

The impact of digitalised end products in Swedish manufacturing industry

September 2017, Jorge Peydro and Stefan Stanica

How Swedish
manufacturing companies
have to rethink innovation
when introducing
digitalised end products

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Overview

This white paper is based on the thesis “How Swedish manufacturing companies have to rethink innovation when introducing digitalised end products” done at KTH (Royal Institute of Technology) by Jorge Peydro and Stefan Stanica. The white paper elaborates on how the digitalisation of end products affects the Swedish manufacturing industry.

What are the changes in the business environment that the manufacturing industry is facing, due to the transition towards digitalised products and how is the industry changing or may need to change to be successful in the future digital era?

How do these changes affect the organisation, processes, competencies and governance, and particularly the organisation and management of innovation.

Additionally, what are the business opportunities that emerge with the rise of the digital user interaction and involvement that is enabled by digital products and channels?

We find that a stronger focus on innovation around digitalisation is needed and that companies will have to rethink their ways of working (organisation, processes, competencies and governance) related to innovation when doing so. Digitalisation opens up new opportunities for business innovation. It does, however, also demand enhancement of current and development of new skills to strengthen the organisations innovation capabilities to take full advantage of these opportunities. Digitalisation should therefore be included in the business strategy.

We see many new business opportunities that emerge from the collection of data that is enabled by the digital interaction and involvement with end users. Data collected in this new way enables organisations to interact with their end users any time and anywhere throughout the entire industrial value-chain. In order for this data to be of use, organisations have to transform it into business outcomes by analysing it. Traditional manufacturing companies are still only at the earliest stage of analysing this data. We believe that the business opportunities identified today is just the “tip of the iceberg” of the true potential in this area.

Digitalisation as a powerful trend



Currently, digitalisation is being developed in today's industries around the world. Digitalisation, which can be understood as the continuing convergence of the real and the virtual worlds, will be the main driver of innovation and change in all sectors of our economy. For many industries, digitalisation is completely revolutionising how products are manufactured, sold and distributed, how companies are managed, how companies interact with their customers, and with whom they compete. The traditional manufacturing industry is no exception from this digital transformation.

Companies need to develop and adapt their industrial processes to the rapid changes incurred by digitalisation. Failure to do so will cause them to fall behind their competitors and the general development in their sector. Manufacturing companies are integrating digitalised features into traditional manufacturing products, thus creating digitalised products. In order for

this transition to be successful, there is a need for innovative solutions and new processes. This new trend of increasingly digitalised end products will impact the manufacturing industry in various ways, and companies will have to address these changes efficiently.

Digitalised products are crucial in order to enable sustainable innovation practices for manufacturing companies. They affect the organisation and management of innovation of the manufacturing industry, which will have to be rethought in order to leverage the potential of digitalised end products. Moreover, digitalised products are also affecting the involvement and interaction of the manufacturing end users companies with their large, enabling the company to analyse huge amount of data and thereby creating new business opportunities.

“Digitalisation of end products is about reaching your customers in a new way, about connecting products to a connected ecosystem, creating interfaces for these products and transform the information that you have and that you can get in either consumer services, getting closer to the customers, or creating new business models.”

Managing Director

Where are the Swedish manufacturing companies today?

The Swedish manufacturing industry is taking the first steps towards the “digital era”. Manufacturing companies have introduced digital products and infrastructures around them at different levels.

