The Digital Health Sciences Network

Improve Lives

Collaborating in a digital world to improve outcomes

SAP

Run Simple

"Patients are assuming greater accountability for their own health. The industry is moving to a model that aligns stakeholder incentives to be more proactive and wellness-focused. Healthcare providers, payers, and producers, historically highly fragmented, are now exploring ways to collaborate across the digital health sciences network to reduce costs while improving patient safety and care quality."

Joe Miles
Global Vice President
Industry Cloud
Life Sciences
SAP

Dear Customers and Partners,

By 2025, the global life sciences market will have gone through dramatic change from the industry we know today. In the near future, we expect patients to be more accountable for their care and to have greater access to their personal health information. We also believe patients and payers will demand personalized treatments with superior outcomes, but in a cost-effective manner. Based on our observations of current trends, I am confident that technology will allow patients to use smart devices to monitor their health, in real time, while collaborating with physicians from home.

Likewise, we expect that physicians will leverage various technologies to have virtual interactions with colleagues and patients. We envision that devices will monitor patients' health data that physicians will integrate with weather patterns, smog levels, and cohort data to create compelling insights about the patient to identify causes of declining health conditions or drug adherence issues for patients not following their treatment protocol. We also think that patient outcomes will be continually monitored to identify patient populations that may have an identical genetic predisposition to a treatment while also providing early detection of any adverse events. Overall, I believe that patients, physicians, providers, and producers will collaborate tightly within a treatment protocol to ensure optimal outcomes at a reduced cost.

Clearly, this picture is a radical departure from today's health market, but advances in digital technologies are quickly moving to the point where this vision can begin to be realized. Today's life sciences companies need to prepare now to make the vision of a digital health sciences network a reality. They need to leverage digital platforms across all aspects of their business, including:

- **Reimagined business models** to improve health outcomes while reducing the cost of care
- **Reimagined processes** that leverage digital technology to transform the patient, physician, provider, and producer collaborations
- **Reimagined employees'** roles and organizational structures to automate and eliminate processes that improve responsiveness and agility at a lower cost

This "reimagining" of a new and holistic health sciences approach creates a world where patients, physicians, providers, and producers get much closer together to achieve one shared goal: improved patient outcomes.
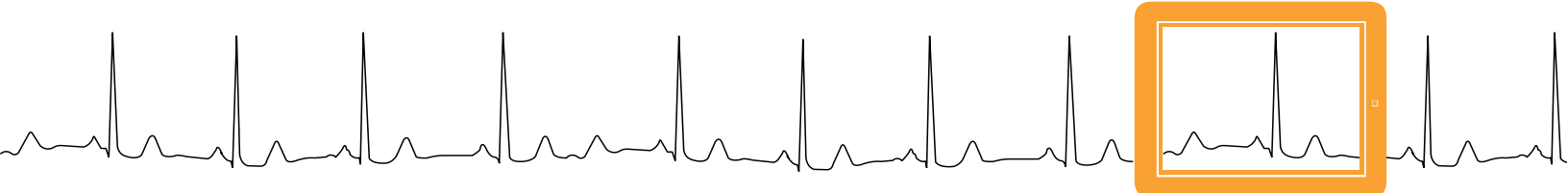
SAP's vision is to help the world run better and improve people's lives. SAP can help life sciences companies improve patient outcomes through a digital health sciences network that simplifies collaboration across the value chain. It provides an integrated digital core, linking cloud-based solutions with networks and smart sensors in real time while maintaining full patient privacy. It will be used by patients, physicians, providers, and manufacturers of health products and add value through Big Data analysis, connected health models, and by running business processes in real time.

This document offers our perspective on where the industry will go and how SAP can enable the evolution of the digital health sciences network. Thank you for your interest and we look forward to your feedback.

Joe Miles
Global Vice President
Industry Cloud
Life Sciences
SAP

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The Digital Economy

Technology trends

Major technology trends are shaping the digital economy – connected health, personalized medicine, cloud computing, an insight-driven value chain that leverages the Internet of Things, health wearables and predictive analytics to improve responsiveness, and cybersecurity. Leading life sciences companies prepare to use these technologies to find new answers to questions such as:

- What are profitable business models based on new technology trends like personalized medicine, smart medical devices, value-added services, and Big Data in science?
- How can we capitalize on the demand for outcome-based therapies, solutions for incurable and chronic diseases, and affordable drugs and medical devices across the world?
- Which trends and technologies from adjacent industries are influencing the life sciences market, e.g., consumer electronics, software, and sports?

**Leaders are emerging quickly from outside the life sciences industry**

The life sciences industry boundaries are already blurred. Large players like Google and Apple are starting to offer health wearables and software that help millions of patients engage in their own therapy decision making and well-being.[1] Key questions include:

- How do we sustain and grow customer relationships with new digital services?
- Which market spaces are the most attractive for new, disruptive competitors?
- Who are potential partners in the digital health sciences network?

Early adopters are winning

Companies that drive innovation in the digital world and systematically execute on their digital strategy are growing shareholder and stakeholder value faster than their peers. The health sciences network allows them to improve R&D productivity; focus on patient outcomes; and interact with B2B customers, physicians, and patients more effectively. Key questions include:

- Which business segments allow market leadership and competitive differentiation?
- Which tasks are better allocated to a partner in the network?
- How do we develop and sustain the ability to adapt continuously to changing market conditions?
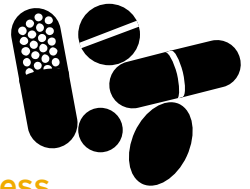
Digital business models are disruptive. The rules have changed.

- **Genentech** launched Herceptin, one of the first "personalized medicine" drugs in 1998 for genetic indicators. It was still among the top 10 best selling drugs from 2012-2014[2]
- **MKI,** a leading Japanese bioinformatics company, uses SAP HANA to speed genome analysis and bring down cost for DNA extraction and analysis from up to $1 million to below $1,000[3]
- **Alphabet (formerly Google X) and Novartis** are developing smart lenses that read glucose levels in tears. The market potential for continuous glucose monitoring is projected to be at $568.5 million by 2020[4]

TODAY, EVERY BUSINESS IS A TECHNOLOGY BUSINESS

Keys for utilities to win in the digital community:

- Lead reinventing and digitizing the business
- Digitize the engagement with customers
- Partner with other market participants to achieve economies of scale

## Fundamental changes: Five technology trends changing everything

We are witnessing an unmatched era of true business innovation. Breakthrough technologies have matured and hit scale together, enabling five defining technology trends:

CONNECTED HEALTH

1

Every patient and medical device is connected through smart technology, the Internet of Things (IoT), and the cloud, disrupting the patient care value chain. New opportunities for insights are emerging across the value chain: the health sciences network connectivity enables collaboration between patient, physician, provider, and producer to drive improved outcomes.

PERSONALIZED MEDICINE

2
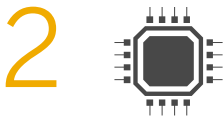
The limits of 20th century computing power are gone. Networking and in-memory computing allow for the creation of infinite new business opportunities for developing new drugs, medical devices, and services that are not targeted to the mass market, but deliver therapies to specific patient populations or even to one specific patient. Personalized medicine will dramatically improve therapeutic outcomes.

CLOUD COMPUTING

3

Technology adoption and business innovation now move at lightning speed. Technology infrastructure is rented to eliminate barriers to entry. Interactions in R&D, manufacturing, and clinical care are moving to new cloud-based collaboration platforms, where numerous organizations and users are connected in a matter of minutes.

INSIGHT-DRIVEN VALUE CHAIN

4

Smart devices, smart sensors, smarter visualization, predictive maintenance, and remote service are the new norm. The outcome-based economy rewards life sciences products that improve efficacy and responsiveness and lower cost. Manufacturers can remotely manage products and operate faster and in a more efficient and agile manner.

CYBER SECURITY

5

Cyber criminals have expansive new capabilities to attack, undermine, and disrupt organizations. Trust remains the ultimate currency to stay successful in life sciences as companies need to fulfill requirements of security, privacy, and ownership of sensitive patient, clinical, and product data.

The future: The life sciences industry transitions into a digital health sciences network

The digital economy in life sciences

Life sciences companies have traditionally collaborated with external parties in R&D, manufacturing, supply chain management, and sales marketing and services. Industry trends and digitization will transform collaboration into deep networks that enable new business models.

