Digitizing Manufacturing: Ready, Set, Go!

Manufacturing at the verge of a new industrial era
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“Are Manufacturing Companies Ready to Go Digital?” was the title of our 2012 study on the progress of Digital Transformation in manufacturing industries. At the time we observed that most manufacturing companies were in a state of ignoring or denying the impact of digital. Now, just two years later the situation has changed entirely: the vast majority of manufacturing companies now acknowledge the need for digitization. Organizations recognize that Digital Transformation is essential for ensuring sustainable competitiveness and a key driver for profitable growth in the mid- and long-term. While digital has long become a strategic dimension in the B2C business, our study shows that Digital Transformation now has emerged as a strategic imperative for the manufacturing sector, too. So, what factors have driven that radical shift in mindset?

Turning skepticism into a drive for action

First of all, the digital top-performers in the manufacturing industry have started to exploit the growing business potential of Digital Transformation across the manufacturing value chain and business model. Digital initiatives in manufacturing have created game-changing performance leaps in the top-line as well as in the bottom-line.1 These success stories have turned much of the skepticism into a drive for action.

Second, manufacturing associations and think-tanks have acknowledged the verge of a fourth industrial revolution. In the age of “Industry 4.0”,2 digital technologies are the core driver for the fusion of the physical and the virtual world. More and more manufacturing companies start incorporating smart machines, storage systems and production facilities in Cyber Physical Production Systems (CPPS). CPPS enable machine-to-machine communication and autonomously acting smart factories. These technological advances allow for producing highly individualized products on an industrial scale, while driving operational agility and efficiency to new levels.

Digital maturity is yet very low in the industry

Despite the well recognized need for digitization, the average manufacturing company is a true digital beginner. Digital maturity is low throughout the business model, digital practices, management practices and digital capabilities (see Figure 1). Only in specific disciplines, such as operational excellence, we can observe that the majority of manufacturing companies have started to go digital.

While the majority of manufacturing companies have not yet evolved beyond the early stages of Digital Transformation, the small minority of digital top-performers has already advanced across all business domains. While these pioneers now gain a competitive edge, the rest of the industry is under massive pressure to catch up. However, most manufacturing companies face a fatal deficit of digital

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1 In our study “The Digital Advantage” we demonstrated that digital leaders outperform their peers in manufacturing as well as in any other industry. For example case studies, please consult our report “Are Manufacturing Companies Ready to Go Digital?”

2 The term “Industry 4.0” is mainly used in Germany. Similar visions are known as “Smart Manufacturing” or “Advanced Manufacturing”.

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leadership and lack a digital vision. There is no appropriate governance model to steer digital initiatives and no concept to engage the organization. Without any orientation towards where and how to leverage digital, these organizations won’t be able to ignite their Digital Transformation – a call for digital leadership!

**Key fields of action point to the way forward**

While there is no schematic formula for a generic Digital Transformation journey, there are certain key dimensions to kick-start digital initiatives in manufacturing. Notwithstanding the implicit need for a digital vision required for leadership and cultural change, leveraging our project expertise and our research results we have derived four key fields of action that offer guidance towards the way forward: integrated business planning, data-driven business excellence, cyber-physical supply chains, and digital service management. As we outline in this study, by addressing these fields of action manufacturing companies can boost their operational performance and enhance their value proposition to customers.

**Digital will drive the next industrial revolution**

So, where do we see the manufacturing industry in 10 years? Compared to other industries, digital has not had a visible disruptive impact on manufacturing yet. However, we are deeply convinced that the fourth industrial revolution will be driven through Digital Transformation. And as in earlier industrial revolutions, organizations ignoring the need for adaptation and change will be forced out of the market very rapidly. 10 years from now, we will see manufacturing markets being dominated by industry leaders that have radically transformed every business domain. Judging by the experiences from other industries affected by the advent of digital, there is a chance that these leaders may not be identical with today’s leading manufacturing companies.
We can clearly see that the perspective of manufacturing companies on digital has changed both rapidly and substantially.

Digital technologies have started impacting corporate performance across industries, and organizations now begin to notice the disruptive and productive impacts of digital on their operations. However, in the recent past we were able to observe that manufacturing companies were not entirely convinced of the value-adding benefits of digital and preferred a wait-and-watch approach instead. In an earlier industry survey, only 25% of the interviewed executives believed that the manufacturing sector would be highly impacted by Digital Transformation during the next five years. ³

In our 2012 study “Are Manufacturing Companies Ready to Go Digital?” we addressed the industry’s constraints by outlining how digital innovation is critical when it comes to addressing manufacturers’ key business drivers and creating value.⁴ We demonstrated how digital technologies boost business performance throughout the manufacturing value chain.

In the past two years, Capgemini Consulting and the MIT Center for Digital Business have collaboratively conducted a research program on Digital Transformation across industries. Based on the results of this joint research, we can now take a closer look at the progress of Digital Transformation in the manufacturing industry. We can clearly see that the perspective of manufacturing companies on digital has changed both rapidly and substantially. Driven by business opportunities and risks, the vast majority of manufacturing companies now firmly believe in the need for digitization.