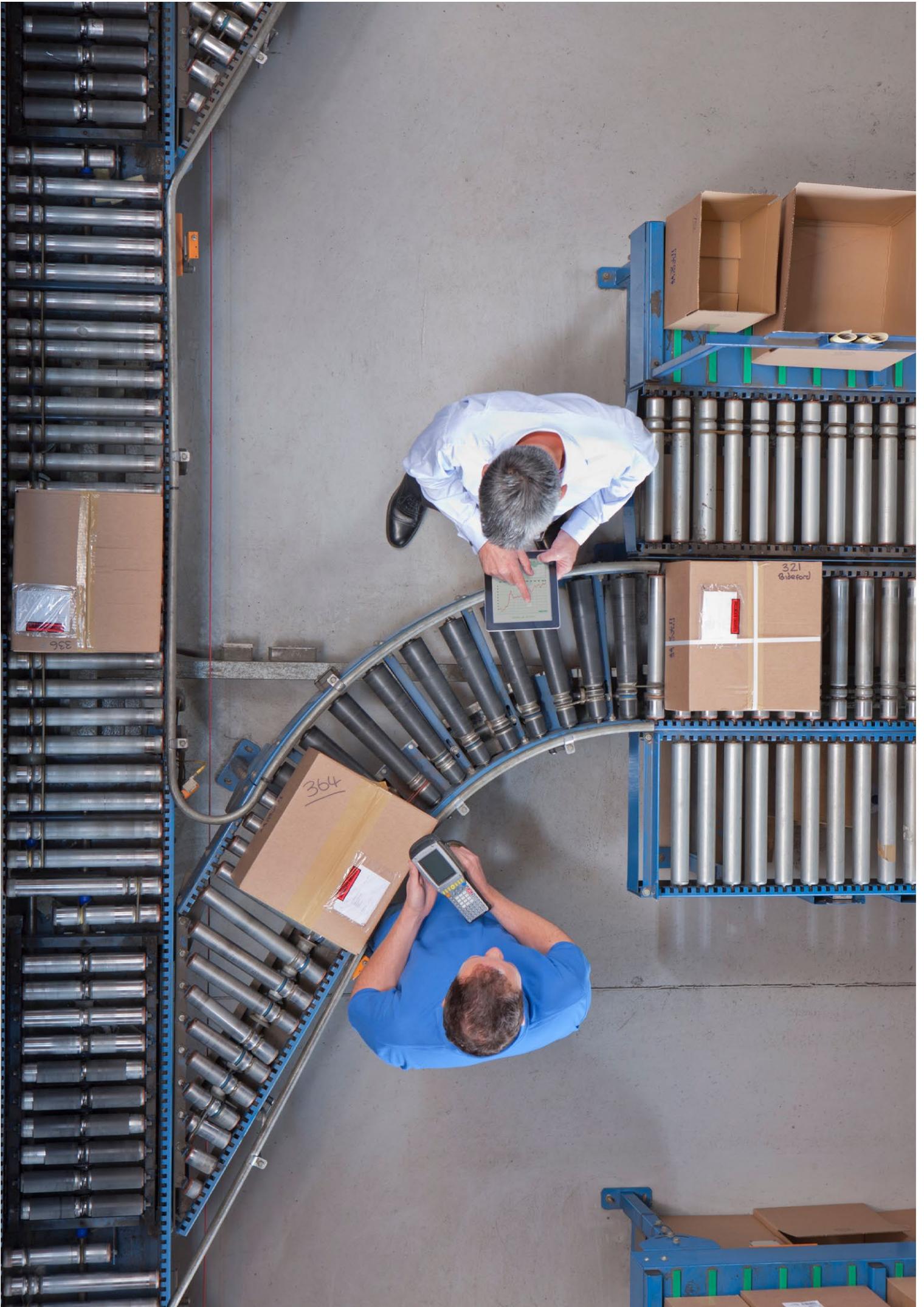
The Swedish manufacturing companies are working on digitalising their end products, a process known as external digitalisation, but the amount of steps they have taken towards digitalisation varies significantly. Here we use five steps as described below.

The majority of the companies have taken the first two steps towards achieving a digitalisation of end products by offering connected products but without really

controlling or analysing the data that they are generating. However, only a few companies have reached the third and fourth step, and they are mostly at an immature stage. Companies who are in the fourth step have skipped the third step, since these companies are in the B2B sector rather than the B2C, and therefore digital functions to customers are left in the background. The fifth step still seems to be far away for all of the companies.