Transformation drivers

The health sciences industry value chain along science, contract organizations (CxOs), third-party logistics providers, wholesalers, care providers, and payers is transforming at breakneck speed, driven by:

- **Healthcare reforms,** not only driving a stronger focus on cost-effective therapies, but also on higher efficacy and improved patient outcomes
- **Scientific advances** in genomics, proteomics, and other disciplines to further drive opportunities for new innovative drugs and medical devices
- **Accountable, educated patients,** who are more informed and share experiences via networks to obtain the highest efficacy at a reasonable cost
- **New competitors,** like Alphabet and Apple, which are disrupting traditional health markets with their digital innovations, so that industry boundaries are blurring

New business models

Leading life sciences companies and new players are reimagining business models, business processes, and job roles as a response to the transformation drivers.

- **Paying for outcomes** will lead to higher reimbursements, a strong focus on proving efficacy, and enhanced value-added services and connected care models supported by mobile devices
- **Real-world R&D networks** will enable improved products, e.g., for chronic and rare diseases or affordable products for emerging markets
- **Patient-centricity across channels** will provide real-time information flow across stakeholders and on- and offline channels while improving treatments, therapy adherence, and cost efficiency
- **Targeting segments of one** will transform go to market, revenue streams, and operations

>75%
of all patients expect to use digital services in the future[5]

10GB of raw data
created by a scan of a single organ[6]

Sensor prices
have dropped to an average unit cost 60 cents[7]

$375-575B
global costs of cyber-security in the United States alone[8]

DIGITAL HEALTH SCIENCES NETWORK

Road map to the digital health sciences network: Steps to digitize your business

REIMAGINING

Do you have the right strategy? The starting point of the transformation journey is to reimagine your business with business outcomes and customers at the center.

REIMAGINE
BUSINESS MODELS

Drive competitive advantage by expanding beyond traditional industry boundaries and transforming from a drug or device company to a patient-centric, health-focused organization.

REIMAGINE
BUSINESS PROCESSES

Change or eliminate fundamental business processes due to digitization. Rethink collaboration and information sharing for large, disparate, and complex health networks.

REIMAGINE
WORK

Revamp existing processes based on real-time information, enabling therapeutic insights to drive improved patient outcomes and engagements.

PLATFORM

Do you have the right platform? Leaders are investing in digital capabilities that are congruent with their strategy. The digital health sciences network will provide all participants the right platform to drive efficiency, accelerate innovation, and develop new business models.

We provide solutions that align to desired outcomes. SAP's digital business framework is based on the five key pillars of a digital strategy:

1. **Customer experience** across all channels to enhance outcome-based patient focus and experiences
2. **Supplier collaboration and business networks** across all spend categories (direct, indirect, contractors (CxOs), researchers and clinicians, and expenses)
3. **Core business processes** (finance, procurement, supply chain, and work management)
4. **Workforce engagement,** including employees as well as the broader ecosystem, such as the contingent workforce
5. **Internet of Things** to drive real-time insights and new business models

ROI drives this significant phase of the transition to digital. It's not about any one of the above five pillars, but rather how they all interconnect to achieve business outcomes.

We apply Design Thinking as our key approach during the reimagining phase. Design Thinking can be described as a discipline that uses the designer's sensibility and methods to match business needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.

REIMAGINING

THE DIGITAL ECONOMY OFFERS INFINITE NEW OPPORTUNITIES

In a connected world where the health sciences network evolves, smarter products and services will focus on patient outcomes.

DIGITAL INNOVATION IS REAL

Companies reimagine their entire business to become – or remain – successful players in the digital health sciences network.

REIMAGINE BUSINESS MODELS

Technology and industry trends are opening up new opportunities for life sciences companies to add value to patients, physicians, and care providers.

- **Outcome-based healthcare solutions** will change revenues and reimbursements, as payment models will be based on patient outcomes, rather than a product or service. This will ensure efficacy and cost-effectiveness of the therapy

- **Medical information solutions** will generate new revenues from service offerings for medical devices and/or equipment. Life sciences companies will provide technology to improve usability, asset utilization, cost-effectiveness, and therapeutic efficacy

- **Personalized healthcare solutions** leverage genomic and cohort definitions of patient populations combined with additional services to improve the effectiveness of the therapy through a more tailored and holistic approach to the patient

REIMAGINE BUSINESS PROCESSES

When analytics and transactions are combined in real time on the same platform, business processes will never look the same.

- **Global supply chains** will evolve to include one-to-many and one-to-one operational models to address many of the new therapies and collaboration models

- **Networks for patient safety** will emerge as organizations and governments will leverage greater global visibility to reduce counterfeits and improve efficacy

- **Smart and agile operations** efficiently and proactively maximize quality and compliance with global GxP and other requirements in real time while having in/outsource flexibility

- **Real-world evidence** and **value-added** services will improve patient outcomes in clinical and commercial scenarios due to improved adherence and transparency

- **Patient engagement models** improve outcomes through a deeper patient-physician-manufacturer relationship

- **Value-added services** will allow leading companies to share their expertise in a way that directly and positively impacts their customers

REIMAGINE WORK

The way people engage will fundamentally change.

- **Work items will be eliminated** by digitizing manual steps, e.g., invoicing, payments, and documentation to comply with regulations such as the U.S. Sunshine Act

- **Real-time insights** at the right time, from the right role, and across devices will improve processes across R&D, the shop floor, sales, marketing and services, and beyond

- **Predictive and self-learning** software allows knowledge to be embedded and available across the operational landscape

- **Interactive technology** will be used to improve user experiences for discerning scientists and to facilitate onboarding of the contingent workforce

- **Learning management software** will be used in a regulated environment to ensure GxP compliance and institutionalize operational compliance

- **Flexible business-to-people relationships** provide relevant insights to employees that accelerate their learning and productivity

REIMAGINE BUSINESS MODELS

Increasing regulations, decreasing margins, industry consolidation, and process digitization disrupt established life sciences business models but don't show a clear road to the future. We see the life sciences industry redefine its business model and restructure the value chain. New value will come from the ability to digitize the model and accelerate innovation.

Outcome-based healthcare solutions

Life sciences companies will sell products and services based on patient outcomes rather than using a traditional product-centric revenue model.

- Solutions will have innovative reimbursements that leverage unique metrics such as remission rates, glucose levels, or other health indicators as a baseline for efficacy and reimbursement
- Researchers will analyze genetic and cohort data in real time to identify factors that impact drug efficacy
- Researchers, payers, and physicians will leverage sensors and smart medical devices to capture and analyze real-world clinical and commercial data to continuously monitor and validate product efficacy
- Predictive analytics will be used to identify adverse event signals as well as determine statistically relevant therapeutic outcomes

Medical information solutions

Life sciences companies will offer devices and equipment-as-a-service that includes a medical device and also the infrastructure needed to use the product more efficiently.

- Medical device manufacturers would provide their products as a service with unique billing metrics based on usage, time, or other device-related measurements
- Life sciences companies will offer cloud environments to enable access to diagnostic data, images, product information, or other relevant content that reduces costs and complexity
- Solutions are easily deployed, configured, and accessed by the healthcare professionals, thereby improving time to value

Personalized healthcare solutions

Life sciences companies develop holistic solutions for specific patient populations with biomarkers to determine who has responded positively to a therapy. The solutions include value-added services to enhance, differentiate, and improve the outcome of the treatment.

- Solutions leverage genomic and cohort data to identify specific patients, potentially down to a "segment of one," whose biomarkers indicate a positive predisposition to the therapy
- Sensors, medical devices, and wearables simplify patient-doctor-manufacturer interactions by reliably capturing, monitoring, and analyzing patient data to ensure therapy adherence, treatment efficacy, and patient safety
- Manufacturers will enhance their supply chain, manufacturing, and e-commerce processes to support the addition of make-to-order products and processes
- The rapid pace of advancements in technology will provide new partnership opportunities as organizations leverage the disruptive innovations to transform a treatment regimen

EXAMPLE: PAY FOR OUTCOMES
Amgen and Harvard Pilgrim Health Care agreed on rebates in the case that cholesterol drug Repatha does not perform as it did in clinical studies[9]

EXAMPLE: SEGMENT OF ONE
Novartis builds new R&D and manufacturing site for T-cell receptors to enable personalized tumor targeting therapies[10]

REIMAGINE BUSINESS PROCESSES

> The life sciences market continues to evolve with increased regulations, reduced reimbursements, lower margins and continued consolidation which dramatically alter the traditional view of suppliers, partners, competitors and customers.

