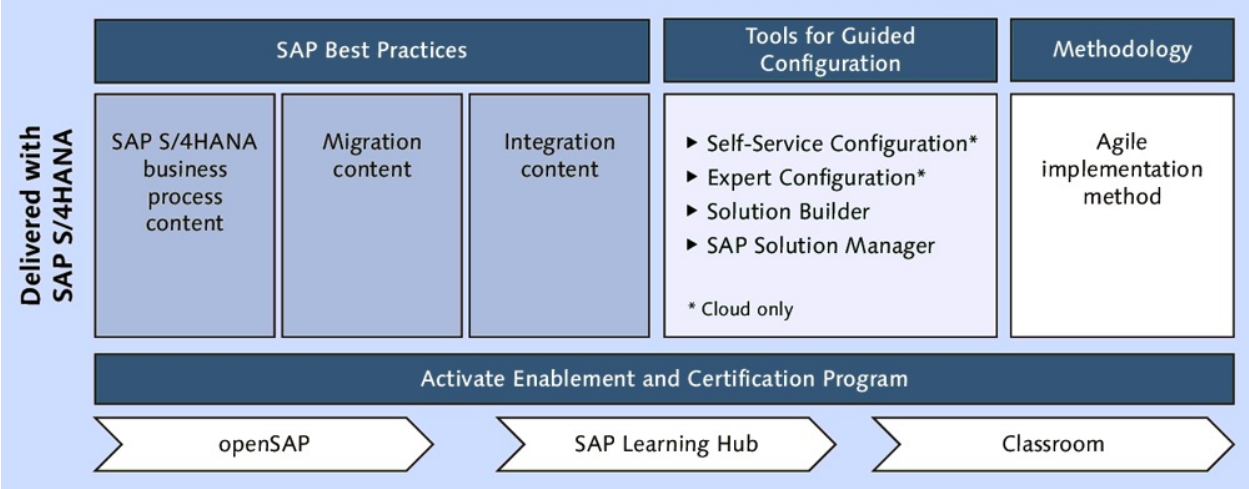
Figure 10.2   SAP Activate Accelerators
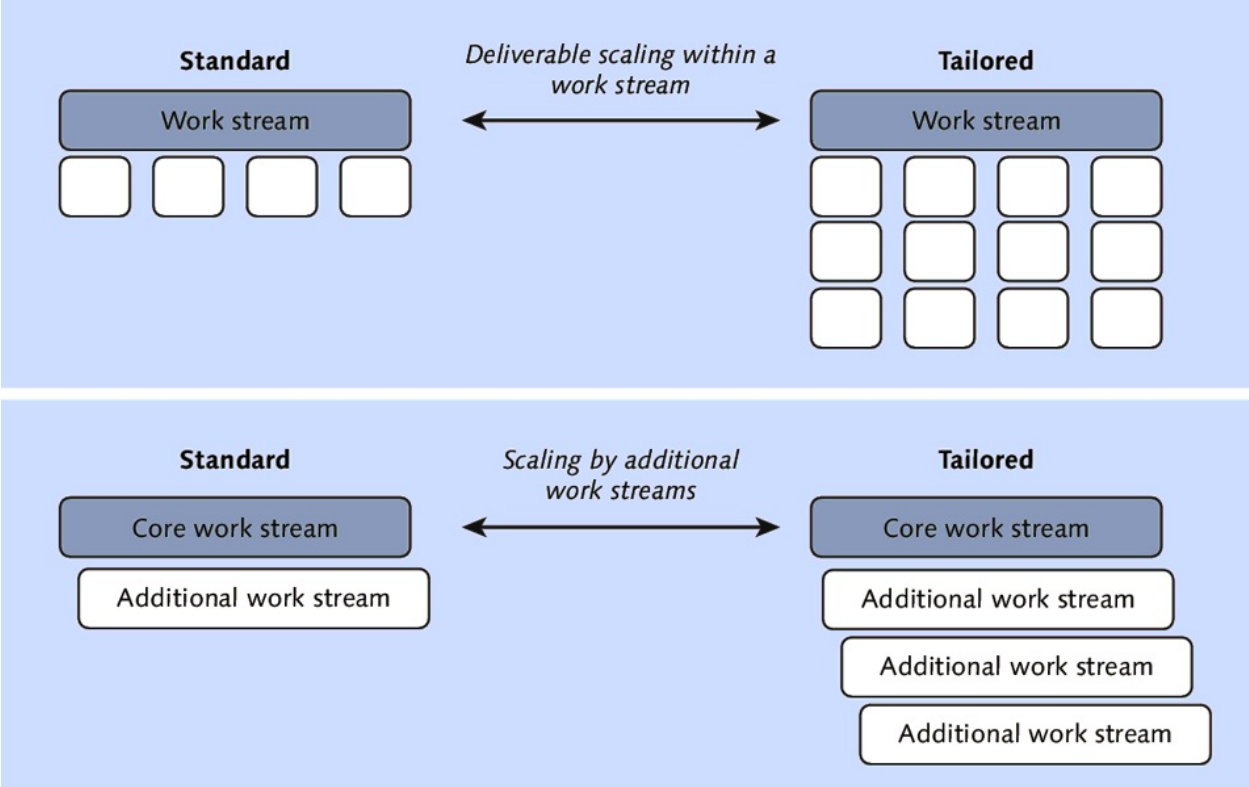
Figure 10.3   SAP Activate Flexible Methodology