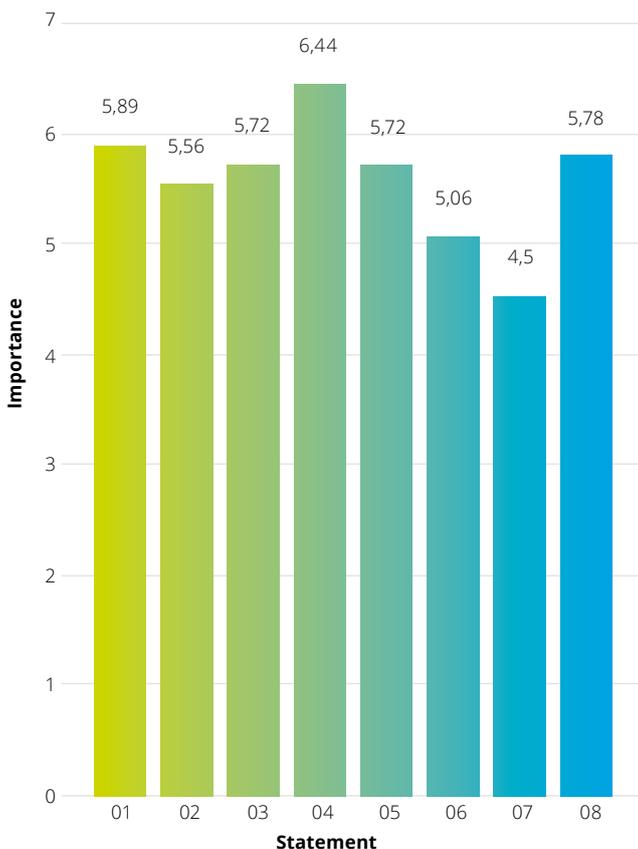
Once the connected ecosystem is created and the companies are using the data from it for external purposes, the companies will be able to use the data automatically in the factory, throughout the whole manufacturing processes.





How important is digitalisation for the Swedish manufacturing industry?

We asked the surveyed companies to rank several statements on a scale from 1–7. Doing this, we wanted to analyse the importance of digitalisation in the Swedish manufacturing industry. We found that the Swedish manufacturing companies all rank the statements about digitalisation as of high importance, and they all plan to increase their digital interaction and involvement with their end users. However, even though companies find digitalisation important, they have yet to analyse and use the data from end users.



Why are companies digitalising their end products?

The reasons why the companies have started their digitalisation of end products are divided into drivers and opportunities. The **drivers** for why the companies want to digitalise their end products are:

Satisfy the end users

Companies aim to satisfy the end user by fulfilling their digitalisation demands about connectivity and digital products, and delivering extra value to them through digital products. This can be to improve the experience and convenience for the customer as well as for general cost savings. Companies also get closer to end users through the digital products and get information about the end users in order to help them achieve the full potential of their products.

Focus on the satisfaction of the customer was found to be the business driver mostly affected by digitalised end products.

Stay competitive

Becoming and/or staying competitive is one of the main drivers that make companies start the journey towards digitalisation of their end products. By doing this, they also wish to gain a first mover advantage in the industry. Not being left behind and to keep up with competitors are also important factors when taking the decision of starting with the digitalisation of end products

Generate new revenue streams and improve the branding

Another important driver, last to be listed here is to generate new revenue streams through the creation of new digital services and to improve the branding by adding value to the core products with related digital products and services.

The **opportunities** that can be exploited when digitalising end products are:

Possibility of exploiting the technology push and the decreasing cost of digitalisation

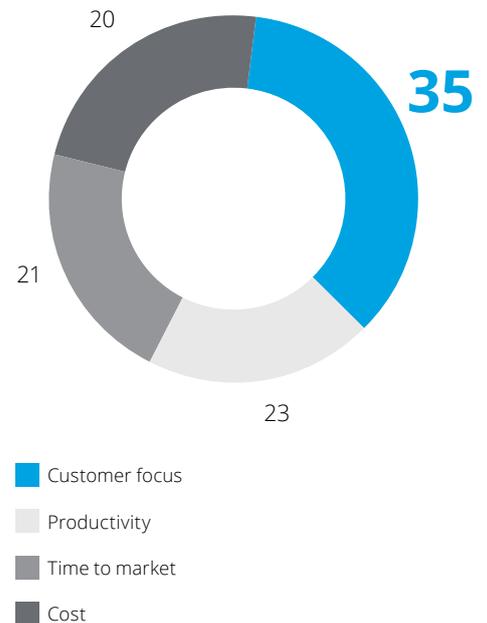
The current development and maturity of digital technologies make it possible to exploit the technology push by adding extra functionalities to traditional products. Additionally, the decreasing cost of digitalising enables connectivity and products with extra functions at a reasonable cost.