Digital Transformation creates business opportunities

Today, 75% of manufacturing companies agree that Digital Transformation will help to leverage their competitive position (see Figure 2). When taking a closer look on how companies think they will achieve a competitive advantage, it is not surprising that they rather focus on bottom-line than on top-line improvements. The potential of digitally transforming operations to boost internal efficiency and thereby driving bottom-line performance is widely acknowledged by two in three organizations. When it comes to addressing top-line performance, every second company states that they believe digital technologies help to improve their value proposition and their customer relations. Considering that manufacturing is a mainly B2B-driven business and to date its products can only be digitized to a certain level, these results are absolutely remarkable.

Digital Transformation implies business threats

Most manufacturing companies recognize that ignoring Digital Transformation will weaken their market position, as competitors will exploit the fundamental business opportunities mentioned above (see Figure 2).

⁴ Capgemini Consulting: “Are Manufacturing Companies Ready to Go Digital?”
However, according to the broad majority of manufacturing companies, Digital Transformation is not a threat to their fundamental position in the industry. Furthermore, it is a popular opinion that Digital Transformation options are not constrained by other players. Hence, manufacturing companies currently perceive the external threat of Digital Transformation as comparatively low. On the other hand, Digital Transformation already has a great influence on internal structures: every second company expects Digital Transformation to have a disruptive impact on the internal organization. Taking into account how fundamentally digital changes the way of life in society at large, this assumption will likely hold true.

The presented results clearly indicate that manufacturing companies have recognized the need for engaging in Digital Transformation. In the next section, we look at the extent to which manufacturing companies have already transformed into Digital Organizations.

“75% of manufacturing companies believe that Digital Transformation will help leveraging their competitive position.”

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Since neutral answers were not considered, the given figures do not add up to 100%.
The Industry’s Digital Maturity

The need for digitization is recognized, yet the organizational transformation is still widely stuck in an early stage.

As a main outcome of the joint research program with the MIT Center for Digital Business, we have benchmarked the digital maturity of approximately 400 large companies from more than 15 different industries. In our study “The Digital Advantage” we allocated the assessed companies to four clusters. The research team was able to prove that the most digitally mature companies, the so-called Digirati, significantly outperform their peers regarding revenue generation, operational profitability and market validation.

When focusing on digital maturity at an industry level, we can clearly see that the manufacturing industry has fallen behind most other industries (see Figure 4): Only 12% of manufacturing companies can be associated to the Digirati, whereas the typical organization has to be considered a “Digital Beginner”. Considering that the industry’s shift in mindset towards digital has only recently begun, these results are not surprising. Digital Transformation is not a quick fix but a long-term change process incorporating all business domains.

In order to identify the most promising fields of action for Digital Transformation in manufacturing, we outline a differentiated perspective on the industry’s digital maturity in the following subsections. We assess the maturity towards the domains business model, digital practices, management practices and digital capabilities. Furthermore, we provide the comparative figures set by the industry’s digital top-performers, the Digirati.

Figure 4: Digital Maturity by industry

Digital Intensity measures how advanced digital initiatives are within an organization. This includes investment in customer experience, operational processes, business model transformation, as well as digital capabilities.

Transformation Management Intensity measures senior executives’ capability to drive change throughout the organization. This includes creating and communicating a clear vision, establishing governance mechanisms, facilitating cross-silo coordination, and building a digital-ready culture.

Source: Capgemini Consulting – MIT Center for Digital Business, please consult page 31

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6 Capgemini Consulting: The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry
Digital business model

“Transforming into a holistic solutions provider – that is where digital offers great opportunities for manufacturing companies.”

In the past we saw that manufacturing companies were particularly skeptical in terms of the impact of digital on their business model. It goes without saying that the traditional core value proposition, the industrial product, can only be digitized to a certain degree. However, manufacturing companies increasingly transform into comprehensive solutions providers and thus extend the range of their service offering – an area where digital delivers vast opportunities. As the industry’s Digirati collectively demonstrate, digital can be leveraged to systematically increase the added-value of offered solutions or even launch new business opportunities (see Figure 5). Looking at offerings like data-driven machine optimization, predictive maintenance, remote services or performance-driven pricing models, digital is a key driver to create unique selling propositions beyond the traditional service management.

Looking at the industry at large, we can see that only a minority has started taking action towards leveraging digital to improve their value proposition (48%) or launch new businesses (35%). We expect these shares to significantly rise in the short-term, and this rapid evolution will put enormous pressure on late-movers. As their value proposition will no longer meet competitive standards, they are unlikely to survive the digital age.

If we look beyond the value proposition, it is remarkable that fewer than one in three manufacturing companies use digital to engage with customers they could not reach before. Today, even very small manufacturing companies have to operate on global markets. Digital communication channels allow for engaging in new market regions without huge initial investments. Manufacturing companies of any size can benefit from Digital Transformation practices to extend their value proposition across borders, thereby comprehensively exploiting global growth opportunities.

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<th>Share of response “Agree” among digital top-performers (“Digirati”)</th>
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<td>Disagree</td>
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<tr>
<td>36%</td>
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<tr>
<td>57%</td>
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<tr>
<td>54%</td>
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<tr>
<td>54%</td>
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<tr>
<td>63%</td>
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If we use digital technologies to increase the added-value of our products and services, 36% of respondents agree, while 48% agree. Similarly, 57% agree that we have launched new businesses based on digital technologies, and 54% agree that digital technologies allow us to reach customers we could not reach through traditional approaches. A total of 54% agree that we use digital technologies to customize our products or services for each customer, while 63% agree that we are actively transitioning physical products and services to digital.