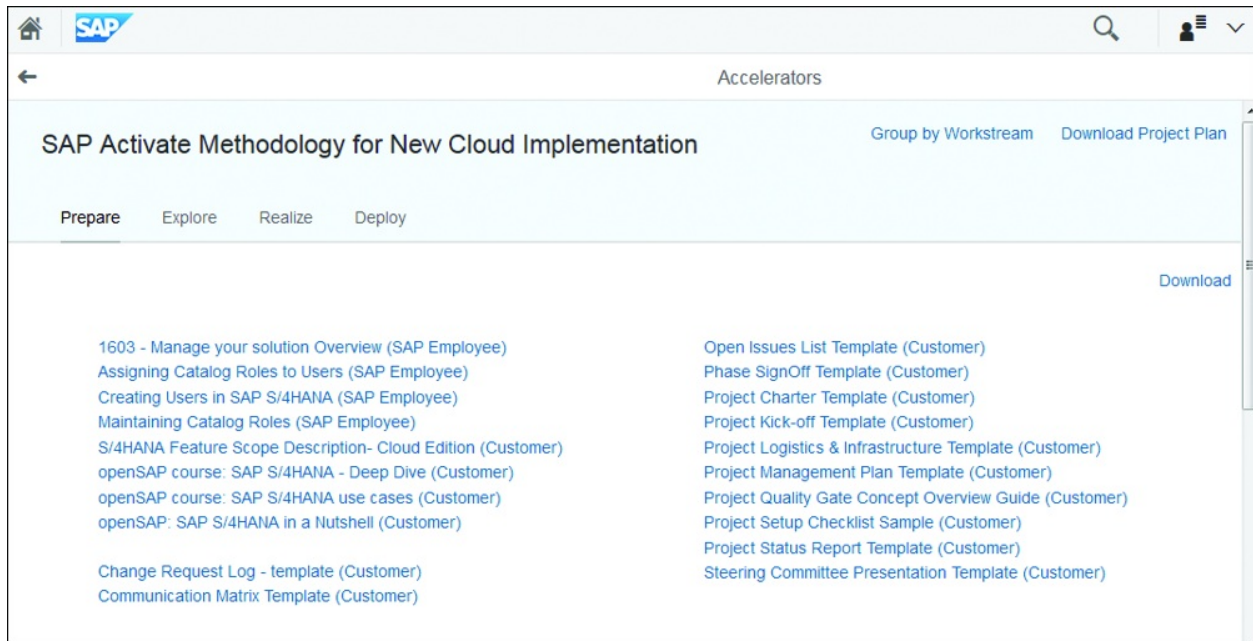
Figure 10.4   Sample List of SAP Activate Accelerators for SAP S/4HANA Cloud
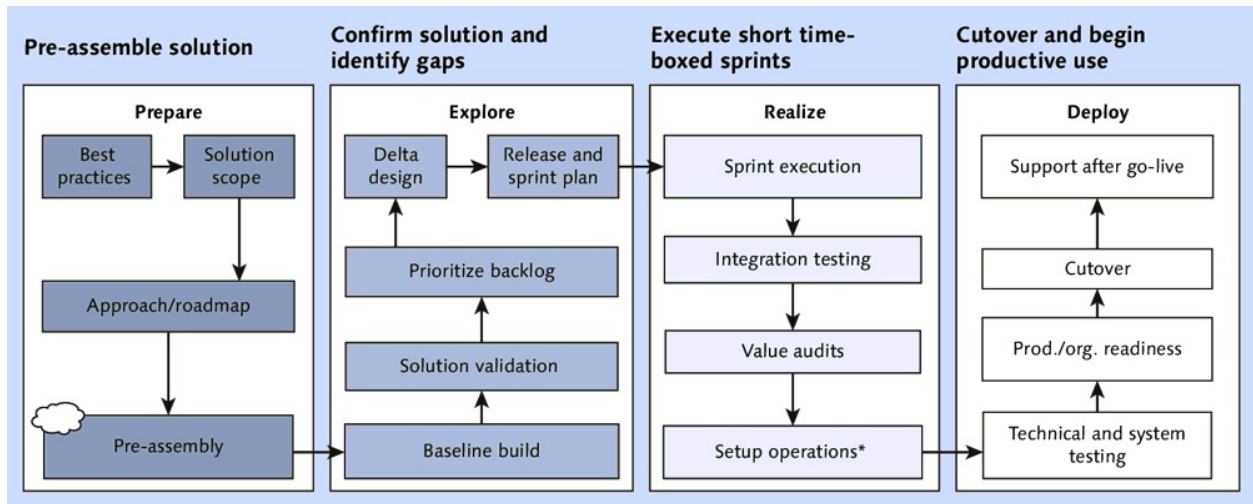
Figure 10.5   SAP Activate Methodology Phases
