World Economic Forum
Digital Transformation Initiative

Maximizing Return on Digital Investments
Executive Summary

In collaboration with Accenture

May 2018

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Foreword

Digital transformation is occurring at an unprecedented pace. It is a key driver of sweeping change in the world, improving people’s lives and creating a more connected world. It also opens new opportunities for businesses to grow and create value.

Companies are using new technologies, such as the internet of things (IoT), robotics, artificial intelligence (AI), big data analytics and mobile/social media to build new business models, enhance customer experiences and drive new efficiencies. While the applications have significant potential, only a few organizations are ready to take full advantage of them, which is fuelling a debate around the productivity impact of digital investments. Organizations must identify where to best take advantage of digitalization and invest in the activities that will have the most positive impact and accelerate their performance in the long term.

Most business leaders understand the potential effect of digital transformation on business and society. However, many do not see a clear path to bridging the gaps that inevitably occur when innovation moves faster than existing organizational and societal frameworks. This creates a gap between leadership’s strategic digital intent and its operational execution. This is one of the main inhibitors to unlocking the value of digitalization and to the Fourth Industrial Revolution.

This paper, which forms part of the World Economic Forum Digital Transformation Initiative (DTI), aims to contribute to the debate on the return on digital transformation. Through quantitative and qualitative analyses of existing digital investments, it provides a framework to give business leaders the best possible chance of addressing many challenges – driving cultural change, bridging the digital skills gap across workforce levels, changing customer expectations, data privacy and security – and maximizing the return on upcoming investments.

Launched in 2015, the DTI serves as the focal point for new opportunities and themes arising from the latest developments in the digital transformation of business and society. Since its inception, the initiative has analysed the impact of digital transformation on 12 industries and several cross-industry themes to drive engagement on some of the most pressing topics facing industries and businesses today. DTI is part of the World Economic Forum System Initiative on Shaping the Future of Digital Economy and Society and supports the Forum’s broader activities around the theme of the Fourth Industrial Revolution.

This paper was prepared in collaboration with Accenture, whom we thank for their support. We would also like to thank the World Economic Forum community of digital leaders and industry experts who helped shape the insights and recommendations.

The paper embodies the World Economic Forum’s commitment to helping leaders understand the implications of digital transformation. We are confident that the findings will support them on the journey to shape better opportunities for business and society.
Introduction

The Digital Transformation Initiative (DTI) is a project launched by the World Economic Forum in 2015 to serve as the focal point for new opportunities and themes arising from the latest developments in the digitalization of business and society. Over the past two years, DTI has analysed the impact of digital transformation across 12 industries and five cross-industry themes with inputs from more than 450 subject-matter experts, including over 200 CEOs. Now in its third year, the DTI’s focus is on driving the global conversation to enhance societal and business value from digital.

Background and Objective

- Digital technologies have opened new avenues for companies to accelerate growth and productivity. However, the relationship between investments in new technologies and growth and productivity is still unclear.
- Companies want to understand how new technologies impact productivity.
- Key questions are:
  - How much value are companies getting from digital investments?
  - How do returns on digital vary by company, industry and technology?
  - How can companies maximize returns from their digital investments?
  - How can companies successfully execute on digital investment projects?
- The aim is to make a significant contribution to this debate by analysing the business value impact of investments in new technologies, and providing recommendations for maximizing the value from those investments.

Approach

- Quantitative analysis of over 16,000 public companies across 14 industries to estimate the productivity impact of investments in new technologies.
- Analysis based on new ICT spend data from IDC and Ovum with financial data from Capital IQ (2015-2016).
- Comprehensive text analysis of leading business and IT publications to identify key enablers.
- Four technology categories were identified based on investment levels and their place in the production process:
  - Cognitive Technologies
  - IoT / Connected Devices
  - Robotics
  - Mobile / Social Media

The Digital Transformation Initiative

The Digital Transformation Initiative (DTI) is a project launched by the World Economic Forum in 2015 to serve as the focal point for new opportunities and themes arising from the latest developments in the digitalization of business and society. Over the past two years, DTI has analysed the impact of digital transformation across 12 industries and five cross-industry themes with inputs from more than 450 subject-matter experts, including over 200 CEOs. Now in its third year, the DTI’s focus is on driving the global conversation to enhance societal and business value from digital.