Taking advantage of the increasing connectivity

The increasing connectivity among products, end users, and between the end users and the company, allows companies to build new relationships with the end users, to increase the customer loyalty, and to create new useful data. The increasing connectivity will create an opportunity to integrate new business ecosystems. This

will bring new partners and open new markets for the companies which opens up new business opportunities.

Which business drivers have been affected by digitalised end products?



The customer focus was found to have been the most affected business driver by digitalised end products.

What is needed to start digitalisation of end products?

In order to begin with the digitalisation of end products in the right way, companies must fulfill several requirements that they are currently lacking or not meeting fully:

Understand the digital ecosystem

The digital ecosystem is not just about the digitalised end products, but also about the infrastructures and services around it. Therefore, digitalisation of end products is a new business and should not be seen as a "technological silo". The digital channels that it involves are not isolated and should be treated as a part of the connected ecosystem.

Gradual introduction of digitalised end products

Gradual introduction, both for the companies and the customers, is required since digitalisation entails a significant change. Simple digitalised products should be offered first in order for the customers to understand them. Then, the more the customers interact with the products, the system can grow with their capabilities of understanding it. Therefore, incremental development of digital offerings is needed when starting with the digitalisation of end products.

Ability to follow the progress of the society and adapt accordingly

In order to attain the drivers of being competitive and satisfy end users successfully, the companies have to strive to understand and foresee the customer needs and behaviors, and also follow and foresee the market and technology trends. However, it is not enough to just observe and understand these facts in such a fast-changing environment. There is also a

strong need to adapt fast to the changes in trends or customer behaviors, before they occur.

The need of explorative management

Since digitalisation entails a big change for the companies that try to introduce it, there is a need of an explorative management, where managers are open to new ideas and willing to look outside the traditional business in order to exploit new opportunities. Therefore, companies must be open-minded and prepared to make organisational changes and even rethink their business. The management has to be aware of the fact that the more you introduce digitalisation in a company, the focus of the core business changes to connectivity and digital. This leads to managers realising that the company needs to transform in order to embrace digitalisation.

Gaining new competences

Digital competences within software and app development, system development, and digital user-experience are currently lagging behind and is something that needs to be addressed. When it comes to system development, competence within data storage and analytics is something that is missing throughout all the companies. Additionally, digital strategists and business developers within digital business is also a missing competence which is pervading for all of them.





adapt

explore

experience

What are the barriers when digitalising end products?

Performing a digitalisation of end products is easier said than done since traditional manufacturing companies are not digital natives. The *risks* and *difficulties* when doing so were found to be a struggle to deal with for the Swedish manufacturing companies.

The *risks* that appear when digitalising end products are:

Handling and managing sensitive customer data

Dilemmas regarding integrity and privacy issues are concerning the manufacturing companies. It is extremely important to use the data in the right way. In order to do so, the companies have to either ask for permission to end users to analyse the data in the future or collect it in an aggregated and anonymous form.

Increasing competition from disruptive entrants

Since digitalisation is keen to disrupt the current business models there will be increased competition from disruptive entrants. These new entrants will not be related to the core products or business and are mostly represented by agile software-based start-ups.

Digital security

IT security around the data of the ecosystems is considered vital since this data should be protected from hackers and cyber-attacks. The instability of digital systems is also another risk for the companies. Since the products will share the same software, it exposes the

risk of software bugs, meaning that if one software breaks down, all software within the products will break down.

The *difficulties* that occur during the digitalisation of end products are:

Hard to change people's working processes and convince top-management into changing

Since the companies have worked with the same core businesses for decades, it is hard to change people's working processes. It is also difficult to convince top management into changing when the business is going fine. The fear of cannibalising their traditional business is also an issue since it is difficult to convince top management to invest in something new with uncertain business outcome. Therefore, it is important that the top management understands the pressing need for digitalisation and sees the benefits that digitalisation is bringing to their business.