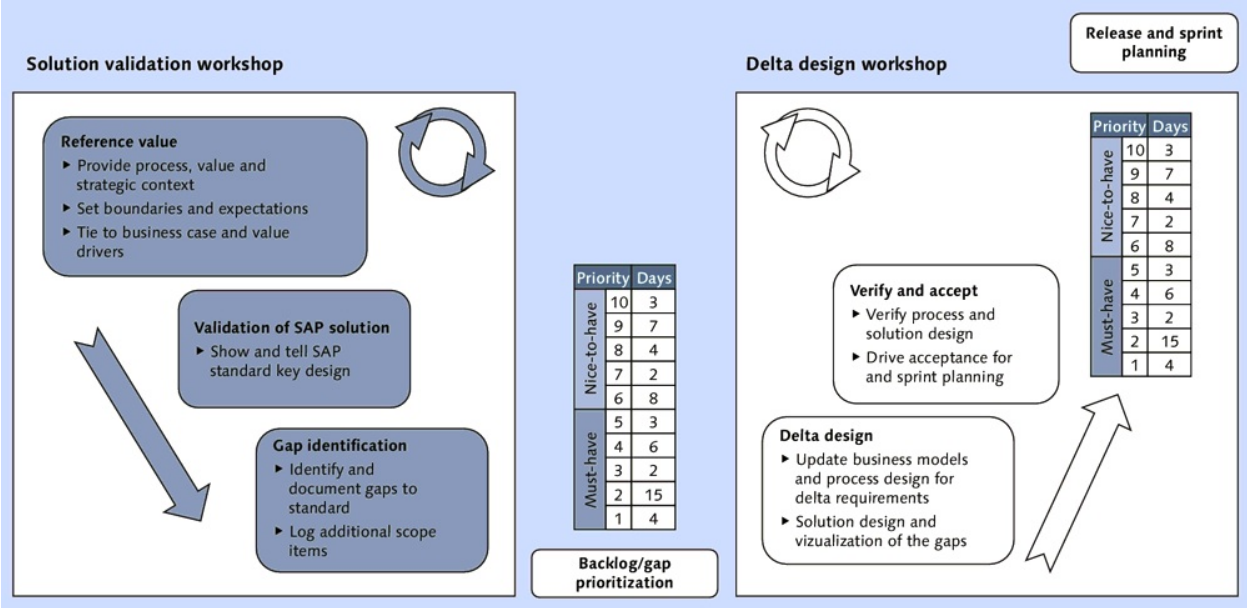
Figure 10.6 Fit/Gap Analysis and Workshops

Figure 10.7 Mandatory Project Quality Gates and Recommended Review Phases