Notes

1) AI and Big Data Analytics, 2) Does not include Robotics Process Automation
Executive Summary

Productivity and New Technology Investment Trends

- Companies in our sample have realized **growth in revenue and productivity** over the past decade.
- However, gains are not evenly distributed. The growth was driven by a small group of companies: **industry leaders**.
- Companies are investing in new technologies to accelerate growth and productivity. Total investment spend is expected to increase to **$2.4 trillion by 2020**, led by IoT (42% of total spend).
- These investments are made to drive new **efficiencies**, enhanced **customer experiences** and new **business models**, with new efficiencies the most prominent driver.
- While there are concerns about technologies such as AI and Robotics Process Automation causing worker displacement, **employment levels** have remained stable over the past decade.

Return on Digital Investments

- Return on investment in new technologies is **positive overall**, with 3x productivity increase realized when technologies are deployed in combination.
- Return on digital **varies by industry**, and **industry leaders outperform followers** for most industries.
- Chemistry and Advanced Materials, Metals and Mining and Professional Services showed the **biggest productivity increases** from new technology investments.
- **Leaders** in majority of industries tend to be **larger companies** by revenue.
- **Asset-heavy industries** realize more value from Robotics whereas **asset-light industries** realize more value from Mobile/Social Media.
- While **industry leaders** realize higher overall return on digital compared to followers (70% vs 30%) led by **Robotics and Mobile/Social Media**, followers do better on IoT and Cognitive Technologies.

Notes 1) Top 20% companies by productivity within each industry.
Analysis findings

- Average revenue and labour productivity have increased considerably over the past decade, also driven by an improved business environment and growing consumer demand.
- However, not all companies realized increases in productivity. The overall productivity increase was primarily driven by the top 20% productive companies (industry leaders), who doubled their productivity during this period, while remaining firms (industry followers) saw average productivity fall. Even in the period after the economic crisis (2011-2016), industry leaders delivered 12% CAGR in productivity while followers managed only 2% CAGR.
- Although there are concerns about worker displacement due to investments in technologies such as AI and Robotics Process Automation, employment levels for our sample of companies were stable.

Notes 1) Accenture analysis based on Capital IQ data from 16,000+ companies across 14 industries, 2) Labour productivity represents EBITDA per employee, 3) Industry leaders are identified as the top 20% of companies by labour productivity within their industry. Leaders and Followers classification is based on the OECD method for productivity levels.
New Technology Investment Trend

Companies are investing in new technologies to accelerate growth and productivity. Total investment spend is expected to increase to $2.4 trillion by 2020, led by IoT.

Analysis findings

- Companies are investing in new technologies to accelerate growth and productivity, also supported by the reduced cost of technologies such as 3D printing and Robotics.
- IDC estimates corporate spending on new technologies to grow by 13% CAGR to $2.4 trillion between 2016 and 2020.
- While Mobile/Social Media remains one of the key technologies, it is expected to lose share of overall spend from 35% to 25%, potentially to new technologies such as augmented/virtual reality and cybersecurity.
- The growth will be led by investments in IoT, which is estimated to contribute 42% of the total new technology spend (~$1 trillion) by 2020.

Corporate Spending on New Technologies (2016-2020)

<table>
<thead>
<tr>
<th>Technology Cluster</th>
<th>2016 (1,503)</th>
<th>2020 (2,426)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IoT</td>
<td>11%</td>
<td>25%</td>
</tr>
<tr>
<td>Mobile/Social Media</td>
<td>35%</td>
<td>42%</td>
</tr>
<tr>
<td>Cognitive Technologies</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>Robotics</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Other</td>
<td>41%</td>
<td>16%</td>
</tr>
</tbody>
</table>

13% CAGR

Notes
1) Based on new technology spending estimates from IDC, excluding cross-industry spend ($80 billion in 2016 and $166 billion in 2020).
## Drivers of Digital Investment