Inability of developing "Go-to-market strategies" for digitalised products

Since digitalised products are something new for traditional manufacturing companies, a barrier is found within the area of Marketing & Sales. Companies are struggling with how to sell the digital offerings, how to package them, through which channels, and in which markets. Companies currently do not know how to analyse the data and transform it into offerings that customers can pay for. They have a lack of knowledge about what to do with the collected data when it comes

to analysing it. Regarding the usage of the analysed data, companies are insecure about where to send it, to whom, and what to do with it. Finally, companies are unable to create a business around digitalisation, which means how to transform the possibilities that digitalisation enables into a business context. Factors such as creating offerings that customers can pay for, monetising from digital services, turning ideas into business, and which functionalities or services to add, are believed to be key for developing this business area.

Attract digital talent or competences

The development of digital competences is difficult for the companies because the skilled software developers and digital strategists do not go to traditional manufacturing companies. Instead they go to pure IT or software companies. The difficulty of attracting the right digital competence to their industry is due to the fact that digital business is not their core business. However, software competence, digital business developers, and people with competence within building structures for data analytics are vital.

What are the consequences of digitalising products?

Companies are starting to introduce digitalised products. Organisations and the environment around them are starting to experience changes that will have to be managed in the most efficient way. The effects that digitalised products are having on the Swedish manufacturing industry are represented in the categories below.

End users

The customers' demands and their behavior are proven to be adapting to the digital era that is being created in today's society since customers are shifting from traditional usage to digital usage. End users are demanding digital features, and interconnected products and services, since they are becoming a part of everyday life. However, since digitalisation opens up endless possibilities, the customers' demands are simultaneously becoming more unclear. Their demands are changing at an extreme pace since they follow the changing environment that digitalisation is triggering. We also see that there is an increasing demand for individualisation and customisation among customers, where the companies will need to offer personalised products to satisfy their customers. However, the customers' basic needs and core values are not changing, but digital ways of providing these while adding complementary ones are emerging.

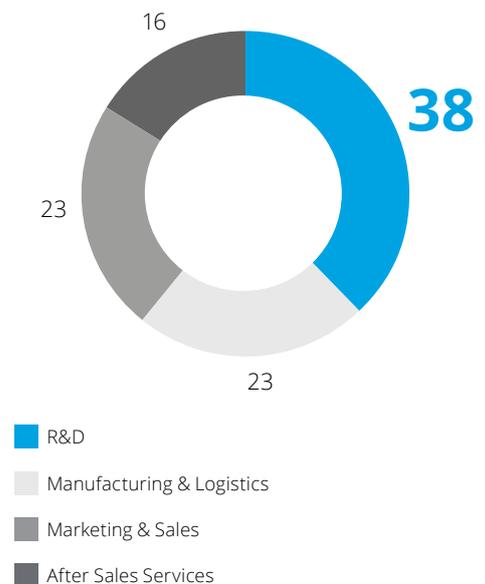
Structure and Organisation

Digitalisation of end products creates a need for the involvement of more partners that are not related to the cores business. However, it also enables increased collaboration among new and current partners. Due to the closer collaboration, the relationship between the companies

and their partners will be more open and transparent. This change in the *external organisation* is due to the need to gain digital competence and exploit new business opportunities from digital partners. We also find that digitalisation enables companies to omit their retailers and dealers due to the increasing direct contact that they have with their end users.

Regarding the *internal organisation* companies are having a "silo thinking", meaning that they are either concentrating all the digital initiatives without them being connected to the rest of the company or that the digital initiatives are scattered and isolated. In order to deal with this issue, companies are trying to organise digitalisation in an integrated and cross-functional way, where it goes throughout all the departments. Therefore, the digital initiatives should be collected under a cross-functional common umbrella, where all the initiatives are tied up in order to align resources and departments around digitalisation. Within this umbrella, a clear visible head with a structured mandate is essential. In order to explore digitalisation while simultaneously exploit the core business, companies have to either divide certain departments into different units or to create a spin-out. Eventually, companies need to develop a proper infrastructure to deal with the services that digitalisation enables. Moreover, there is also a need of managing and analysing the data that comes from the digitalised products, thus a whole business around digitalisation where new units and even departments, linked to the rest of the company, need to be set.

Which business areas have undergone the most digital transformation?