Figure 10.8   SAP Activate Methodology SAP Jam Group

Figure 10.9   SAP Best Practices for On-Premise Deployment

Figure 10.10   Scope Selection in Solution Builder

Figure 10.11 Example of the On-Premise Enterprise Structure Delivered with SAP S/4HANA
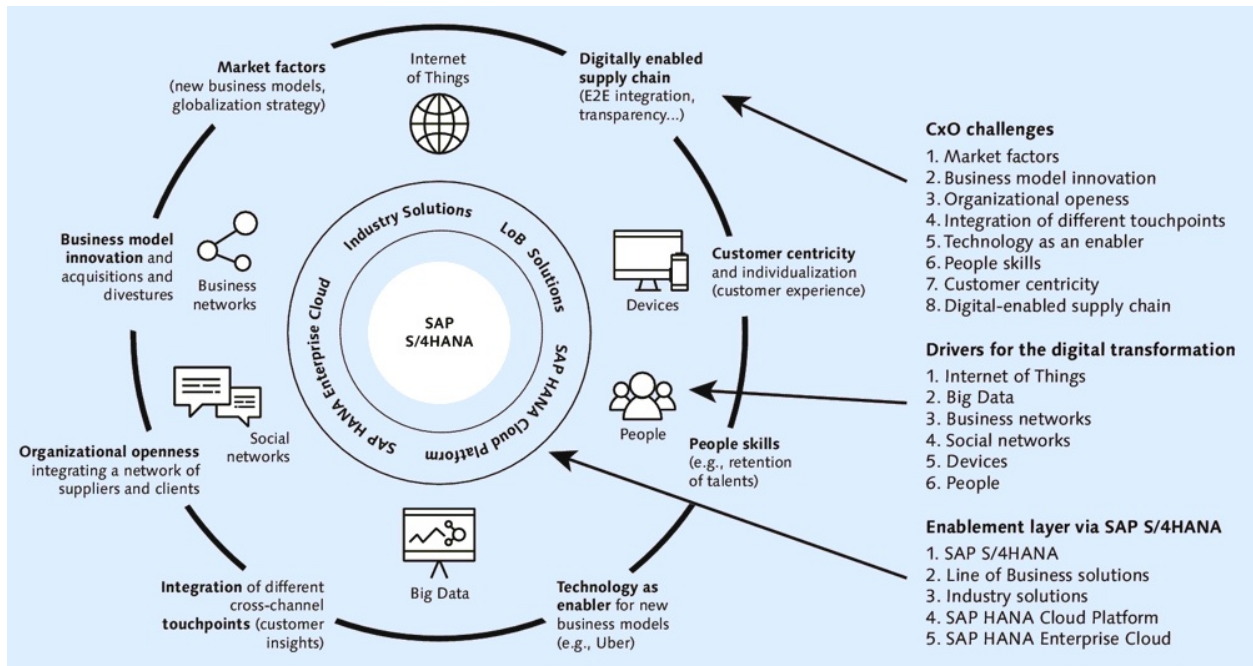
Figure 11.1 SAP S/4HANA: Transforming the SAP ERP Core into a Digital Enterprise Core