**Investments in new technologies are made to create new efficiencies, enhance customer experiences and build new business models**

<table>
<thead>
<tr>
<th>Investment drivers</th>
<th>Enables bottom-line efficiencies</th>
<th>Enable topline growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New efficiencies</strong></td>
<td>• Automation of entire value chain, from decision-making to operations</td>
<td>• Customized offerings that create ‘moments of truth’ for customers and support decision journeys</td>
</tr>
<tr>
<td></td>
<td>• Efficient use of resources such as time, energy, raw materials and assets</td>
<td>• Integrated customer information across platforms to reduce friction and increase transaction speed</td>
</tr>
<tr>
<td></td>
<td>• Initial specific efficiency objectives with potential to expand to new business models and customer experiences</td>
<td>• New experiences led by privacy and trust, customer relationship management, digital marketing and access to the right talent/skills</td>
</tr>
<tr>
<td><strong>Customer experiences and outcomes</strong></td>
<td>• IoT and Robotics to automate processes and collect data</td>
<td>• Address market needs with a combination of new and existing data and technologies</td>
</tr>
<tr>
<td></td>
<td>• Combination of big data analytics, AI, 3D vision and digital platforms to analyse data to identify incremental efficiencies</td>
<td>• Build deep understanding of the value chain and the scalability potential of opportunities</td>
</tr>
<tr>
<td></td>
<td>• Typically low complexity, similar to traditional capex investments</td>
<td>• Address cannibalization of existing business by concentrating on overall consumer demand and the opportunity cost of not investing</td>
</tr>
<tr>
<td></td>
<td>• Relatively clear business case</td>
<td>• Big data analytics to identify new areas of customer demand</td>
</tr>
<tr>
<td><strong>New business models</strong></td>
<td></td>
<td>• Social media and mobile technologies for engagement</td>
</tr>
</tbody>
</table>

### Key investment areas

- Complexity
  - Typically low complexity, similar to traditional capex investments
  - Typically medium complexity
  - Typically high complexity

- Enabling technologies (examples)
  - Big data analytics for personalization
  - Cloud to reinforce data management
  - Social media and mobile technologies to improve engagement
  - IoT and Robotics to automate processes and collect data

### Enabling technologies

- Investment drivers
  - Typically low complexity, similar to traditional capex investments
  - Typically medium complexity
  - Typically high complexity

- Sources: GoldCorp, Marriott International, Kuehne + Nagel

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**Case study: Siemens**

Siemens digitalized its major electronics plant in Amberg, which is by now at an automation rate of about 75%. The digitalization improved the efficiency of the plant, as the output was increased by a factor of 10 with a consistent number of employees. It also increased speed (~1 product manufactured per second), flexibility (~1,200 different products built with small lot size) and quality of the production line (99.99885% quality rate).

**Case study: Marriott International**

The hotel chain believes data drives great customer experiences. They aim at building 360° customer profiles and making them available to personalize the entire travel journey, which requires accurate data collection and analysis.

**Case study: Kuehne + Nagel**

Logistics provider K+N’s subsidiary LogIndex produces and commercializes its digital services. LogIndex’s gKNi product uses big data and predictive analytics to provide nowcasts of economic indicators and real-time insights into global supply chains. This new business model helps customers improve decision-making and allows K+N to monetize data.
Return on Digital by Technology

Return on investment in new technologies is positive overall, with 3x productivity increase realized when technologies are deployed in combination

Analysis findings

• Robotics is estimated to generate the highest standalone productivity impact

• Cognitive Technologies are the most significant drivers of topline growth but that does not translate into the highest productivity level

• IoT, which contributes over 40% of total spending on new technologies, doesn’t deliver the highest productivity impact

• Investment in a combination of appropriate technologies drives 3x higher returns than technologies deployed in isolation

Key insights

• To understand the application and integration of multiple technologies to maximize returns, companies need a clear strategic objective and long-term approach to new technology investments

Return on Investment by Technology (2015-2016)¹ ²
Impact of a $1 new technology investment on revenue per employee and labour productivity at the average company. E.g. $1 invested in combined new technologies has yielded $2.2 – or a 120% increase in revenue per employee.