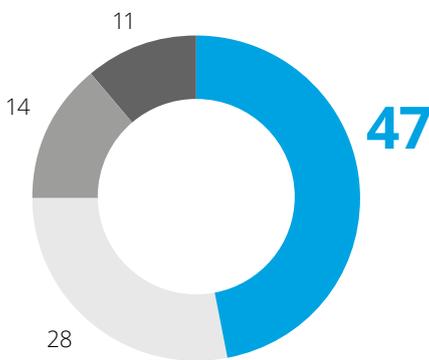


The effects that digitalised end products have had on the internal organisation was found to be most remarkable in the business area of R&D.

Business Models

Digitalisation of end products is disrupting the business models and it will be at the core of the business models in a near future. The new business models are allowing new services, products, and processes which are more focused on software. Companies are at the verge of going from pure manufacturers to solution providers, even though they are just at the beginning of this path.

Which organisational characteristic is affected by digitalised end products?



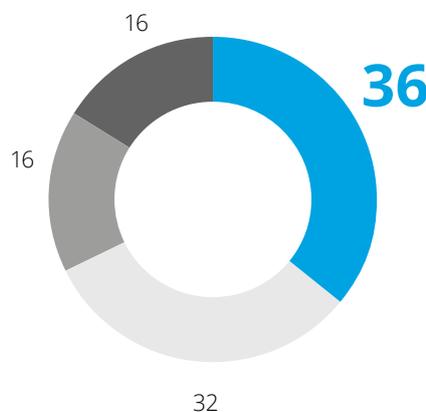
- Business model
- Information Thread Along the Value Chain
- Horizontal Integration
- Vertical Integration

The business model was found to be the organisational characteristic that is affected the most by digitalised end products.

Regarding processes, a shift from traditional marketing to digital marketing has been ongoing for some years now. We also find that the importance and time spent on software development is increasing. As the software processes are faster than hardware, this is allowing companies to improve their time-to-market and made their development faster. Their increasing focus on software is making them able to incorporate software into their existing hardware but they will have to do it more and better with the manufacturing of digitalised products. Since digitalisation is creating a connected ecosystem, a shared digital platform among products is being created. Companies are modifying and connecting their traditional products with digital technologies. This

is creating system solutions rather than products alone. These products are also starting to be integrated with current end users' personal devices. The demand for personalisation also forces companies to develop more flexible user interfaces, customisable screens, etc. The design and the user interface of digitalised products becomes key since they have to be user-friendly, seamless, simple, and easy to use and install, but at the same time more customised. The increasing servitisation that is being enabled from the data that digitalised products are providing will revolutionise the business models. Digitalisation of end products gives the possibility of providing new services with multiple offerings, combining products and services. Digitalisation of end products enables the creation of more service-based business models meaning that more value will be generated in the future from the services that the products provide, rather than the products itself.

Which business area will be impacted by digitalised end products the most?



- After Sales Services
- Marketing & Sales
- Manufacturing & Logistics
- R&D

Companies believe that "After Sales Services" will be impacted the most by digitalised end products in the future. This amplifies the assertion that servitisation will gain importance in the Swedish manufacturing industry.