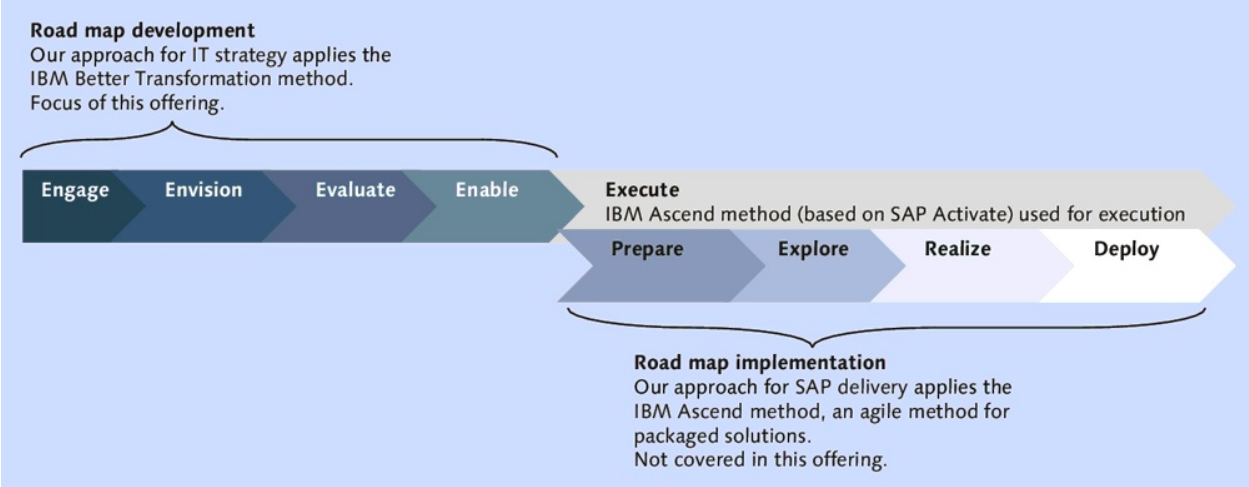
Figure 11.2 A Complete End-to-End Approach from Road Map Definition to Execution
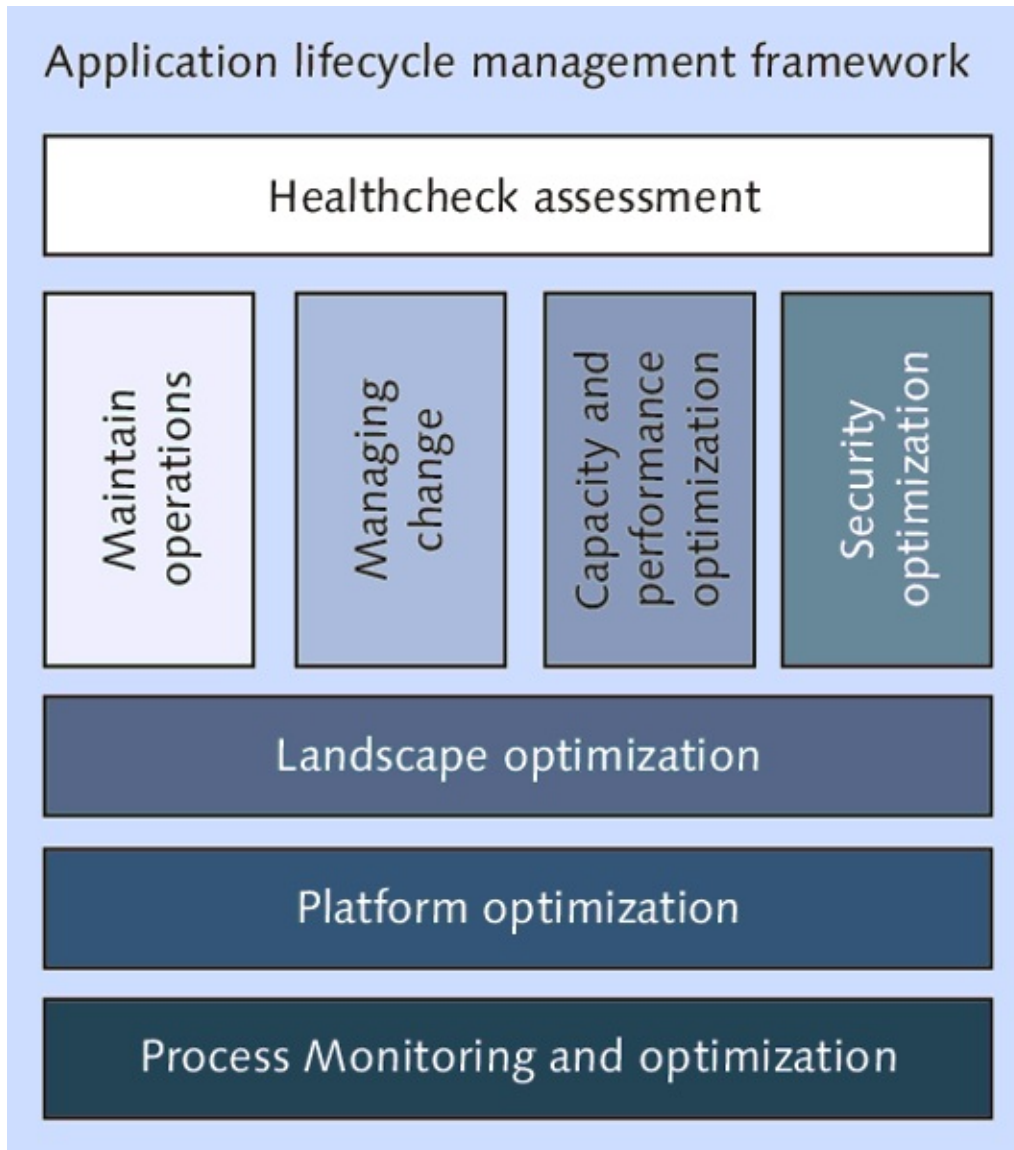