Figure 5: Business model transformation

Digital practices

Only 54% of manufacturing companies have automated their core processes – a remarkable result given that the industry is strongly driven by operational efficiency.

Boosting operational performance

In the 1990s, manufacturing companies were early adopters of using technology (such as ERP and Production Planning Systems) for driving operational efficiency. Therefore, it is not surprising that digitization of operations in specific domains is advanced in the manufacturing industry. Especially when it comes to digitally enabling the workforce, manufacturing companies outperform most other industries. For example, 76% of the organizations have integrated technologies that enable employees to work and digitally cooperate from any location, which is a massive advantage for globally operating and decentralized companies (see Figure 6). In this context, mobile applications and devices, video conferencing, instant messaging and embedded devices are the technologies most often leveraged by leading digital organizations (see Figure 7).

However, when looking at digitizing business processes, many manufacturing companies yet have to make up leeway. Only 54% of manufacturing companies have automated their core processes – a remarkable result given that the industry is strongly driven by operational efficiency (see Figure 8). Furthermore, the majority of manufacturing companies do not make use of the vast amount of data that is usually generated in the organization.

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7 Capgemini Consulting: Operational Excellence Through Digital in Manufacturing Industries
Applying business analytics, data can be transformed into valuable insights regarding potential operational improvements.

In the past six years the operating environment of manufacturing has increasingly been characterized by instability. We have seen global and regional demand shocks strongly impacting the operations of manufacturing companies. With this in mind, it is noteworthy that the manufacturing industry does not widely leverage digital to boost operational agility. The majority of companies can neither monitor operations in real-time nor adapt processes quickly to external changes.

Comparing the industry at large to the Digirati, the significance of the presented results becomes evident: the Digirati vastly outperform the rest of the industry regarding process digitization. Digirati systematically drive operational efficiency and agility using digital practices. The majority of manufacturing companies have fallen behind and need to act now in order to maintain the competitiveness of their bottom-line performance.

**Leveraging customer experience**

The application of digital technologies to enhance customer experience is now a common practice in most industries. However, our research data shows that the potential of digital in B2B customer relationships is vastly underleveraged. Manufacturing companies are widely ignoring digital opportunities in marketing, sales and service activities, e.g. personalized interactions, cross-channel experience, social media integration or location aware marketing.
Business analytics solutions allow manufacturing companies to gain completely new insights into their customers and the global markets.

It is particularly remarkable that among the Digirati even fewer companies leverage digital for enhancing customer experience in specific focus areas. This clearly demonstrates the lack of orientation in manufacturing towards boosting customer experience through digital. The industry players widely assume that digital technologies and methodologies only target B2C interactions and do hence not offer any business potential for B2B-driven manufacturing companies. However, the research results reveal that manufacturing companies have started going digital in specific customer-facing domains.

Digital technologies enable organizations to drive their understanding of customers and markets. As every second manufacturing company systematically leverages the web in this context, we can see that the industry has recognized this potential (see Figure 9). But the web is only a first step. Other digital sources of information, such as social media, mobile services and devices embedded in products, are as yet hardly used in the industry. Identifying and integrating all available data sources and applying state-of-the-art business analytics solutions allow manufacturing companies to gain completely new insights into their customers and the global markets. The Digirati have already picked up on this potential and started to establish cross-divisional marketing and customer intelligence units.

Mobile channels can play a significant role in creating a positive customer experience. Customers can be informed about product benefits through sophisticated mobile platforms, and a digitally enabled field force can provide a superior service. Our research data indicates that a fair share of manufacturing companies now engage in mobile technologies and services (see Figure 10). We expect this share to quickly rise, as customer orientation and the service business will continuously gain importance.

Figure 10: Mobile interaction with customers

Source: Capgemini Consulting – MIT Center for Digital Business, please consult page 31
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Most manufacturing companies have a serious deficit in digital leadership.

Envisioning the transformation

Though manufacturing companies have recognized the need for digitization, our research results suggest they most often lack a comprehensive and consistent digital vision. Only 22% of senior executives have a Digital Transformation vision that involves radical changes (see Figure 11). Keeping in mind that most companies expect Digital Transformation to have a disruptive impact on the internal organization, this is quite remarkable. Furthermore, senior executives often do not share a common vision on how the business should change through Digital Transformation. Even more rarely, senior executives have the same vision as their middle management. Compared to the comparative figures set by the Digirati, most manufacturing companies have a serious deficit in digital leadership.

Essentially, unfolding the power of digital requires a high-level roadmap for Digital Transformation reflecting a digital vision spanning across internal organizational units and management levels. Only one in three manufacturing companies meets this prerequisite – compared to 80% of the Digirati.

Figure 11: Digital vision

- Senior executives have a Digital Transformation vision that involves radical changes: 22%
- Senior executives share a common vision of how the business should change through digital technologies: 42%
- Senior executives and middle managers share a common vision of Digital Transformation: 28%
- There is a high-level roadmap for Digital Transformation: 34%
- Senior executives have a Digital Transformation vision that crosses internal organizational units: 38%

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Source: Capgemini Consulting – MIT Center for Digital Business, please consult page 31
Steering the digital initiatives

The fact that most manufacturing companies lack an overarching Digital Transformation vision has a direct impact on how digital initiatives are managed. The research results reveal clear symptoms: merely 30% of manufacturing companies have created a governance model that consistently defines roles and responsibilities to enable a top-down coordination of digital initiatives (see Figure 12).