Notes

1) Econometric analysis based on 16,000+ companies across 14 industries with data sourced from IDC, Ovum and Capital IQ

2) Combined Investments shows the impact of investment in all four technologies combined (i.e. total amount invested in four technologies analysed)
Return on Digital by Industry

Return on digital varies by industry, and industry leaders by productivity outperform followers in most sectors. Industry leaders are also observed to be larger companies on average across most industries.

Analysis findings

Industry leaders are identified as the top 20% of companies by labour productivity within their industry:

- Most asset-heavy industries realize greater average productivity increases than asset-light industries.
- Chemistry and Advanced Materials realizes the highest return on digital, followed by Professional Services and Mining and Metals.
- Industry leaders tend to be larger organizations by revenue across most industries.

Key insights

- Variance in performance across industries (asset-heavy vs asset-light) and across companies (leaders vs followers) requires further investigation into the nature of their investments in new technologies (see following slides).

Notes

1) Industries are organized by asset intensity, with the most ‘asset-light’ industry at the top. ‘Asset-light’ industries are those with Capex / (Capex + Opex) < 7%.
2) Econometric analysis based on 16,000+ companies across 14 industries with data sourced from IDC, Ovum and Capital IQ.
3) Leaders and followers classification is based on the OECD method for productivity levels. The top 20% of companies are extracting significantly more value from digital than their peers.
Return on Digital: Asset-Heavy vs Asset-Light Industries

Asset-heavy industries realize more value from Robotics whereas asset-light industries realize greater value from Mobile/Social Media

Analysis findings

- The average firm in asset-heavy and asset-light industries realizes similar levels of incremental productivity from digital investments
- However, they make these productivity gains investing in different sets of technologies

Key insights

- **Asset-heavy industries** make greater investments in hardware-based technologies such as IoT and Robotics (80% of new technology spend, 2016-20). They have **achieved greater productivity from Robotics** than IoT
- **Asset-light industries** make greater investments in software-based technologies such as Mobile/Social Media and Cognitive Technologies (70% of new technology spend, 2016-20). They have **achieved greater productivity from Mobile/Social Media** than Cognitive Technologies

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Return on Investment: Asset-Heavy vs Asset-Light Industries (2015-2016)\(^1,2\)

Productivity change for the average company after a $1 increase in investment for each technology. E.g. $1 invested in new technologies overall has yielded $1.9 – or a 90% increase in labour productivity for asset-heavy companies from Robotics

<table>
<thead>
<tr>
<th>Technology</th>
<th>Asset-heavy</th>
<th>Asset-light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robotics</td>
<td>1.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Mobile/Social Media</td>
<td>1.7</td>
<td>0.8</td>
</tr>
<tr>
<td>IoT</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Cognitive Technologies</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Combined Investments</td>
<td>1.4</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Notes

1. Econometric analysis based on 16,000+ companies across 14 industries with data sourced from IDC, Ovum and Capital IQ
2. Combined Investments shows the impact of investment in all four technologies combined (i.e. total amount invested in four technologies analysed)
## Analysis findings

- Industry leaders\(^1\) realize more than twice the overall productivity increase from digital investments than followers: 70% vs 30%.
- Industry leaders are maximizing the value they extract from Robotics and Mobile/Social Media investments.

## Key insights

- The biggest gap between leaders and followers is in Robotics. Leaders, who tend to be large organizations, have realized higher returns because it is a comparatively mature technology, so implementation and integration with existing systems and processes is simpler.
- Cognitive Technologies and IoT have yielded lower returns for industry leaders than followers, perhaps because strong data management and legacy system integration is a challenge at larger organizations.