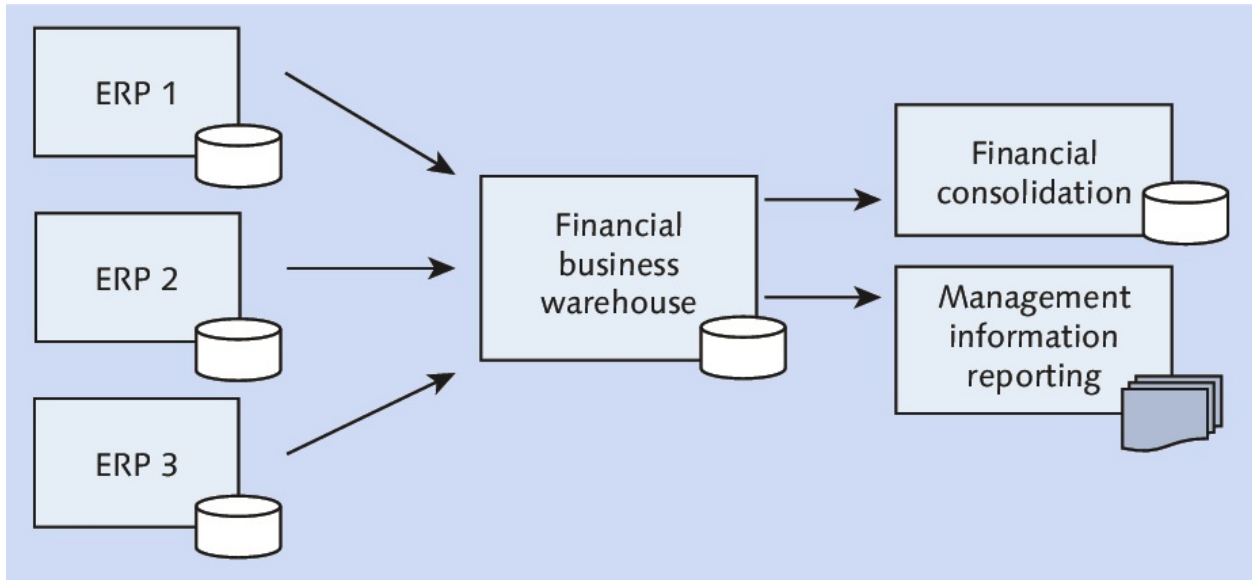**Figure 11.3**   IBM's Application Lifecycle Management Framework

Figure 12.1   Typical Financial Architecture and Data Flow