Consequently, digital initiatives are not coordinated across silos, functions or borders and are not systemically aligned with corporate objectives. As a result their benefit potential may barely be positive or might even be negative when contradicting the corporate strategy.

In our experience, initiating and steering a Digital Transformation program is as numbers-driven as any other change initiative. Especially manufacturing companies focusing on cost efficiency are typically cautious and demanding in terms of the effectiveness of investments. Thus, the fact that the majority of organizations lack robust business cases and KPIs to validate success is a true barrier for conducting digitization programs (see Figure 13).

Executives believe that digitization creates value but fail to quantify and validate it.
Engaging the organization

Digital Transformation is likely to have a significant change impact on the way a company is doing business. In order to drive the transformation successfully, it is essential to engage all relevant organizational stakeholders. The broad majority of the Digirati have recognized this necessity and have thus allocated adequate funding for transforming the organization (see Figure 14). They actively promote a digital vision, engage all stakeholders in digital initiatives and systematically drive a cultural change. Moreover, they invest in developing the required skills in their organization – an indispensable transformation measure, since digitization will entail radically new capability and skill profiles.

When looking at the industry at large, we can see that fewer than one in two manufacturing companies are systemically fostering the change process. The research results indicate that the players of the manufacturing industry have begun to recognize the need for engaging the organization but find themselves at a very early stage of this process.

"Manufacturing companies need to engage all relevant organizational stakeholders to ensure a sustainable transformation."
The alignment of IT and business perspectives is a prerequisite for launching Digital Transformation.

Aligning business and IT

The transformation journey is about leveraging the potential of digital technology for driving business performance. Aligning the perspectives of IT and business is hence a prerequisite for launching Digital Transformation. According to our research results, the majority of manufacturing companies have ensured this alignment in the past years, and IT and business executives now have a common understanding of the role of IT in the organization (see Figure 15). IT can be leveraged to gain a competitive edge and is a driver for operational excellence. Even in cross-industry comparisons, manufacturing is outstandingly mature in this domain.

However, this successful alignment has in many cases not yet delivered an IT performance that meets the requirements of the business. This indicates that instead of a thorough functional integration across hierarchy levels we are merely looking at a top-level alignment. In our projects we frequently encounter IT and business functions that are separated by organizational barriers. In our study “IT Trends 2014” we demonstrated that reducing organizational boundaries drives the perceived IT performance by the business side. Therefore, unfolding the power of digital will require an organizational transformation to overcome boundaries through functional integration.

Figure 15: Alignment of IT and business

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<tr>
<th>Statement</th>
<th>Agree</th>
<th>Disagree</th>
<th>Share of response “Agree” among digital top-performers (“Digirati”)</th>
</tr>
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<tbody>
<tr>
<td>IT and business executives have a shared understanding of IT’s role in our organization</td>
<td></td>
<td></td>
<td>64%</td>
</tr>
<tr>
<td>IT and business executives have a shared understanding of IT’s potential as a competitive weapon</td>
<td></td>
<td></td>
<td>66%</td>
</tr>
<tr>
<td>IT and business executives have a shared understanding of how IT can be used to increase productivity of our operations</td>
<td></td>
<td></td>
<td>52%</td>
</tr>
<tr>
<td>The IT unit’s performance meets the needs of the company</td>
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<td></td>
<td>42%</td>
</tr>
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Source: Capgemini Consulting – MIT Center for Digital Business, please consult page 31

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8 Capgemini: IT Trends 2014
Only 48% of manufacturing companies have implemented digital platforms that span across different business entities.

Integrating IT platforms

Digital technologies enable companies to gain a comprehensive and transparent view on their business across all organizational boundaries. As financials are of vital importance for organizations, it seems plausible that 80% of manufacturing companies claim to have an integrated view on their financials (see Figure 16). 72% believe to have an integrated view on operational performance and 56% think they have an integrated view on their supply chain status.

However, these figures are remarkable when taking into account that only 48% have digital platforms across business units in place. In our experience, cross-company platforms are a prerequisite for having a truly integrated view on the business. We have often observed that companies have a somewhat unified view but cannot access it in real-time or conduct more in-depth analyses through drill-downs. Today, in-memory solutions such as SAP HANA enable an integrated, real-time view on the entire business and offer a great variety of analytics functionalities to gain business insights.

Figure 16: IT and platform integration

Different units of the company use a common digital platform

We have an integrated view of financials

We have an integrated view of operational performance

We have an integrated view of product/service performance

We have an integrated view of customer data

We have an integrated view of supply chain status

The lack of digital talent can be a true show-stopper on the way ahead.

But these solutions rely on digital platforms that integrate data and technology silos. When these platforms even span the entire supply network, manufacturing companies will be able to reach new levels of operational transparency and agility – a tremendous advantage in a highly competitive and fragile manufacturing environment.

**Establishing digital know-how**

Embracing the power of digital requires very specific knowledge and skills in an organization. From our project experience we know that almost all organizations struggle with a lack of digital skills on their transformation path. This competency gap can be a true show-stopper. When looking at our research results, it becomes evident that the majority of manufacturing companies face a lack of talent in all relevant digital skill domains. It is surprising that a mere 39% of the organizations have incorporated the necessary skills in digital leadership. (see Figure 17). As digitization of economies and societies progress, this gap truly challenges the survival of individual organizations in the mid- and long-term. Manufacturing companies need to start closing this competency gap to ensure their ability to conduct Digital Transformation. This holds especially true when looking at the Digirati: having recognized the need for digitization in an early phase, they have broadly developed and acquired the skills needed in their organization.