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### Return on Investment: Industry Leaders vs Industry Followers (2015-2016)\(^1,2,3\)

Impact of a $1 new technology investment on labour productivity. E.g. For leaders, $1 invested in combined new technologies has yielded $1.7 – a 70% increase in labour productivity.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Industry Leaders</th>
<th>Industry Followers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robotics</td>
<td>1.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Mobile/Social Media</td>
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</tr>
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</tr>
<tr>
<td>Cognitive Technologies</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Combined Investments</td>
<td>1.7</td>
<td>1.3</td>
</tr>
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**Notes**

1. Industry leaders are the top 20% of companies by labour productivity within their sector.
2. Econometric analysis based on 16,000+ companies across 14 industries with data sourced from IDC, Ovum and Capital IQ.
3. Combined Investments shows the impact of investment in all four technologies combined (i.e. total amount invested in four technologies analysed).
Based on research and discussions with industry leaders, there are five key enablers and four underlying execution principles for maximizing returns on digital.

1. Agile and digital-savvy leadership
   Strategic vision, purpose, skills, intent and alignment across management levels ensure a nimble decision-making process on innovation.

2. Forward-looking skills agenda
   Infusing a digital mindset in the workforce by making innovation the focus of training and hiring programs.

3. Ecosystem thinking
   Collaborating within the value chain (e.g., with suppliers, distributors, customers) and outside (e.g., startups, academia).

4. Data access and management
   Strong data infrastructure and warehouse capability combined with the right analytics and communication tools to drive competitiveness.

5. Technology infrastructure readiness
   Building required technology infrastructure to ensure strong capabilities on cloud, cybersecurity and interoperability.

Follow an outcome-based approach
Establish clear ownership of digital investments
Invest in use cases, not technologies
Fail fast, fail cheap
Agile and Digital-Savvy Leadership

Strategic vision, purpose, skills, intent and alignment across management levels ensure a nimble decision-making process on innovation

Driving digital leadership across levels

To become the disruptor, not the disrupted, companies must make a deep cultural shift. The best leaders recognize this and will help their workforce to understand digital change and innovate in four key areas:

1. **Provide a vision and purpose**
   - Leaders lay out a vision and purpose for their digital journey with ongoing communication

2. **Cultivate a company-wide digital culture**
   - Innovative ideas require a company-wide culture of entrepreneurialism
   - ‘Digital culture’ involves team-based engagement with new technologies, risk-taking and continuous skill development

3. **Infuse a start-up mentality**
   - Transition from structured, predetermined development processes to a ‘start-up’ or experimental approach
   - Reduce resistance to change and empower teams to fail with minimized cost of failure

4. **Drive efficient and transparent decision-making**
   - Leaders focus on giving employees clear digital performance KPIs which increase their motivation and help leaders make faster decisions

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**Case study: Royal Dutch Shell**

Royal Dutch Shell started its digital journey with the objectives of protecting margins, reducing costs, increasing productivity and finding new revenue streams. Now digitalization is a board level topic rooted in the overall company strategy.

A corporate culture is fostered in which innovation can emerge from anywhere: from senior or middle management to creative, entry-level employees. That culture relies on communication, workforce-wide alignment on the company vision and effective change management. Design thinking workshops and agile development methodologies are applied to further drive digital innovation.

Source: Royal Dutch Shell

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**Key considerations and challenges**

- Organizations tend to be tied up in long vertical chains of command; management is invested too much in the status quo, has cultural inertia to change and is risk averse
- Digital leadership skills and competency are often scarce across organizations
Forward-Looking Skills Agenda

Infusing a digital mindset in the workforce by making innovation the focus of training and hiring programs

Developing a digital skills agenda

Digital opportunities are linked to one another and their full potential can only be uncovered if people have the right skills to identify them. Getting the right people in the right place means assessing skill requirements through the lens of an overall digital vision and translating the results into a forward-looking agenda covering four key areas:

1. Re-skilling
   - Companies now understand the need to enhance their workforces’ digital and technical skills to keep pace with industry-wide digital transformation
   - Lifelong learning is of utmost importance to meet the ever-evolving requirements of new technologies

2. Attracting new talent
   - Companies are aligning new hiring efforts with their digitalization needs
   - Additionally, new roles are created that give employees a sense of purpose (e.g. clear goals, greater accountability, self-directed growth)

3. Utilizing a flexible workforce
   - The skill requirements for digital transformation are such that organizations must seamlessly access the best talent
   - Appropriate talent is managed via internal and external employment models