Global supply chains

Life sciences companies will continue to sell products to global markets and need to ensure fast and efficient supply chains. Additionally, manufacturers that offer personalized medicines will be required to design a make-to-order process for a single patient.

Networks for patient safety

Governments want to ensure patient safety and prevent counterfeit drugs and medical devices. Consequently, they are instituting new regulations that increase transparency across the life sciences value chain, e.g., pharma serialization, unique device identifiers (UDI), and identification of medicinal products (IDMP). In order to comply, the industry will require alignment with manufacturing, packaging, logistics, and outsourcing processes.

Smart and agile operations

As regulatory complexity is increasing, demand and supply are subject to changes, but the quality of drugs and medical devices cannot be compromised. Facing growing competition, life sciences companies need to be able to source, manufacture, and deliver in an efficient, compliant, and agile way. IoT, predictive analytics, and compliant manufacturing will help manage operations in real time from top floor to shop floor.

Quality and compliance will remain a top priority, and even expand in scope and focus. Real-time visibility and predictive analytics will become the norm across both, in- and outsourced operations.

Real-world data to improve patient outcomes

Real-world data streams from patient smart devices will generate massive amounts of data, providing more accurate insights on the patient condition. The vast and rich data will allow companies to improve outcomes through enhanced protocol visibility and superior adherence processes.

Patient engagement models

Organizations will be able to identify patient segments and engage them directly with therapeutic solutions that leverage a more holistic therapeutic approach that improves outcomes and quality of life.

Value-added services

Innovative service offerings will allow leading companies to share their expertise in a way that directly and positively impacts their customers.

These services can include direct patient education, initiatives to increase patient engagement, support for disease diagnoses, packages that help to monitor health conditions through smart wearables, and providing incentives and higher transparency for therapy adherence of patients. This will simplify the access and adoption by the patient while also improving the quality of the outcome.

~122,350 deaths of African children in 2013 caused by substandard malaria drugs[11]

86% higher operating margin for life sciences companies where finance leadership has access to a cockpit/ dashboard that provides a timely and integrated view into a predefined set of key financial and operational metrics[12]

REIMAGINE WORK

> **The dramatic transformation of the life sciences industry value chain to a health sciences digital network profoundly changes what people do and how they learn, interact, and grow.**

Every substantial business transformation automates manual tasks, enriches jobs, and drives efficiency.

Digital business processes replace manual transaction work in procurement, inventory management, invoicing, and payment processing. Digital processes have access to real-time analytics to support rule-based decision making.

Provide real-time insights to the right person, at the right time, on the right device: Operational, financial, or customer processes leverage predictive and self-learning systems that interact with machines and business processes.

Automated and integrated operational controls institutionalize compliance into the process to ensure quality and compliance while also scaling the organization's ability for knowledge transfer of complex and/or regulated scenarios.

People continue to be key assets in the digital health sciences network. Their roles will change, but their value to each segment in the network will grow.

Interactive technologies reflect the transition of people's roles from transaction workers to information workers, who engage when the digital rulebook needs human creativity and ingenuity.

Learning management compliance requires that life sciences companies have a rigorous and transparent learning system that leverages the latest technologies, but also ensures alignment with the current standard operating procedures.

51% of pharmaceutical and life sciences CEOs are worried about the availability of key skills[13]

Only **28%** of pharma leaders say they have access to top talent[13]

SAP HANA: THE GREAT SIMPLIFIER

Life sciences companies are under tremendous pressure as society, payers, doctors, and patients expect affordable but high-quality products with maximum efficacy. Providing this requires two key approaches: simplification and innovation.

Simplification is all about doing what we are already doing, but better, faster, and cheaper.

Innovation is all about reimagining business models and customer engagement by leveraging the technology trends discussed earlier.

The diagram below shows the center of the digital health sciences network. The idea is very simple, but it took years to make it a reality: Bringing together transactions and analytics on the same platform. Uniting structured data (e.g., finance data) and unstructured data, such as text, video, or voice, will change the way businesses plan, scale, and innovate. For example, it will allow life sciences companies to analyze clinical and commercial data much faster and in a much more holistic way than ever before to continuously maximize quality and efficacy of drugs and devices.

In-memory computing is a concept brought to life by the breakthrough SAP HANA platform. While relatively young by commercial standards, the rapid adoption of SAP HANA across the life sciences industry validates its massive potential for digital businesses.

With in-memory computing, we can now finally:
- Leverage Big Data from laboratories, experimental and sequencing platforms, sensors, devices, universities, clinical and commercial markets, CxOs, manufacturing, third-party logistics providers, finance, and many other sources. Bringing all data signals together leads to optimal decision making across the enterprise, which can be instantly acted upon in transactional systems via human and machine-to-machine interfaces
- Extend the business process to interoperate with CxOs, scientists, care providers, and other partners in near real time via advanced cloud-based business networks
- Modernize business processes from R&D to manufacturing and finance, running them in real time with no data replication and no batch programs

These capabilities open infinite new ways to optimize business, drive business digitization, simplify everything, reduce cost, and provide the agility required in a rapidly changing world.

SAP constructed an innovation road map designed to bring in-memory computing together with cloud computing and mobility. This strategy has been embraced by early adopters who are leading the transition to digital.

SMARTER DECISIONS + SMARTER TRANSACTIONS = SMARTER BUSINESS

SAP HANA PLATFORM
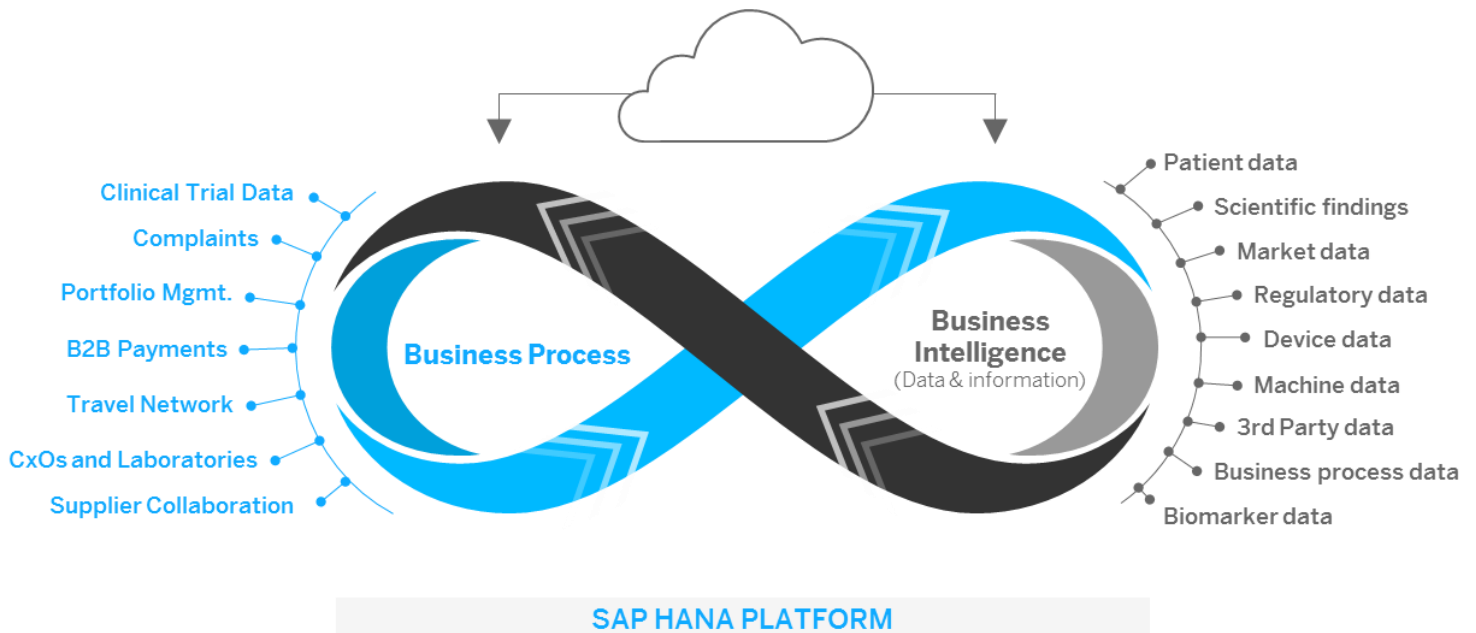
DIGITAL BUSINESS FRAMEWORK

A SIMPLE AND PROVEN APPROACH TO VALUE CREATION THROUGH DIGITIZATION

Every company requires a simple digital approach to build a pragmatic and executable vision of its digital strategy.