**Figure 17: Digital skills**

- We have the necessary skills in digital leadership to conduct digital initiatives
  - Agree: 53%
  - Disagree: 19%

- We have the necessary skills in analytics to conduct digital initiatives
  - Agree: 60%
  - Disagree: 80%

- We have the necessary skills in mobile to conduct digital initiatives
  - Agree: 39%
  - Disagree: 61%

- We have the necessary skills in social media to conduct digital initiatives
  - Agree: 19%
  - Disagree: 81%

- We have the necessary skills in embedded devices to conduct digital initiatives
  - Agree: 43%
  - Disagree: 57%

Source: Capgemini Consulting – MIT Center for Digital Business, please consult page 31
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9 Capgemini Consulting: The Digital Talent Gap - Developing Skills for Today’s Digital Organizations
Organizations are urgently required to start taking action now as their digital backlog is rapidly growing and building a momentum that puts their very survival on the line.

The outlined research results clearly document that manufacturing has only just begun its journey into the digital future. Most organizations lack digital maturity throughout all relevant business domains. However, we can see that the industry’s Digerati have developed and implemented a digital transformation strategy providing them with an increasing competitive advantage. The rest of the industry’s players are urgently required to start taking action now as their digital backlog is rapidly growing and building a momentum that puts their very survival on the line.

Despite the evident need for digitization, for the most part the manufacturing industry lacks a perspective on how and where to leverage digital. In this section we provide guidance for manufacturing companies. Based on our project experience and the indications provided by the research results, we outline four key fields of action for conducting Digital Transformation: integrated business planning, data-driven business excellence, cyber-physical supply chains, and digital service management.
Integrated business planning

Manufacturing companies operate in a complex business environment driven by volatile and regionally diversified customer demands. In order to break down business complexity into addressable elements, companies have developed many sub-organizations and organizational silos. As a result, the business functions sales, manufacturing, supply chain, and finance individually conduct isolated planning processes. Taking into account that these functions often have contradicting targets, isolated planning processes and decision making lead to sub-optimal business performance. Important decisions cannot be made with full certainty about their impacts: an unexpected increase in demand might look good at first – but will the cash inflows later on pay the balance for raw materials and production costs that are incurred now?

Overcoming the planning silos

In order to overcome isolated planning silos, many manufacturing companies have engaged in sales and operations planning (S&OP). While this planning method has somewhat improved decision making, it is just a first step in the right direction. Today, digital technologies allow for a truly integrated business planning (IBP). With its cross-functional planning approach IBP consolidates planning activities from supply chain, marketing, production, and finance and thereby transforms counteracting goals into an overall value orientation for the entire organization.

In the context of integrated business planning, digital technologies not only provide a common data basis and planning platform: solutions like SAP HANA allow for processing and analyzing vast amounts of data in order to model and simulate the outcomes of different planning scenarios. This way, integrated business planning is conducted dynamically, taking into account internal and external developments in real-time. Operational decision making of executives can be based on a clear and comprehensive perspective on how the outcome of decision alternatives will impact the business.

Benefits around all business domains

In our projects we have seen great business benefits for manufacturing companies when the concept of integrated business planning meets the power of digital. By focusing all business activities on core value drivers, integrated business planning has a proven impact on operational performance as well as capital costs. Typical examples include: more effective and value-oriented resource allocation between competing orders leading to an improved on-time delivery; higher capacity utilization through a consistent and reliable production planning and steering; lower sourcing costs through a targeted bundling of procurement volumes; significant inventory reduction through improved inventory turns and a better management of obsolete and excess stock; more efficient planning,
By focusing all planning processes on core value drivers, integrated business planning offers the opportunity to increase EBIT by 5-30%.

Both in terms of how long it takes to complete a plan and the amount of resources required to support it; optimized liquidity management based on improved transparency and an aligned planning of resource utilization of liquid funds.

The above examples underline that integrated business planning creates benefits for the entire organization. Based on our project experience in the manufacturing industry, we estimate that the benefits across all domains add up to an EBIT increase of 5-30%. Integrated business planning is therefore a vast opportunity for manufacturing companies to create a competitive edge by driving their top-line as well as bottom-line performance.

A globally operating industrial goods manufacturer aligned its operational planning processes by integrating them into one digital platform

The organization faced high efforts when defining meaningful operational plans and a low level of alignment of the stakeholders towards reaching the overall targets. Disconnected, non-synchronized processes in the finance, supply chain and sales functions caused a contradictory planning and target setting for the different functions.

In order to transform the operational planning processes, the organization initially set up an alignment process amongst all relevant stakeholders, considering existing restrictions, the market situation, costs and the budget plan. Major business and cost drivers were identified across the entire value chain. Based on these value drivers, one common digital planning platform was designed and realized – today, it integrates all operational planning processes in accordance with the strategic targets. Furthermore, the integration of advanced SAP planning technology enabled scenario-based decision making.

The continuous development and integration of an Integrated Business Planning (IBP) concept has enabled the company to focus all business activities on two core targets: maximizing EBIT and improving customer satisfaction through an increased reliability of delivery.