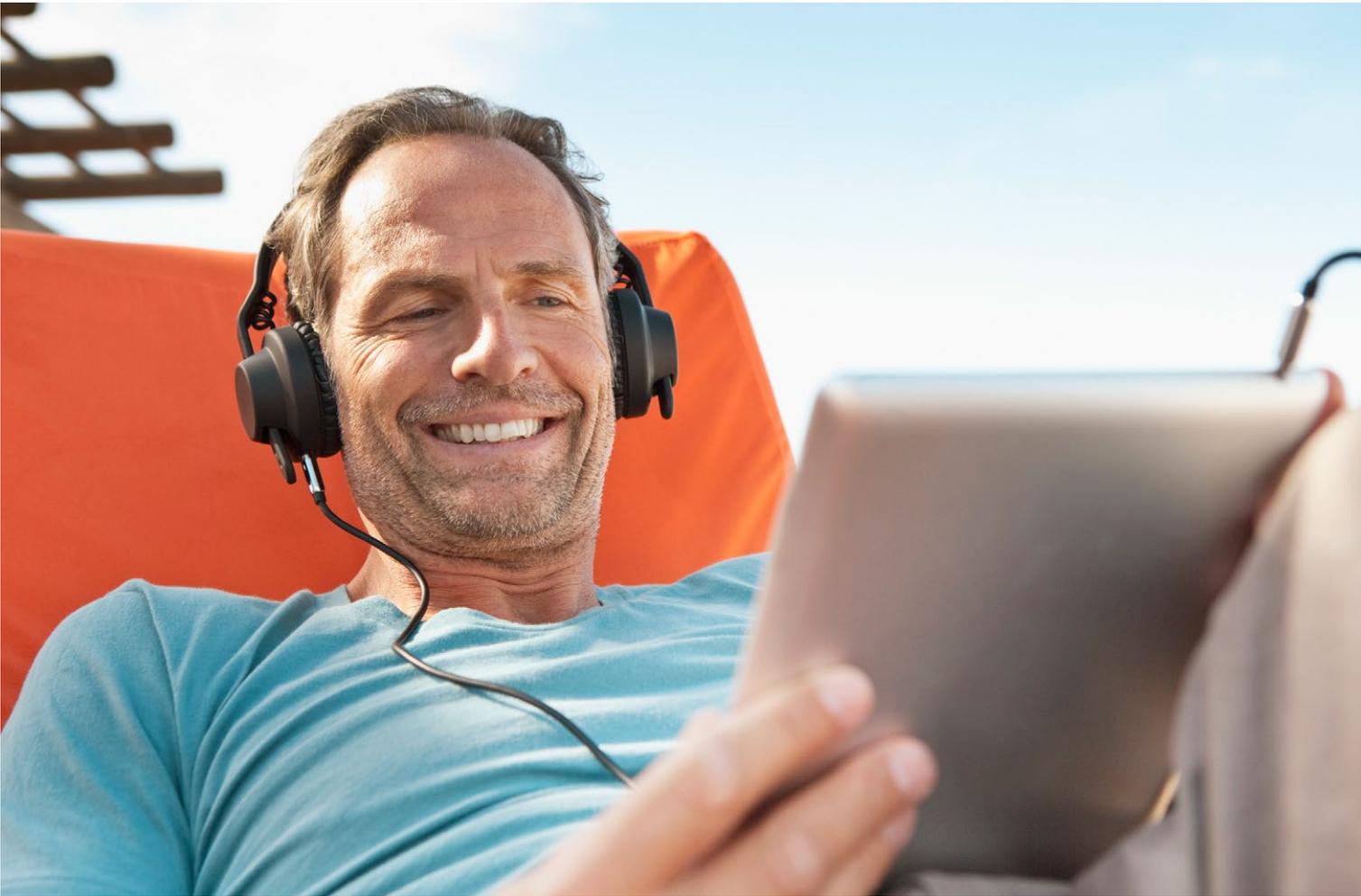
Even though digitalisation will disrupt the business model, it is not acting as a destructive force but it is *complementing current business models*, since digitalisation is enabling the companies to keep traditional products while adding digital functions or services to them. In this way, the products can keep their core values while adding digital functionalities through software. The additional functions are starting to grow and are now required to be competitive since they are becoming increasingly important for the users and they provide extra customer value.

Interaction and Involvement with the end users

Digitalisation of end products enables more and easier interaction and involvement with the end users through digitalised products and channels, instead of an internal focus on manufacturing. Digitalisation is not just enabling, but it is also a requirement for these activities as it provides new communications methods through digital channels and digitalised products.

Digitalised end products are enhancing the customer focus since they are enabling a closer relationship between companies and their end users since it enables to interact directly with the end users through digital channels and digitalised end products. We also see that digitalisation enables a new digital customer experience since it enables companies to reach customers in a new way and create a whole connected and integrated customer journey.

The digital interaction and involvement through digitalised products with end users is increasing. This new digital interaction and involvement adds a new dimension to the traditional means since they are enabling companies to collect a large amount of data through connected devices and digital channels. However, the digital interaction and involvement should be combined with the traditional ways such as focus groups, workshops and interviews since human interaction is still considered vital in order to get qualitative input and identify the basic needs and validate ideas.



“The digital way of interacting is a way of improving the quality of the dialogue with the end users”

Business Development Director

The use of digital channels brings the companies' end users into the development process by letting them become part of it. This is done through online focus groups, Skype meetings, digital reviews, and web services, where they can communicate with the end users in a new way through their personal devices.