DIGITAL BUSINESS FRAMEWORK

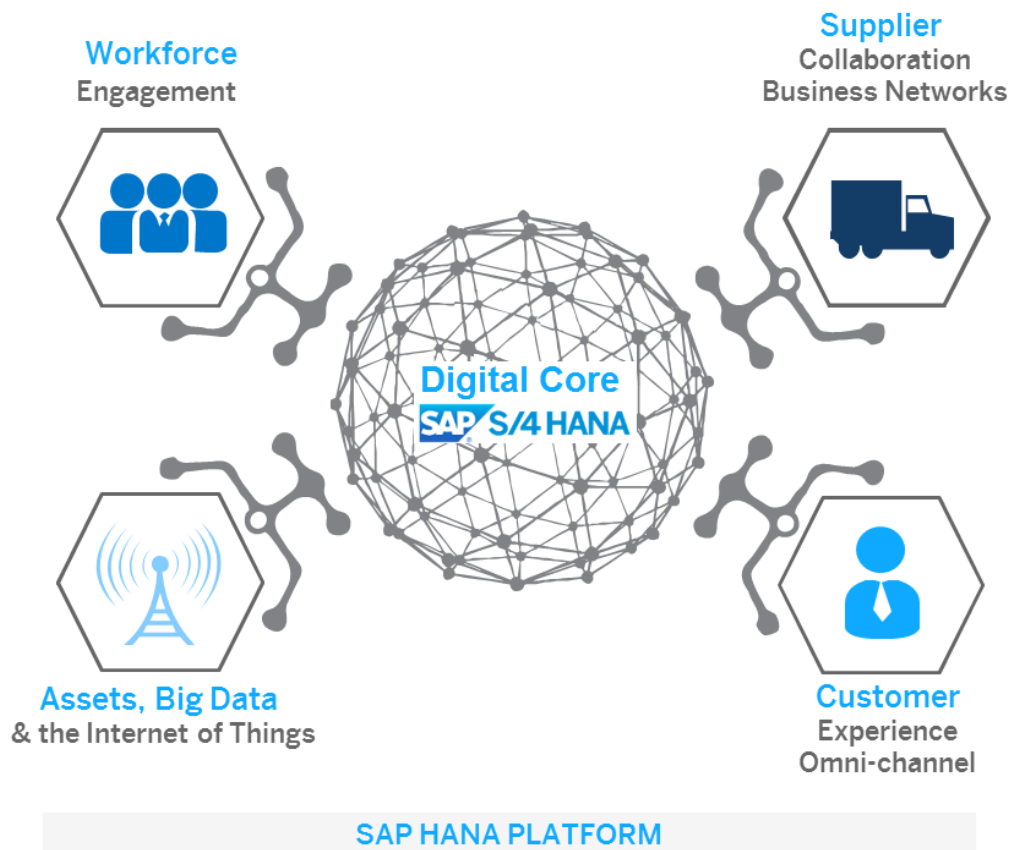## Every life sciences company needs to think about the five pillars of a digital strategy

SAP understands the five pillars of digitization, and we also understand that the continuously changing requirements pose big challenges for businesses. The method of reimagining business models, business processes, and work helps develop the digitization road map.

We have built the digital business framework to support life sciences companies in developing and executing on their enterprise strategy to become innovators that fully leverage and contribute to the digital health sciences network.

Life sciences companies must digitize to grow profits and reduce costs by simplifying operations. The value of the digital economy is based on how to serve the patient, physician, or hospital. Value creation often comes from edge solutions that are based on and coordinated by the digital core. It is the platform for innovation and business process optimization, connecting the workforce, the Internet of Things, the supply network, and the customers.

When building a digital life sciences enterprise, there are five key areas to focus on:
1. Outcome-based **customer** experience and improved patient interactions that enable personalized medicine, value-added services, and outcome-based therapies
2. Re-platformed **core business processes** that bring together transactions and analytics in real time to be smarter, faster, and simpler
3. Smarter and engaged **workforce** across all employees and contractors including clinical researchers
4. Improved **supplier** collaboration with contract organizations, scientists, care providers, and other suppliers to accelerate growth and innovation
5. Harnessing **Assets, Big Data & Internet of Things** to drive analysis in R&D, connect providers and patients, and leverage real-time data, e.g., patient data or the status of machines and devices.

Workforce Engagement

Supplier Collaboration Business Networks

Digital Core SAP S/4 HANA

Assets, Big Data & the Internet of Things

Customer Experience Omni-channel

SAP HANA PLATFORM

THE DIGITAL CORE FOR THE DIGITAL LIFE SCIENCES

A new generation of ERP solution, running in **real time, integrating predictive, Big Data, and mobile,** will change how the life sciences industry works, how the business is run, and how information is consumed. **The future is here.**

Advanced in-memory computing signals the end of running the business in batch mode and building complex reporting applications to get around technology limitations.

Real time
Real-time insight into the business will have massive implications for how life sciences companies work, how they approach their various market segments, and how they organize internally and within the health sciences network.

Power of prediction and simulation
Employees can leverage real-world data through simulations and predictive tools to drive R&D, faster responsiveness, and higher quality, and ensure compliance to improve patient outcomes.

Agility
The ability to rapidly understand new research insights, develop or acquire new clinical platforms, or implement organizational change much faster than today will yield the agility to stay competitive.

Deployment choice and lower TCO
Running the core has to be simple. With the choice to deploy in-house or in the cloud, even for GxP-relevant solutions with in-memory computing, life sciences companies will reduce TCO and free up resources to innovate drugs, devices, and services.

Consumer-grade user experience
User experience is key to success. It drives adoption, user engagement, and ultimately productivity, allowing for higher patient-centricity.

Simplify with SAP

SAP S/4HANA is the only solution that covers all business processes and runs in-memory. With SAP S/4HANA, companies write data only once, but use it countless times for analytics, predictions, simulations, and decision making. It helps life sciences companies run in real time for higher performance. For instance, and organization can achieve:
- A single, real-time view of plant and business performance with real-time analysis of quality and risk
- Optimized supply and demand management using predictive capabilities
- A 360-degree view of the various customer segments to improve patient outcomes

In addition, the SAP HANA Cloud Platform can be the single enterprise data source for SAP S/4HANA and the rest of your solution landscape.

Workforce Engagement

Supplier Collaboration Business Networks

Digital Core

| Collaborative R&D | Strategic Sourcing and Procurement | Demand-Driven Supply Networks | Compliant Manufacturing | Multichannel sales, marketing and services |

| Finance | Human Resources |

Assets, Big Data & the Internet of Things

Customer Experience Omni-channel

CUSTOMER EXPERIENCE

Digital technology has **changed the game,** but empowered patients **changed the rules.** Patients need highly efficacious and efficient treatments. Life sciences customers and stakeholders expect personalized and consistent experiences and education across channels.

Three key trends are reshaping the experience of customers and influencers including care providers, wholesale distributors, and patients:

Healthcare reforms and pay-per-outcome

Pay-per-outcome requires a deep change in the life sciences business and new organizational and business process structures. It also needs a different approach to R&D, manufacturing, and communication to various customer segments. Patients want the best, but cost-efficient, therapies. Managing a holistic patient-centric model will open new revenue sources, such as value-added services.

Empowered patient

Patients choose not only rely on their physicians, but also inform themselves using multiple channels and networks – the pattern that emerges is not linear, as in the past. As a result, the complexity for life sciences market segments and influencers is growing.