Source: Capgemini Consulting client
Over time manufacturing companies collect and store huge amounts of data along their value chain. As digitization progresses, the amount of data generated every day grows exponentially. Especially the so called cyber physical production systems (CPPS) associated with the concept of “Industry 4.0” leverage this development. In CPPS all physical elements such as production facilities, storage systems, machines, and products are connected through digital technologies. They are able to autonomously exchange data, communicate and trigger actions. The boundaries between the physical and digital space become increasingly blurred.

Transforming data into insights

While digital technology drives the generation of data, it also allows leveraging it for driving business excellence. Especially the in-memory technology enables the processing of vast amounts of data in very short timeframes. Advanced business analytics leverages the new technological latitude by identifying patterns in real-time or stored data which helps to provide answers to business issues that hitherto seemed irresolvable. While traditional BI reporting mainly informs executives about what is happening in their organization, advanced business analytics now allows for much more: it answers questions on why things have happened and what will happen in the future. Furthermore, it provides business executives with key insights into how to improve organizational performance.

The number of potential use cases advanced analytics solutions offer to manufacturing companies is downright endless: instead of merely touching on single processes, production facilities can be holistically optimized and steered in real-time taking into account the various limitations and contradicting targets. Quality assurance processes can be planned depending on analytical models that incorporate historical product lifecycle data. Product development can be guided by analyzing quality assurance and maintenance data of earlier products.

From data silos to one data lake

However, achieving data-driven business excellence is not only about applying state-of-the-art digital solutions but also involves an organizational integration process. Today, manufacturing companies store most of their information in data silos of specific business functions or units. Since the real value of data consists in collectively leveraging data of all business domains, this situation is a true barrier for transforming into a data-driven organization. Following the principles of the business data lake, manufacturing companies need to overcome data silos by implementing a cross-company digital platform that ensures real-time access to all data stored in the organization.10

10 Capgemini: The Principles of the Business Data Lake
Leading organizations start leveraging the potential of data by conducting pilot projects that target very specific business issues through analytics.

Starting small, winning big
Organizations mastering the organizational and data integration challenge can fully leverage advanced business analytics to transform their data into valuable business insights along their entire value chain, thereby redefining business excellence. In our project experience, we see that manufacturing companies are overburdened with the numerous performance potentials disclosed by business analytics.

Chip manufacturer Intel designed and implemented a data-driven chip testing process resulting in significant operational cost savings

Intel’s highly automated production facilities generate the massive amount of 5 terabyte of data every hour. However, in the past Intel did not leverage the benefit potential arising from this data to drive its core competency of high volume, precision manufacturing.

Realizing that opportunity, Intel initially launched several pilot projects to discover the potential arising from data. For instance, they designed a business analytics solution that optimized the chip testing processes of a specific production line. Previously, all produced chips were run through an extensive series of tests. Intel incorporated historical process data into an analytical model that evaluated the relevancy of chip testing procedures.

Intel leveraged the model results to significantly cut down the number of conducted tests in the production line. Intel was thereby able to realize cost savings of USD 3 million within the first year. By rolling out this analytical solution to other production lines, Intel now expects to generate annual costs savings of USD 30 million.

Source: Intel (“Accelerating Business Growth Through IT”, 2013)
In the manufacturing industry, supply chains are most often characterized by hybrid structures (combination of paper-based and IT-supported processes). Hybrid supply chains typically result in rigid organizational structures, inaccessible data, and fragmented relationships with partners. Hence, they do not respond to today’s business complexity: customers demand products and services to be delivered to any location worldwide within a short timeframe. Rigid, hierarchical supplier relationships are replaced by flexible, dynamic and global partner networks, while ever shorter product lifecycles require a steady re-configuration of supply chains.

Hybrid supply chain structures are completely overburdened with the complexity of commodity flows they are confronted with today. This fact became instantly tangible after the 2011 earthquake and nuclear catastrophe in Japan: manufacturing companies massively struggled with comprehensively evaluating the impact of a temporary outage of Japanese suppliers on their supply chains.

Managing complexity through Digital Transformation

Digitally transforming the supply chain is not about applying innovative technology within traditional structures. Managing supply chain complexity initially requires manufacturing companies to drastically reduce organizational complexity. Companies have to start defining a comprehensive operating model that spans across organizational silos, boundaries and even external entities. Standardized, end-to-end processes have to be defined and transparent, intuitive governance structures need to be developed. These are fundamental prerequisites for truly embracing the power of digital in supply chains.

Accompanying a comprehensive organizational transformation, digital technologies enable manufacturing companies to effectively manage supply chain complexity. Organizations can create cyber-physical supply chains by connecting physical commodity flows with digital platforms. Technologies like RFID and machine-to-machine communication are key enablers in this context.

Driving operational performance and mitigating risks

By implementing a cyber-physical supply chain manufacturing companies can access a virtual image of their commodity flows on every aggregation level in real-time. Complexity is thereby targeted by a drastically increased supply chain transparency. A virtual image of physical flows enables organizations to comprehensively analyze the supply chain regarding inefficiencies and potential threats. Furthermore, the impact of disruptive events can be rapidly and precisely simulated in order to indentify and mitigate risks.