4. Building accountability
   - Businesses use digital-specific metrics or KPIs to monitor digital readiness and associated capabilities of employees
   - These are included in annual reviews and incentive plans to ensure progress

Key considerations and challenges

- Traditional industries face tough competition from digital-native companies for scarce talent
- With the rapid development of new technologies, it can be challenging for businesses to keep their skills agenda clearly aligned with company strategy

Case study: AT&T

Between 2007 and 2015, 150,000% growth in data traffic on its network forced telco giant AT&T to move towards software-defined systems. Needing experts in cloud computing, coding and data science, in 2013 it invested $250 million in education and professional development programs, while spending $30 million annually on tuition assistance.

With approximately half of its workforce participating, AT&T credits re-skilling with a 40% decrease in its product development cycle and a 32% decrease in time to revenue.

Sources: AT&T’s Talent Overhaul, Harvard Business Review (October 2016 Issue)
Collaborating within the value chain (e.g. with suppliers, distributors, customers) and outside (e.g. start-ups, academia)

Building a digital ecosystem
As technology revolutionizes the way products and services are produced, distributed and consumed, visionary enterprises are stretching their boundaries and tapping into other digital businesses, providers, customers and even competitors to create ‘digital ecosystems’ that harness ingenuity from across industries and disciplines. Using different models, they drive open collaboration with other participants in their ecosystem to make the most of data-driven opportunities.

Open collaboration
- Successful digital transformers are the most advanced in leveraging skills and capabilities that lie beyond their core organization
- They do this via existing platforms and/or partner organizations that can help enhance their competitive advantage, and thus maximize success

Data-based value co-creation
- Ecosystems can be both a source of data and a means to utilize it through collaboration with value-chain participants
- Successful digital ecosystem collaborators achieve a balance: generating and using data within their ecosystem, while still protecting it from external misuse and maintaining their own competitive edge

Ecosystem participants and options for collaboration

Key considerations and challenges
- Collaboration with start-ups requires careful curation of the process due to the high failure rate
- Resistance to collaboration is often embedded in large organizations through cultural differences and prejudice towards competitors, customers and start-ups

Case study: Iberdrola
Iberdrola invests in collaborations within the value chain and outside the value chain through a number of channels.

For example, with suppliers, the company engages in proof of concept initiatives and programmes to develop innovative procurement models from small and medium-sized enterprises.

With start-ups in its ecosystem, Iberdrola engages with the help of its corporate venture capital programme, which has €70 million ($87 million1) available to invest in disruptive technologies and businesses.

With universities, research collaborations are conducted, e.g. a $10.3 million collaboration with the Massachusetts Institute of Technology to advance technologies that contribute to the energy transition.

Source: Iberdrola

Notes 1) Based on EUR-USD exchange rate on 16th Feb 2018
Data Access and Management

Strong data infrastructure and warehouse capabilities, combined with the right analytics and communication tools, drive competitiveness

Building the foundations for data-driven efficiencies and new business models

Matching robust data infrastructure, plus warehousing and analytics capabilities to strong communication tools can help companies actualize the full potential of technologies such as IoT. This is impossible without an intelligent and connected data infrastructure that helps firms keep pace with actual business requirements while allowing for potential new revenue streams.

Data management cycle

- **Data Origination**
- **Data Structuring and Analysis**
- **Data Storage**
- **Communication and Action**

**Strong data infrastructure to enable origination**
- Data-driven digital environments that are aligned to business requirements
- Creation of tangible and unique data lakes (e.g. derived data such as cookies, creditworthiness, health, lifestyle) can provide significant competitive advantage
- Enabling customer and employee devices/assets helps generate and store data

**Robust data warehousing to enable storage**
- Data warehouses that mix centralized and decentralized systems
- Combinations of on-premise, cloud and hybrid models deliver storage capability

**Capabilities to structure and analyze data**
- Efficient ways to process data and extract relevant elements for decision-making
- Strong analytical tools make the best use of data

**Tools and assets to communicate and take action on insights**
- Communication tools such as Slack, Trello or Collabee facilitate smooth collaboration and decision-making
- Structured and analysed data support real-time decision-making

Key considerations and challenges

- Data management should be aligned with business objectives and use cases
- Data access and management requires strong technology infrastructure and must fulfil basic data security and privacy requirements

Case study: Evonik

Specialty chemicals company Evonik has developed a ‘Digital Lab’ to improve data management and give it all the prerequisites for building and scaling cognitive solutions. Those prerequisites range from data quality and structuring to good use cases and business questions.