Big Data in near real time for sales, marketing, and services

Big Data allows companies to sense and respond to customers' needs in real time. Health wearables and social media add on the existing vast data volumes, giving rise to new opportunities to learn from the behavior of patients and physicians, educate them, and to differentiate through faster and enhanced services.

Medtronic

has dropped query times from three hours to three minutes by running SAP HANA[14]

$75 million

cost savings over five years for a life sciences company that digitizes customer-facing processes[15]

$4.6 billion

industry-wide incremental revenue by digitizing the customer experience in the branded pharmaceutical market in the United States within the next five years[15]

Digitize your end-to-end customer experience with SAP

A single platform that brings together marketing, sales, services, and commerce (including SAP Hybris omnichannel solutions) to ensure seamless digitization of interactions with all stakeholders including clinics, wholesalers, and patients. SAP solutions for customer engagement and commerce powered by the SAP HANA platform enable a detailed view of your customers, real-time responses, and sophisticated, predictive analytics, fully integrated to the core system.

- **Orchestrate business processes** across marketing, commerce, sales, and service
- **Deliver personalized experiences** in context with each interaction
- **Create a single, harmonized experience** for all customer segments, from wholesalers to physicians and patients, while reducing the burden on employees
- Be prepared to **engage your customers** on the channels they choose **at any moment in their journey**
- Achieve full **integration** with your core business processes to provide a unique life sciences-specific platform for e-commerce and engagement of wholesalers, care providers, and patients across channels

SAP HANA PLATFORM
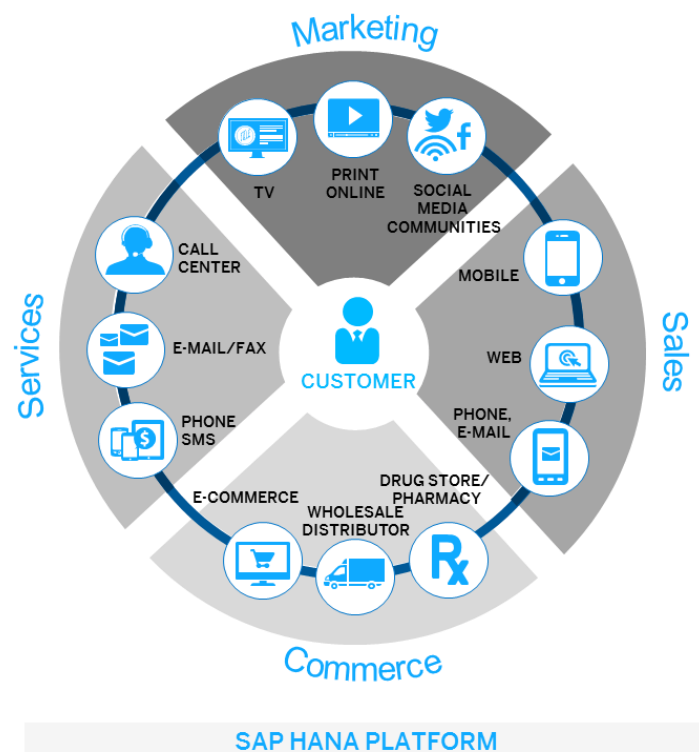
WORKFORCE ENGAGEMENT

The world is getting **smarter** in the digital economy, but **complexity is overwhelming the workforce** in this pursuit.

Complexity is the enemy of workforce engagement. People are working harder than ever but are not necessarily accomplishing more. People do not have access to smart, consumer-grade technology to work faster, better, and more efficiently. Organizational complexity is driving cost up and slowing down progress. Four forces need to be addressed:

Changing of the guard

Over 50% of the workforce will be millennial by 2020.[16] Life sciences companies will have to devise a workforce strategy to make work in this industry attractive for young, specialized scientists coming from the digital generation.

Contingent labor is on the rise

The life sciences industry continues to use a contingent workforce, CxOs, and service providers to drive agility and lower costs. Tasks can be outsourced, but the responsibility for GxP compliance and quality cannot. The contingent workforce and third parties must be quickly on- and off-boarded and integrated in all business processes.

Mergers, acquisitions, divestments, and reorganization

Mergers, acquisitions, and divestitures are becoming the norm in life sciences. They cannot be allowed to cause disruptions or inefficient operations.

Complexity is on the rise

Companies are opening more emerging markets and engaging patients across more channels, which increases product and service complexity. Regulations continue to increase, and operational complexity hinders speed and agility.

$166.3 billion
Total value of M&A in Q1/2015 alone – in 2014 the whole year M&A value was $150.1 billion[17] – causing a need for organization updates

Sonova
Since it began to use SAP SuccessFactors solutions, Sonova's staffing fluctuation rate declined from 15% to 9% globally. Instead of scrambling to fill vacant positions, the company spends more time nurturing internal talent and planning successions[18]

79%
of pharmaceuticals and life sciences CEOs believe over-regulation could sidetrack growth prospects [19]

Improve your total workforce productivity: Simplify with SAP

Digitize your workforce with SAP: SAP S/4HANA + SAP SuccessFactors + SAP Fieldglass + SAP Fiori provide the tools for total workforce engagement and advanced analytics.
- **Attracting the best people** Recruit and onboard the best scientists and other specialized talents, simplify their work, and ensure that regulatory and compliance requirements are met
- **Managing the total workforce lifecycle** Manage employees including recruiting, onboarding, performance, compensation, and learning, in compliance with GxP regulations – all in one place
- **Creating smarter apps with greater user experience** Enable scientists in R&D and other employees to easily find the right information across any device and through a dramatically simplified user experience

EMPLOYEE LIFECYCLE
Recruiting/ On Boarding
Performance & Goals
Succession & Development
Compensation
Employee Record and Payroll
Travel & Expense
Workforce Analytics
Learning

SMARTER APPS WITH GREATER USER EXPERIENCE
Contextual
Intuitive
Adaptive & Predictive
Anywhere/ Anytime
Secure

FLEXIBLE WORKFORCE LIFECYCLE
Recruiting/On Boarding
Time & Expense
Invoicing/Payment
Statement of Work
Performance Mgmt.
Workforce Analytics

SAP SuccessFactors   **SAP Fiori**   **SAP Fieldglass**

BUSINESS NETWORKS AND SUPPLIER COLLABORATION

Traditional life sciences companies only collaborated with adjacent nodes on the value chain and have not had the ability to collaborate across a health sciences network. This siloed perspective creates **inefficiencies that are costing billions per year** in areas like patient engagement, clinical trials, sourcing, contracting, and manufacturing.

Collaboration across all spend categories will change the nature of how life sciences companies interact with patients, acquire products and services, outsource, and how they support better outcomes and lower costs across the entire value chain. Several trends are redefining the game:

Business connectivity at scale
When life sciences suppliers small and large are connected in the millions, the transactional platform becomes the de facto standard. This is already a reality (examples: SAP Ariba, Concur, SAP Fieldglass)

B2B collaboration by category
Engaging physicians, scientists, CxOs, and providers and acquiring products and services or managing expenses all require a set of open standards and a different community of suppliers to be able to comply with regulations and internal quality standards in life sciences. Those standards are becoming easier to measure and control across the network.

User experience
Without a better user experiences (examples: Amazon, Travelocity, Google), internal and external stakeholders such as physicians, patients, wholesale distributors, and employees will work around the system, resulting in poor engagement, negating the value of negotiated contracts, and driving maverick spending.

50%
improved efficiency through real-time, automated collaboration with suppliers[20]

Sage Health Solutions
"Since we began working with [SAP] Ariba and receiving and responding to all of our tenders via e-mail, we have been able to grow our business from almost nothing to a multimillion-rand venture"[21]

50-75%
faster transaction cycles are being achieved with the SAP Ariba Network[22]

Simplify supplier collaboration with SAP business networks

SAP S/4HANA gives you incredible capabilities to digitize business processes across your business – and the connectivity to the business network allows you to extend those processes beyond the four walls of your business.
- **Solution already at scale** and cover all spend categories (direct and indirect material, labor and services, travel and expenses)
- **Business networks operate on a global basis,** meet data security standards, and operate with near zero downtime
- **Extensive offering by leveraging services** from many partners such as supply chain, financing, payment, supplier certification, etc.`

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ASSETS, BIG DATA & THE INTERNET OF THINGS

The most dramatic change in the digital economy will be driven by **connected health, network collaboration, and Big Data science.** These will transform life sciences business models.