Manufacturing companies can target supply chain complexity by connecting physical commodity flows with digital platforms.11

11 AIRMIC: Supply Chain Failures – A Study of the Nature, Causes and Complexity of Supply Chain Disruptions
Cyber-physical supply chains radically increase the visibility, reliability, and agility of operations.

Leveraging digital technologies in cyber-physical supply chains enables the integration and automation of business processes. Physical processes along the supply chain can be digitally mapped allowing for a computer-automated planning, steering, execution, and tracking along the supply chain.

Process automation typically results in up to 20% cost savings on the relevant cost base. Furthermore, digital technologies provide the opportunity to respond to increasing collaboration intensity with suppliers in the manufacturing industry. Cross-company platforms reduce the complexity of coordination and allow for a flexible ad-hoc configuration of collaboration networks. Leveraging the power of digital, manufacturing companies can drive the performance of their collaborative value creation to new levels.

Cyber-physical supply chains boost competitiveness

In summary, Digital Transformation enables manufacturing companies to create cyber-physical supply chains that radically increase the visibility, reliability, and agility of operations. Moreover, the relevant cost base can be driven down drastically. Cyber-physical supply chains are a key lever for securing a competitive edge in the demanding and dynamic manufacturing market environment.

High-tech manufacturer HP developed a digital solution for dynamically mapping supply chain structures leading to an increased operational visibility

HP is operating one of the biggest and most complex supply chains in the high-tech manufacturing industry. In 2010, HP launched a comprehensive supply chain transformation program that targeted multi-billion annual savings.

Facing the challenging target setting, HP developed a digital solution for supply chain optimization named “Geographic Analytics”. It is based on the idea of initially visualizing the entire supply chain on a digital map and enriching it with selective, real-time data sets. Advanced visualization software allows to flexibly display any kind of location-based information depending on the business purpose. HP uses its digital solution to create a simplified, transparent and unique view on its supply chain and to break down complex operational problems.

The development and implementation of “Geographic Analytics” has radically improved HP’s supply chain visibility. The solution has cut down the time needed for ad-hoc network optimization by 50%. Furthermore, supply chain risk management has been substantially improved by comprehensively visualizing and analyzing the impact of disruptive events.

Source: Supply Chain Management Review (“How HP Visualizes its Supply Chain”, 2013)
The service business has become a very important revenue stream for manufacturing companies. While margins on core products are shrinking, services are the key to competitive differentiation and ensuring operational profitability. Digital technologies play a decisive role in this development. On the one hand, they help increasing the value proposition of services or even allow for developing entirely new offerings. On the other hand, digitizing the service delivery chain drives the effectiveness and efficiency of execution processes.

Enhancing the service offering

For the targeted enhancement of offered services, manufacturing companies need to generate a 360° view of individual customers. Comprehensively analyzing all available customer data is a key lever for developing a deep understanding of individual behaviors and needs. Therefore, organizations need to ensure an end-to-end integration of their service business by implementing a common digital platform across all customer touchpoints.

Digital technologies have initiated the era of connected products. Today, every product can be equipped with internet connectivity that allows for remote communication and steering. Given that products are equipped with adequate sensors, manufacturing companies can remotely retrieve any kind of performance and status information from their installed base in real-time. Based on this access, new service offerings can be shaped. For instance, leading companies offer a preventive maintenance service that is based on continuously monitoring machine data in real-time. Furthermore, remotely accessed machine data can be used to continuously advice customers in maximizing machine performance. The value proposition of these offerings is clear: decreased downtimes, repair costs and replacement rates as well as an increased machine performance are key levers for reducing the total cost of ownership.

Optimizing the service delivery chain

Having remote access to the installed base not only enables enhanced service offerings but also leads to a higher efficiency of service delivery. Depending on the service agreement with the customer, handling service incidents remotely instead of sending out the service staff can deliver significant cost and time savings. But even when using the field force is inevitable, digital technologies can drive business performance along the service delivery chain.13 For instance, leading manufacturing companies provide their service staff with detailed product and customer information through mobile devices. The staff can instantly use and update information like technical specifications, assembly instructions and spare part information. Apart from empowering service technicians, digital also allows for optimizing the spare parts supply model.

13 Capgemini Consulting: Operational Excellence Through Digital in Manufacturing Industries
Digital drives the efficiency of service delivery processes as well as the performance of the spare parts supply network.

Leveraging advanced analytics solutions, organizations can base demand planning on precise, data-driven forecasts and are able to optimize the spare parts distribution network.

Digital enables manufacturing companies to outsource service delivery to external providers. Digital channels allow for flexibly and rapidly distributing knowledge exactly as needed for a specific service incident. While limiting the amount of intellectual property shared externally, organizations can leverage external service providers to ensure the delivery of high-quality services in each corner of the world at low costs.

Digital will shape the service business

Digital is set to redefine the nature of offered services and will transform the service delivery chain in the manufacturing industry. Organizations need to act now in order to exploit the competitive edge resulting from a digitization of service management.

A leading building automation company designed a digital service management platform to enable the delivery of innovative remote service offerings

The company faced an increasing pressure on prices and margins in the product business. It therefore intended to differentiate by offering innovative remote services. However, its fragmented IT infrastructure did not support that strategic direction.

In order to derive the requirements for a new IT platform, the company initially defined business functions, roles and processes for operating the remote service portfolio. Based on this definition, a target IT architecture was designed containing a portal for customer integration, a business intelligence solution for enhanced reporting, and an application suite for remote monitoring, systems management and system-related reporting and forecasting. The organization then converted the target architecture into an advanced digital service management platform.