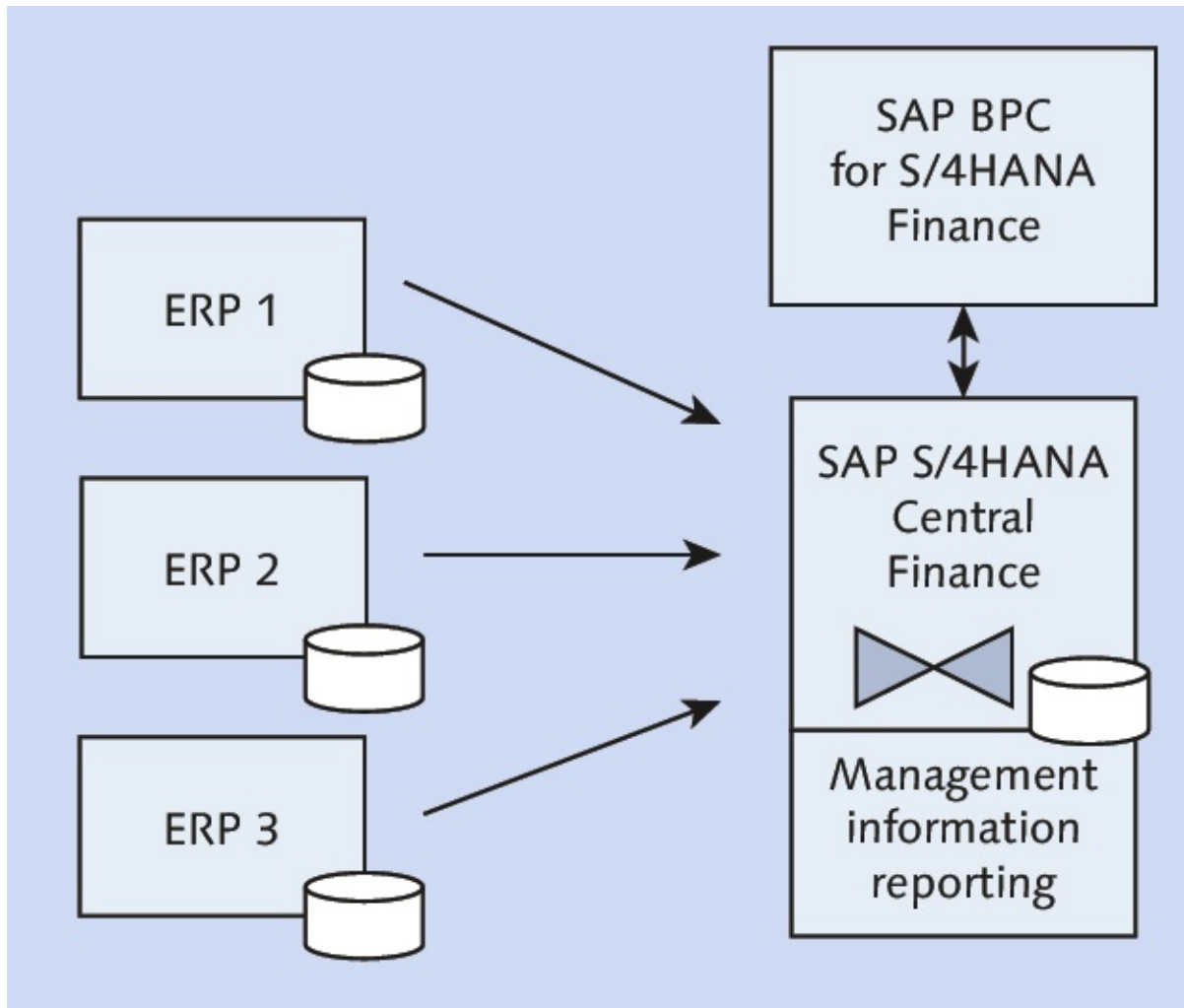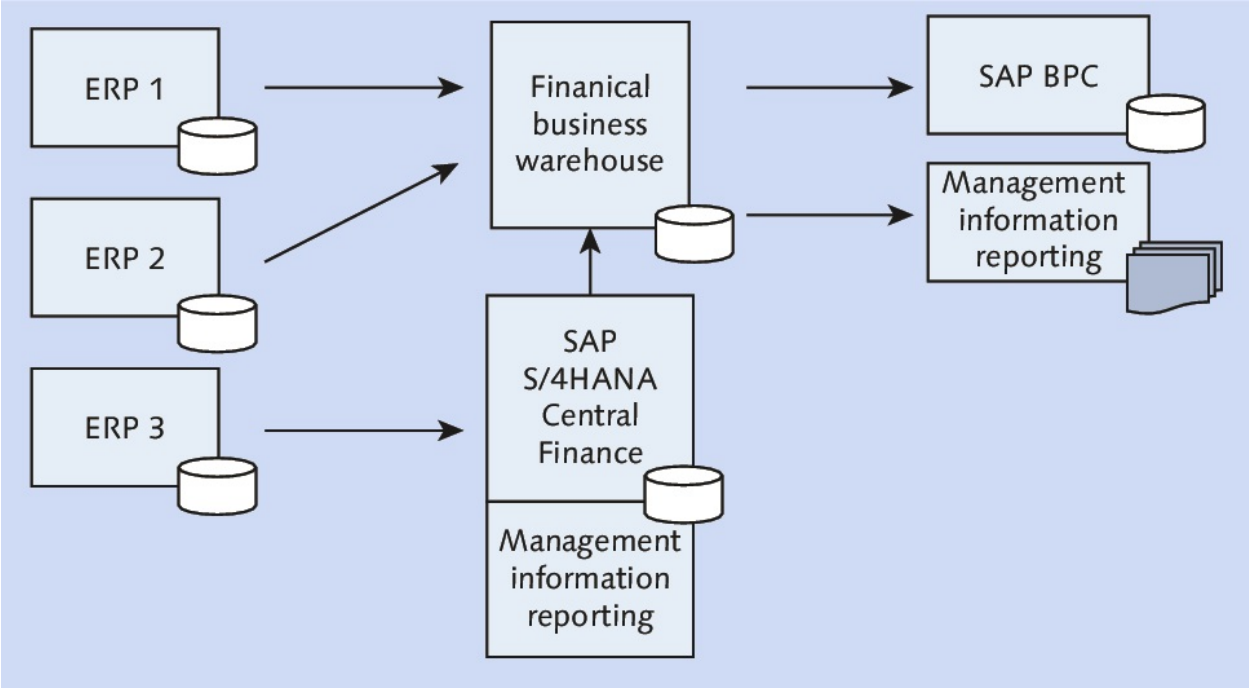**Figure 12.2**   SAP S/4HANA Finance End-State Architecture

Figure 12.3   Central Finance as a Sidecar Scenario

Footnotes