Companies are starting to understand the full potential of Big Data and the Internet of Things. We are witnessing new use cases with breath-taking results, like incorporating genome and proteome analysis into cancer research. Below are some key trends in life sciences:

Smart products drive new business models

Companies are embedding sensors in their medical devices. Life sciences companies are rethinking the value delivered by their products and combining them with a service offerings to improve adherence to drug regiments and collect evidence for better outcomes.

Data-driven business models

Industry sub-segments like biotech, pharmaceuticals, and medical devices are transforming their business models with the power of insight-driven Big Data and are moving towards precision medicine.

Better medical insights

The ability to quickly integrate information from a multitude of structured and unstructured sources, like clinical trials, devices, safety data, genomics, and medical publications becomes key to improving medical insights and the working of new drugs and identifying root causes of diseases.

New alliances

New business models emerge through the advent of new players in the device or genome space collaborating with established life sciences corporations.

62%
of pharma and life sciences companies have already changed their approach to big decision making as a result of data and analytics (between 2012 and 2014)[23]

89%
of pharmaceuticals and life sciences CEOs identified technological advances such as the digital economy, social media, mobile devices, and Big Data as key trends transforming their business[24]

$2.5 trillion
market for personalized medicine by 2022[25]

Connect, transform, and reimagine with SAP

With SAP HANA, Internet of Things edition and the SAP HANA platform for healthcare and life sciences, organizations can now take embedded device data about patient health or shop floor processes, analyze this data into information in real time, and leverage this information across the value chain to drive business insights and create new business models.
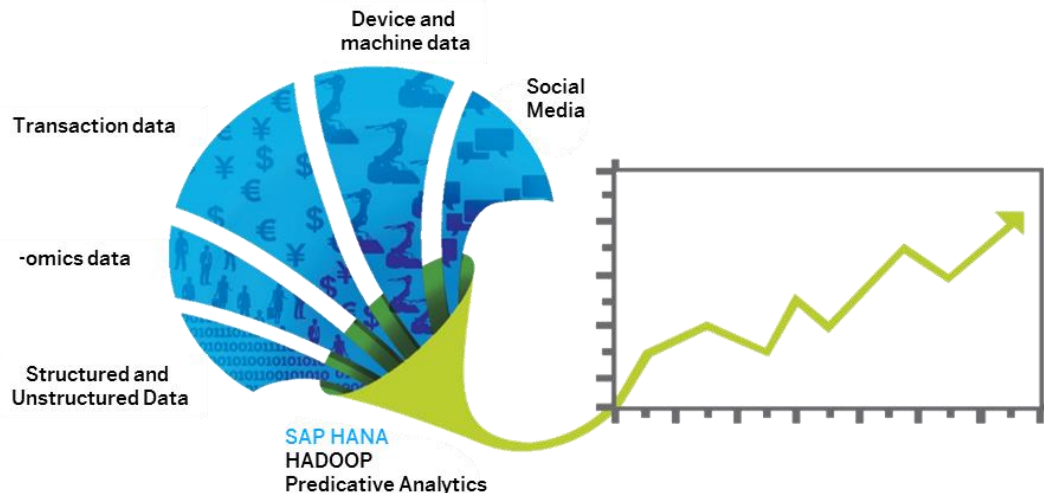
SAP HANA PLATFORM – A NEW COMPUTING PARADIGM

SAP HANA is the ultimate simplifier and the platform for innovation and digital business

Dream, develop, and deliver with SAP HANA Cloud Platform

SAP HANA Cloud Platform gives life sciences companies the collaboration, integration, and analytic capabilities needed to dream big, develop fast, and deliver everywhere in a regulated industry with the following capabilities:

Application extensions

Extend current cloud and on-premise solutions for additional customization, enhanced business flows, and more (e.g., integrated learning management systems).

Real-time analytics

Engage patients, providers, and business partners to optimize business processes and unleash new revenues with real-time analytic apps, powered by SAP HANA (e.g., SAP Hybris Commerce)

New cloud apps

Quickly build innovative consumer-grade and industry apps for today's always-on, mobile, social and data-driven world or benefit from new SAP Cloud solutions such as SAP Health Engagement.

The following architecture highlights how the SAP HANA platform changes the art of the possible.

Extended storage capabilities

Holistically manage all structured, unstructured, and infinite data streams with flexible combinations of data stream processing, in-memory technology, disk-based columnar storage, and Hadoop-based storage solutions.

Data footprint reduction

Significantly reduce memory footprint and TCO. In ERP systems, we have seen ~6x reduction by SAP HANA's dictionary compression. Removing aggregates and actual and historical data separation further reduces the footprint up to ~10x.

Varian Medical

"…The SAP HANA deployment best practices documentation … showed us how we could ensure Varian development processes were aligned with best practices for future SAP HANA deployments, saving us approximately $10,000. And we were able to … receive guidance on how to best enable auditing on SAP HANA to ensure our regulatory requirements were met. Working with the value map experts for SAP HANA saved us approximately $20,000 … because we were able to get answers quickly to solve this not-so-common business challenge."[26]

The SAP HANA platform is...

Real-time, in-memory platform • 10x data footprint reduction for ERP • Extended storage, including Hadoop • Open architecture • Developer-friendly • Embeds mobile and analytics • Secure • Cloud-ready
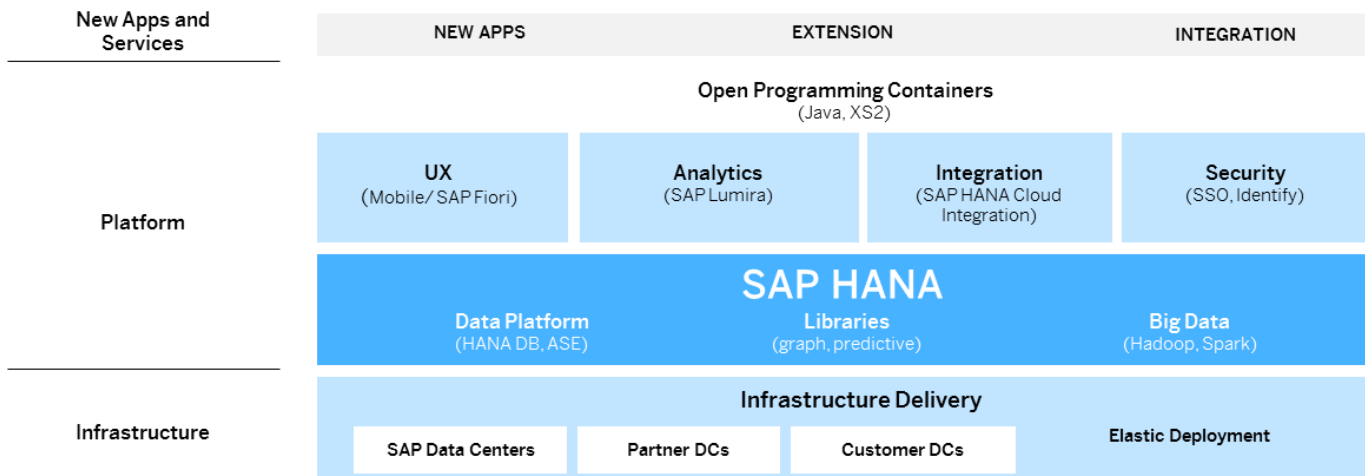
HOW DOES IT ALL COME TOGETHER? – EXAMPLE

While the digitization of each business area delivers significant value as a stand-alone capability, the ultimate goal is to design next-generation technology that will span across the value chain. Patient experience will not stop at the multichannel experience. All internal and external processes have to be aligned to enable products and services that truly focus on patient outcomes.