Having integrated the development of business structures and IT architecture, the designed digital platform now perfectly responds to business needs. The solution enables the company to effectively deliver innovative service offerings through highly automated and efficient processes.

Source: Capgemini Consulting client
Digital Transformation will drive the next industrial revolution in manufacturing (“Industry 4.0”) – a development you definitely won’t want to miss. It has already triggered hectic activity amongst many manufacturing companies. For example, in recent months we have seen many manufacturing companies trying to identify ad-hoc opportunities for implementing state-of-the digital technology. While these companies might realize short-term benefits, they will fail in others and miss the opportunity to initiate a real transformation towards sustainable and profitable growth: Digital Transformation is not a quick-fix solution within rigid manufacturing processes and resources but a long-term commitment and imperative.

Initiating, planning and conducting a Digital Transformation requires a comprehensive top-down approach and leadership. Manufacturing companies need to derive a digital roadmap that incorporates a clear digital vision and determines the transformation path across all relevant business domains. Based on our project experience, we recommend manufacturing to embark on a six step approach towards initiating and conducting a Digital Transformation of their business (see Figure 18).

**Conduct a digital maturity assessment**

First, manufacturing companies should undertake a comprehensive digital maturity assessment. Organizations need to develop a transparent view
Identify opportunities and threats

Once organizations have a clear perspective on their digital maturity, they need to explore the corporate environment for opportunities and threats triggered by digital. They need to look into altering customer demands, competition dynamics and digital best practices across all relevant business domains. The game is changing, and manufacturing companies need to understand the direction things are going.

Define your digital vision and agenda

Based on the identified opportunities and threats, manufacturing companies have to develop a clear digital vision. This vision needs to provide a comprehensive view on how the company aims to do business in the digital age. It is absolutely critical that the digital vision is accepted and shared by all senior executives – a prerequisite for a clear top-down communication and successful implementation in the organization at large.

A company-wide digital vision provides the basis for deriving an agenda on how and where to leverage “digital” across all business functions. Manufacturers should design the digital agenda with a clear outline of the strategic business objectives to be achieved. Short- and long-term objectives need to be clearly defined and commitment to these objectives by all functions (top-down) ensured prior to commencing the transformation process.

Prioritize the transformation domains

The next step after defining the digital agenda is to prioritize the transformation domains based on the perceived business benefits and ease of implementation. The complexity of the implementation will depend on the required level of integration with the existing core business processes and systems. A prioritization matrix helps in identifying quick wins on the path towards digitally transforming the organization.

Derive a digital roadmap

As soon as the transformation domains and initiatives are selected and prioritized, a digital roadmap has to be created containing phase-wise transformation details. The digital roadmap helps to make the transformation journey tangible and is ideally built on a common action set by management, business representatives from different functions, and IT. The Digital Transformation journey has to build on a consistent vision shared by all relevant stakeholders.

Implement and sustain the change

The continuous implementation of the roadmap towards leveraging the benefits of digital entails various challenges. One of the biggest hurdles manufacturing companies will face is to change the traditional understanding of roles and responsibilities, where IT is mostly seen as a service provider. In the course of a Digital Transformation, these traditional boundaries become blurred as IT becomes more involved in manufacturing core competencies. Digital leadership is key to changing this mindset and promoting the IT as a business partner across the manufacturing value chain.14

The approach initially defined to initiate a company’s Digital Transformation will continue to evolve over time. This is because the innovation rate among digital technologies is extremely high, which means manufacturing companies need to continuously challenge and revise their Digital Transformation path.

In summary, it is crucial to see Digital Transformation as a comprehensive approach and a long-term commitment to sustainably changing the people, processes, IT, and culture of an organization in order to fully leverage the benefits of new digital opportunities. Manufacturing companies need to commence their transformation journeys now in order to succeed in the fourth industrial revolution.

14 Capgemini: IT Trends 2014
Research Methodology

The empirical evidence presented in this study is a result of Capgemini Consulting’s long-standing research collaboration with the MIT Center for Digital Business. The MIT Center for Digital Business is a part of the MIT Sloan School and widely regarded as the leading faculty expert in the impact of digital technologies on business. Our research collaboration was initiated in 2011 and will, as things stand today, proceed at least until 2016.

The presented research results are based on an empirical digital maturity assessment across various industries. 469 interviews with senior executives from 391 companies in 30 countries were conducted (the companies interviewed are all major global businesses and the majority of them have more than $1 billion in annual sales). Among the assessed organizations, 50 can be associated to the manufacturing industry. In our research definition, the manufacturing industry consists of three sub-segments: aerospace, automotive and industrial products.

Based on our collaborative research activities with the MIT Center for Digital Business, we have developed a unique digital maturity assessment tool that enables companies to assess their digital maturity and compare their position with peers in their industry.
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Capgemini Consulting is the global strategy and transformation consulting organization of the Capgemini Group, specializing in advising and supporting enterprises in significant transformation, from innovative strategy to execution and with an unstinting focus on results. With the new digital economy creating significant disruptions and opportunities, our global team of over 3,600 talented individuals work with leading companies and governments to master Digital Transformation, drawing on our understanding of the digital economy and our leadership in business transformation and organizational change.

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