Best practices in internal data management are the foundation for Evonik’s outward-facing digital innovation activities such as a strategic partnership with IBM and the University of Duisburg-Essen.

Sources: Evonik, Evonik website
Technology Infrastructure Readiness

Building required technology infrastructure to ensure strong capabilities on cloud, cybersecurity and interoperability

Fitting organizational infrastructure to technology application

New technologies rely on a set of core underlying technologies for successful implementation, e.g. IoT would not be possible without the cloud, connected devices, data management and high-speed connectivity. The right infrastructure is fundamental to scale new technologies up and down quickly. That infrastructure has four key elements:

Cloud
- Digital transformers no longer have to debate whether to use the cloud; the question is how much to use it
- Most companies are investing in cloud capabilities to increase their data storage capacity and meet enhanced requirements

Cybersecurity
- Robust cybersecurity is not only essential but also enables new business models around data monetization, e.g. fintech and Tier 2-3 banks see data as a potential new revenue stream

Interoperability
- Companies must integrate new systems with legacy systems for seamless processes and data flows
- They can typically do that via APIs, standard formats and harmonization of systems

Transparency
- The legal and ethical implications of new technologies must be made clear to all stakeholders
- Ensuring digital solutions comply with regulation helps maintain transparency and reduce compliance costs

58% of companies already use cloud services to support some aspect of their business

~50% of the cost of implementing IoT solutions will be in integration and security through 2018

60% of digital businesses will suffer major service failures by 2020, due to the inability of IT security teams to manage risk

Case study: Sedicii

Ireland-based data-security start-up Sedicii has developed and patented a technology based on the Zero Knowledge Proof Protocol that eliminates the transmission, storage and exposure of private user data during authentication or identity verification.

This reduces the risk of impersonation and any fraud resulting from the identity theft. While primarily a cybersecurity measure that helps to build digital trust and thereby enable the monetization of data, it can also improve customer service and experience.

Source: Sedicii

Key considerations and challenges

- A ready-to-use and state-of-the-art technology infrastructure requires high investment to build and maintain
- Compliance with regulatory standards and privacy norms needs to be continuously assessed

Guiding Principles for Execution

Four guiding principles can help companies to successfully execute on the key enablers

**Establish clear ownership of digital investments**
- Build clear ownership and hierarchy for each investment at organization and project levels
- Set goals and incentives for investment owners that align with the overall digital vision

**Follow an outcome-based approach**
- Take an outcome-based approach, and be clear about the issue to solve and the relevant digital solution
- Focus leadership on digital, understand key stakeholders’ long-term digital demands and assessments of technology infrastructure readiness

**Fail fast, fail cheap**
- Use ‘trial and error’ methods, prototypes and dynamic structures to optimize project lifecycles and associated investments
- Reduce costs of failure by dividing projects into identifiable, short-term goals and defined stage-gates

**Invest in use cases, not technologies**
- Ensure each digital investment is built upon a clear use case that is integrated with an existing company function (e.g. sales, supply chain)
- Create digital-specific KPIs and metrics, then track performance on how they help to achieve traditional business objectives
Measuring the Performance of Digital Investments

Traditional KPIs are not well suited to digital investments, so companies are exploring new ways to evaluate projects

Difficulties of measuring digital investments

Intangible outcomes
- Technology investments often translate directly into intangibles like customer satisfaction, rather than new revenues or cost savings

Long payback cycles
- New technologies often need a considerable amount of time until payback starts

Uncertainty
- Faster lifecycles and developments in competing technologies make outcomes uncertain