PATIENT-CENTRIC CARE MODEL FOCUSES ON OUTCOMES AND BLURS INDUSTRY BOUNDARIES – AN EXAMPLE
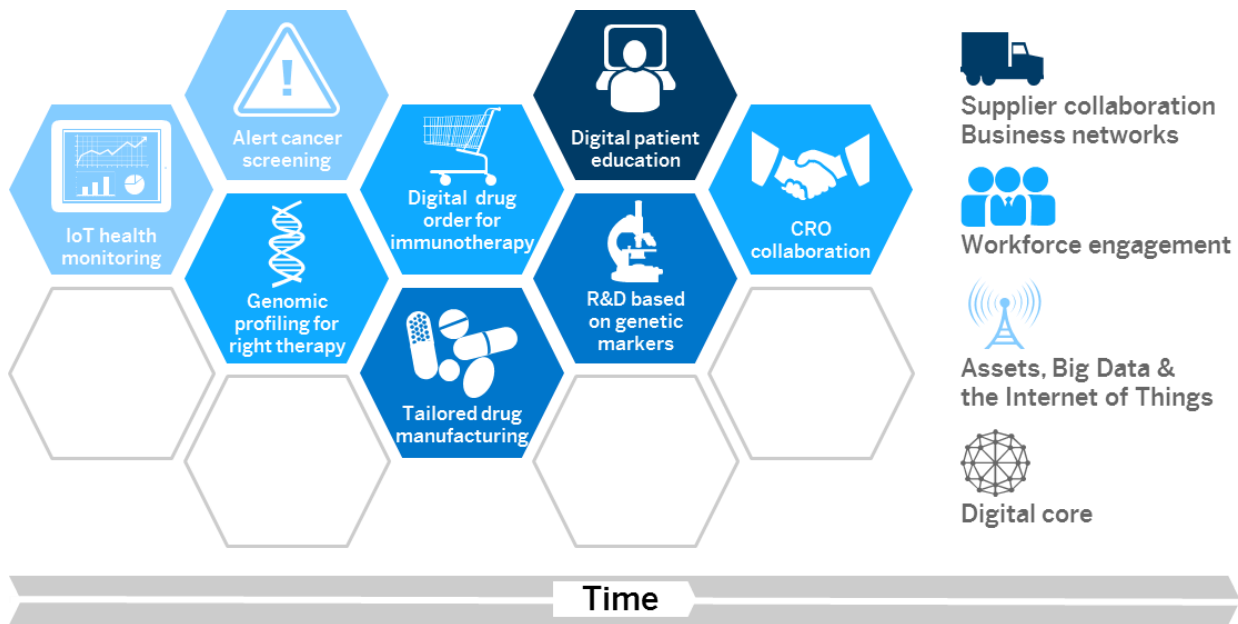
Sonia is a health-conscious person. She uses smart devices to monitor her health, digitally tracks her eating habits, has access to new research information on a handheld device, and maintains a digital copy of her personal genome.

One day, she participates in a cancer screening and finds a cancerous tumor. Her genomic profile shows that she is a candidate for immunotherapy, a treatment that uses her own biology to teach her body how to kill cancer cells. Her oncologist extracts her blood and initiates a digital process that generates an online order creating a case record of her transaction. Sonia's blood is sent to a pharma company to produce a personalized treatment.

Sonia and her physician access information offered by the drug manufacturer that provides Sonia with insights on the drug, participation in a patient community, and status updates of her blood processing. Also, the pharma company is conducting a clinical trial for a new treatment that Sonia is a candidate for based on her genetic makeup. The clinical trial is sourced to a contract research organization, which hires investigators and coordinates the study.

The biomarker not only indicates that Sonia is a candidate for the treatment, but establishes the framework for a reimbursement that was tied to remission rates for patients with the same biomarkers.

The digital health sciences network allowed for collaboration across the value chain to ensure visibility, access, and insight by all of Sonia's healthcare players to enable a positive outcome. The benefits of this scenario are significant:

- Leverage an integrated, end-to-end process from online entry of the sample, to pick up, processing, and return of the personalized blood products back to the specialist and, ultimately, the patient
- Improve patient outcomes through continuous monitoring, early detection, and identification of an effective protocol
- Follow an efficient and collaborative process that identifies and initiates a therapeutic protocol quickly and simply
- Achieve higher efficiency and lower trial costs through improved investigator visibility to quickly identify outliers and adapt payments according to performance agreements

HOW TO START

THE JOURNEY TO THE DIGITAL HEALTH SCIENCES NETWORK BEGINS WITH A CAPABILITY ANALYSIS THAT RESULTS IN THE TRANSFORMATION AGENDA

THE JOURNEY TO THE DIGITAL HEALTH SCIENCES NETWORK

The journey to define future business models capitalizing on the digital health sciences network requires a systematic approach to identify and capture business opportunities.

THE COLLABORATIVE VALUE AND INNOVATION FRAMEWORK

Life sciences companies embarking on the transformation journey to the digital business typically start to reimagine their business with a focus on business outcomes and customers. Answering the key questions, "What role will we play in the health sciences value chain?" and, "How will create value for our customers and better outcomes for our patients?" will provide direction for reimagining your business processes and operational model.

For innovation today, a new level of collaboration is required. As a result, we have developed a framework that will be a continuous and holistic partnership model designed to drive true collaboration and engagement. Outlined below are the five steps of SAP's collaborative value and innovation framework:

1. Strategy alignment: Understand company and SAP strategic direction and identify initiatives
2. Opportunity assessment: Opportunity deep-dive based on strategic initiatives and prioritization based on value
3. Solution road map and ROI: Document end-state solution and business case including benefits, TCO, ROI, and strategic road map
4. Value realization: Deliver transformation on time, on budget, and on value
5. Governance: Maximize investments and accelerate value creation with governance based on executive engagement, value delivery, and continuous innovation

WHY SAP?

SAP ENABLES THE DIGITAL HEALTH SCIENCES NETWORK WITH THE DIGITAL CORE, BUSINESS NETWORKS, SUPPLY CHAINS, AND THE INTERNET OF THINGS

SAP IS COMMITTED TO INNOVATION

Vision   Help the world run better and improve people's lives

Mission   Help our customers run at their best

Strategy   Become the cloud company powered by SAP HANA

GLOBAL PRESENCE AND RELEVANCE	INDUSTRY AND LOB FOCUS	DIGITAL ECONOMY - READY	INNOVATION LEADER	DIGITAL LIFE SCIENCES ENABLED BY SAP

- **75K employees** representing 120 nationalities
- **295K customers**
- SAP operates in **191 countries**

- Solutions for **25 industries and 12 LoBs**
- **98% of top-valued brands** are our customers
- **74% of the world's transactions** managed on SAP

- **80 million** business cloud users
- **1.9 million connected** businesses
- **$800 billion+** in B2B commerce
- **99%+ of mobile devices** connected with SAP messaging

- 2011 **SAP HANA** launched
- 2012 **SAP Cloud** launched
- 2014 **SAP business networks** are the largest marketplace in the world
- 2015 **SAP HANA Cloud Platform**
- 2015 **SAP S/4HANA:** Most modern ERP system

- **40+** years of delivering value to life sciences
- More than **3,800 life sciences companies** run SAP solutions
- **97%** of the life sciences firms in the Forbes Global 2000 are SAP customers

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CONNECTED CARE SERVICE

Roche Diabetes Care is connecting doctors and patients via a mobile app, enabling real-time virtual interactions and increasing therapy adherence[27]

CUSTOMER-CENTRICITY

SAP solutions enable **Boston Scientific** to create and deliver content and materials that educate physicians on products, including videos and animations, more efficiently, faster, and in a more customer-oriented way[28]

COMBATING BREAST CANCER

With Patient Data Explorer running on SAP HANA, **NCT** is able to analyze patient data from different sources, e.g., tumor registries, bio bank systems, and physicians notes, to offer a comprehensive view of a patient's history in real time and accelerate the development of individual, highly adjusted cancer therapies[29]