Limitations of Net Present Value (NPV) in a digital context

NPV is one of the most used metrics for initial investment evaluation, but it is an unsatisfactory measure of innovation-led projects because of three major limitations:
- It assumes that cash flows are predictable
- It emphasizes internal costs of capital, an increasingly arbitrary metric
- It assumes returns from existing businesses are steady and unchallenged

Guiding principles for digital investment and project evaluation

Lifecycle thinking
- Understand the lifecycle phase of current business models. This acknowledges the impact of digital disruption, and helps to adjust business case calculations by taking diminishing future returns into account

Mix of financial and non-financial metrics
- Identify clear business objectives for digital projects and apply an appropriate mix of financial and non-financial metrics for controlling and evaluating
- Examples of well-suited non-financial metrics include customer satisfaction and loyalty, and efficiency metrics such as overall asset utilization

Options thinking
- Investments in digital technologies are about increasing options in an uncertain world
- If investment projects can be continuously monitored and easily stopped, the new options they give can be more valuable than the initial investment

Digital traction metrics
- Digital traction metrics prove that someone wants a company’s digital product or service
- Combining behavioral metrics (e.g. frequency of use, customer engagement and number of users) can communicate the popularity and the momentum in market adoption of a digital product or service

Case study: Kaiser Permanente

When US-based healthcare maintenance organization Kaiser Permanente needed to implement an integrated digital platform, and they realized that it might not break even for more than 10 years, they developed a clear set of over 25 specific operational goals. These goals were used to demonstrate the project’s value to the leadership team and to monitor the project from development through deployment and scaling. New metrics, such as electronic drug prescriptions, online requests for appointments, video visits or online laboratory results are now part of Kaiser Permanente’s annual report.

Case study: Morgan Stanley

When Morgan Stanley introduced its wealth management platform, usage fees were not an option. The business objective was to give more options to clients and increase customer engagement, resulting in performance metrics such as net acquired assets and transactional revenue.

Case study: Adobe

Adobe changed its business model from selling boxed software to a cloud subscription model and adjusted its Executive Incentive Plans accordingly. It moved from using revenue and operating profits to using the value of bookings for Adobe marketing cloud and digital media cloud subscriptions as key metrics for executive incentives.

Questions for Further Investigation

Companies can determine tangible next steps by considering some key questions:

### Drivers of Digital Investments

- **Digital Coverage:** How much of your business is driven by digitally enabled products or services?
- **Digital Agenda:** Are your digital investments serving your overall strategic objectives as well as tactical needs? Are these projects scalable?
- **Digital Investment Portfolio:** Does your investments in new technologies have a balanced focus on driving new efficiencies, enhanced customer experiences and new business models?

### Key Enablers to Maximize Return on Digital

- **Agile and digital-savvy Leadership:**
  - How are you re-skilling your leadership team on the applications of new technologies?
  - Do they have the right mix of business and technology skills?
  - Is the purpose of digital transformation clearly communicated across management levels?

- **Forward-looking skills agenda:**
  - Does the entire workforce understand the case for change, and the significance of augmenting skillsets by combining technology applications with human ingenuity?
  - Does the leadership have a clear view of the skill gap and required skillsets for digital transformation?
  - How does your organization enable and incentivise lifelong learning?

- **Ecosystem thinking:**
  - Are your value chain participants such as suppliers and customers already identified and approached as partners for data-based value co-creation?
  - How do you engage start-ups as part of your ecosystem collaboration efforts? Is there a clear approach to measure the value impact of their engagement?

- **Data access and management:**
  - Are you already capable of accessing data in the required quality and structure to support investments in technologies such as IoT?
  - Do you have the ability to make data-based decisions in real-time?

- **Technology infrastructure readiness:**
  - Do you have a sufficiently strong technology infrastructure to support digital investments?
  - How do you assess the technology infrastructure readiness?

### Measuring the Performance of Digital Investments

- **Digital Performance Metrics:** How do you measure performance on your digital investments? Are they part of management rewards?
- **Stakeholder Engagement:** Is the objective of your digital investments clearly communicated to stakeholders? Are the performance incentives aligned to the achievement of that objective?
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