Customer Experience Omnichannel — C4C SAP Hybris

Supplier Collaboration Business Networks — SAP Fieldglass, CONCUR, SAP Ariba

Digital Core — SAP S/4 HANA

Workforce Engagement — SAP Fieldglass, SAP SuccessFactors, SAP Fiori

Assets, Big Data & the Internet of Things — SAP HANA Cloud Platform
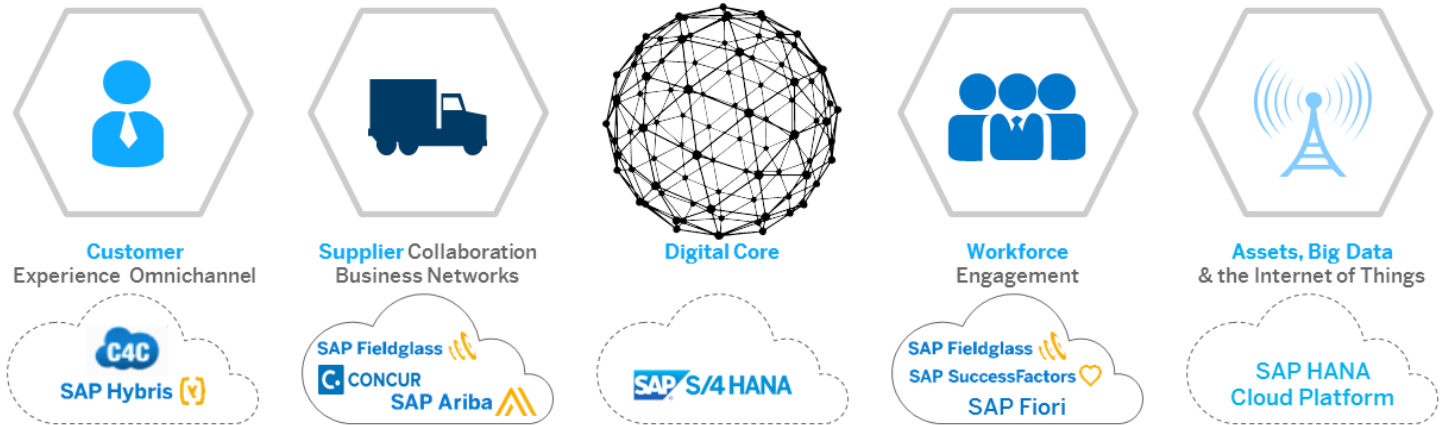
SAP will bring simplification, innovation, and acceleration required to support the development of your digital business strategy. These capabilities will be leveraged throughout SAP's collaborative value and innovation framework.
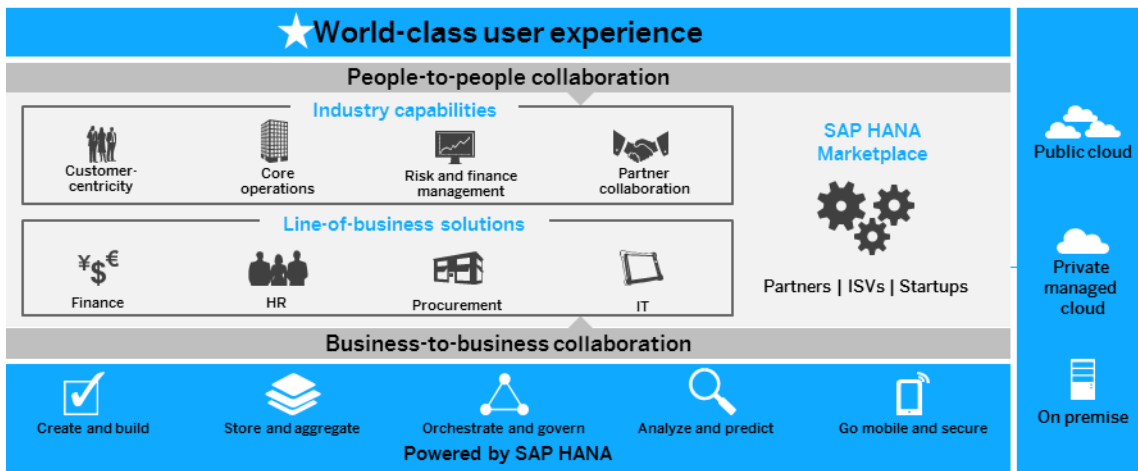
SIMPLIFY

Simplify transaction processing, account management, and customer service while enhancing life sciences operations.

- Deliver superior customer service and truly connect with customers through a single view enabled by the SAP HANA platform
- Provide simplified and intuitive insight to customer profiles, anytime and anywhere
- Give customers a smooth omnichannel experience across channels such as storefront, Internet, telephone, e-mail, Web chat, and social media

INNOVATE

Use SAP HANA Enterprise Cloud to enable life sciences companies, suppliers, and customers to connect and collaborate.

- Connect mobile users to enterprise data on customers, accounts, and services, giving access to the information they need to better manage their health
- Process and optimize data across all operating units and legal entities with SAP HANA in the cloud
- Adopt and apply analytics solutions through the cloud to enhance visibility into consumption and customer demand

ACCELERATE

Predict and respond to opportunities and risks with predictive analytics solutions powered by SAP HANA.

- Proactively minimize quality risk
- Take new products and services to market more quickly and respond to customers on the platforms they prefer
- Balance demand and supply with predictive modeling and accurate and timely analytics using SAP HANA; also detect fraud more quickly

SAP GLOBAL SERVICES AND SUPPORT TO DRIVE YOUR SUCCESS

In the digital economy, simplification and business innovation matters more than ever. SAP has a broad range of services to cover the end-to-end digital transformation journey, ranging from advising on a digital innovation road map and plan, to implementing with proven best practices, to the ability to run across all deployment models, and ultimately optimize for continuous innovation across your digital journey. SAP provides both choice and value within our services, allowing you to tailor the proper approach based on your needs.

Turn to the 30,000 consultants and support professionals who can bring your digital strategy to life. The Global Service & Support (GSS) organization provides a consistent experience – on premise, cloud, or hybrid. GSS provides the expertise, assets, and the proven methodologies required to accelerate business innovation, reduce TCO, and run a stable platform (on premise or in the cloud).

SAP Activate is a new, simplified consumption experience introduced for SAP S/4HANA and cloud adoption. It provides a combination of SAP Best Practices, methodology, and guided configuration. In addition, we provide leadership in learning to drive quick time to value realization and a solid engagement foundation with SAP MaxAttention, SAP ActiveEmbedded, and SAP Value Partnership across the end-to-end customer lifecycle.

Global Service & Support provides the expertise, assets, and proven methodologies required to accelerate business innovation, reduce TCO, and run a stable platform (on premise, in the cloud, and hybrid)

OPTIMIZE
for continuous innovation

Optimize to realize value
- Continuously capture and realize benefits of digital transformation

RUN
all deployment models

Run with one global support
- One global, consistent experience
- End-to-end support – on premise, cloud, hybrid

IMPLEMENT
with proven best practices

Implement with SAP Activate
- Simplified consumption experience for SAP S/4HANA
- SAP Best Practices, methodology, and guided configuration

ADVISE

Simplify and innovate
- Digital innovation Road map and plan
- Co-innovation by industry

Learn | Extend / Innovate | Engagement Foundation | Support

SAP COMPREHENSIVE ECOSYSTEM

Orchestrating the world to deliver faster value

Our comprehensive ecosystem for life sciences offers:

- A wide range of business services (OEM suppliers, banks, key vendors)
- Special technology services for life sciences with focus on IT/OT convergence, geospatial integration, health management, etc.
- Open architecture: choice of hardware and software
- Complementary and innovative third-party solutions
- Reach – partners to serve your business of any size, anywhere in the world
- Forum for influence and knowledge
- A large pool of industry experts with broad and deep skill sets

Our partner ecosystem includes, among others:

BUSINESS NETWORK

- 1.8 million suppliers
- 200 major travel partners (air, hotel, car)
- 50K service and contingent labor providers

INFLUENCE FORUMS & EDUCATION

- 32 user groups across all regions
- 40+ industry councils including SAP Advisory Council for Life Sciences
- SAP community >24 million unique visitors per year
- 1,800 SAP University Alliances

DRIVING CUSTOMER VALUE

IMPLEMENTATION SERVICES

- 700+ life sciences partner companies
- 3,200 service partners
- Delivering life sciences-specific solutions

INNOVATION

- 1,900+ OEM solution partners to extend SAP solutions
- 2,000 startups developing SAP HANA apps

PLATFORM & INFRASTRUCTURE

- 300+ life science cloud partners
- 1,500+ platform partners

CHANNEL & SME

- 450+ life science channel partners
- 4,800 overall channel partners

ADDITIONAL RESOURCES

Outlined below is additional external research that was used as supporting material for this white paper.

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Note: All sources sited as "SAP" or "SAP benchmarking" are based on our research with customers through our benchmarking program and/or other direct interactions with customers

Note: Some images used under license from Shutterstock.com

SAP
Run Simple