The increasing digital interaction provides companies with a new way of gathering large amounts of quantitative data through the digitalised end products and digital channels. In this activity, data is gathered from end users through interaction with the product itself or the digital channel. The digital interaction is enabling companies to harvest data, monitor the connected ecosystem, and possibly find data and patterns that they were not

aware of before. A new and smarter way of interaction has been created where companies now have the possibility of seeing behaviors and patterns regarding the usage of their products. Companies can see how, when and where the products are used as well as which features are being used. This data also enables companies to observe the daily routines of the end users and get reliable information about them. Digitalisation of end products enables a new way of communication that breaks distance barriers and provides faster, more direct and more specific customer feedback, which allows for a better understanding of the demands of the end users. Companies can now receive more, better, and real-time data about the end users.

How should companies act in order to leverage the effects of digitalised end products?

Based on the case study and on the changes in the business environment that digitalised end products are causing, we have listed some of the resulting implications that companies should have in mind when dealing with digitalised end products. In order to leverage the effects that digitalisation of end products is having on the Swedish manufacturing industry, we here provide a list of suggestions for companies on how to develop their organisation and management of innovation. We have also listed the most relevant business opportunities that companies should consider in order to exploit their digitalised end products.

Organisation and Management of Innovation

We give the companies the following suggestions regarding the organisation and the management of innovation:

- Shift to a system innovation mind-set based on the triple helix, with a cross-functional and integrated management of innovation. This mind-set consists of three pillars, technology, business, and customer demands and should focus on:
 - Strengthen internal collaboration around the innovation process.
 - Form multidisciplinary innovation teams.
 - Create a shared digital innovation vision aligned with the strategy of the company through people high up in the organisation.
 - Strengthen innovation around digitalisation in the following areas:
 - Increase business model innovation by including business developers in the innovation teams.
 - Become more user-centric, by performing both traditional and digital user involvement and interaction.
 - Perform open innovation by enhancing collaboration with external partners.
 - Do structural changes such as spin-outs or department divisions to enhance exploration around digitalisation.
 - Build a connected ecosystem between companies, customers, dealers, retailers and sales companies by:
 - Redesigning the supply chain by creating an integrated relationship among the different members of it.
 - Managing the new partners' relationships.
 - Achieve fast, agile and flexible innovation processes through:
 - Managing the integration of software into hardware products by ensuring continuous software updates to upgradeable hardware products and retrofit solutions.
 - Shifting to a short-term and flexible strategic planning with small launch strategies and an incremental development focus around digitalisation.
 - Developing faster decision-making processes by managing and organising small teams and making processes more agile and flexible.
- Business Opportunities from the Digital Involvement and Interaction**
- There are several business opportunities that arise with the digital involvement and interaction in the Swedish manufacturing industry that organisations should consider in order to succeed in the era of digitalisation and customisation. Before listing the business opportunities, the reader should be aware that the Swedish manufacturing companies are not yet ready to take full advantage of the business opportunities that come from digital interaction and involvement even though they are starting to do so. With this being said, key future business opportunities to consider are:
- Digital interaction and involvement. This can help companies to match the customisation trend by enabling the development of more personalised and flexible products through:
 - Facilitating the configuration of software and customer interfaces.
 - Enabling the recommendation of the best product for each user depending on how they use it and in which environment.
 - The data collected from the digital interaction and involvement enables a servitisation in the manufacturing industry. This opens up new opportunities that are not related to the core business, such as digital services or digital add-on functions.
 - Digital interaction and involvement can contribute to the optimisation of products. In various ways, this can help address problems or improve performance, usage, and uptime.
 - The data that digital user-centered practices enables can also bring internal advantages to the organisation since it can improve the development and marketing processes.
 - In the near future, digital interaction and involvement will enhance the customisation trend by enabling a new generation of digitalised services. This will provide:
 - proactive, personalised, and automatic services with products initiating interaction with the user.
 - Contextualised, individualised, and intuitive services.
 - Furthermore, it also allows companies to build a service portfolio with a tactical and dynamic service planning.

“If you introduce digitalisation in a company without doing strategic changes you are killing innovation”

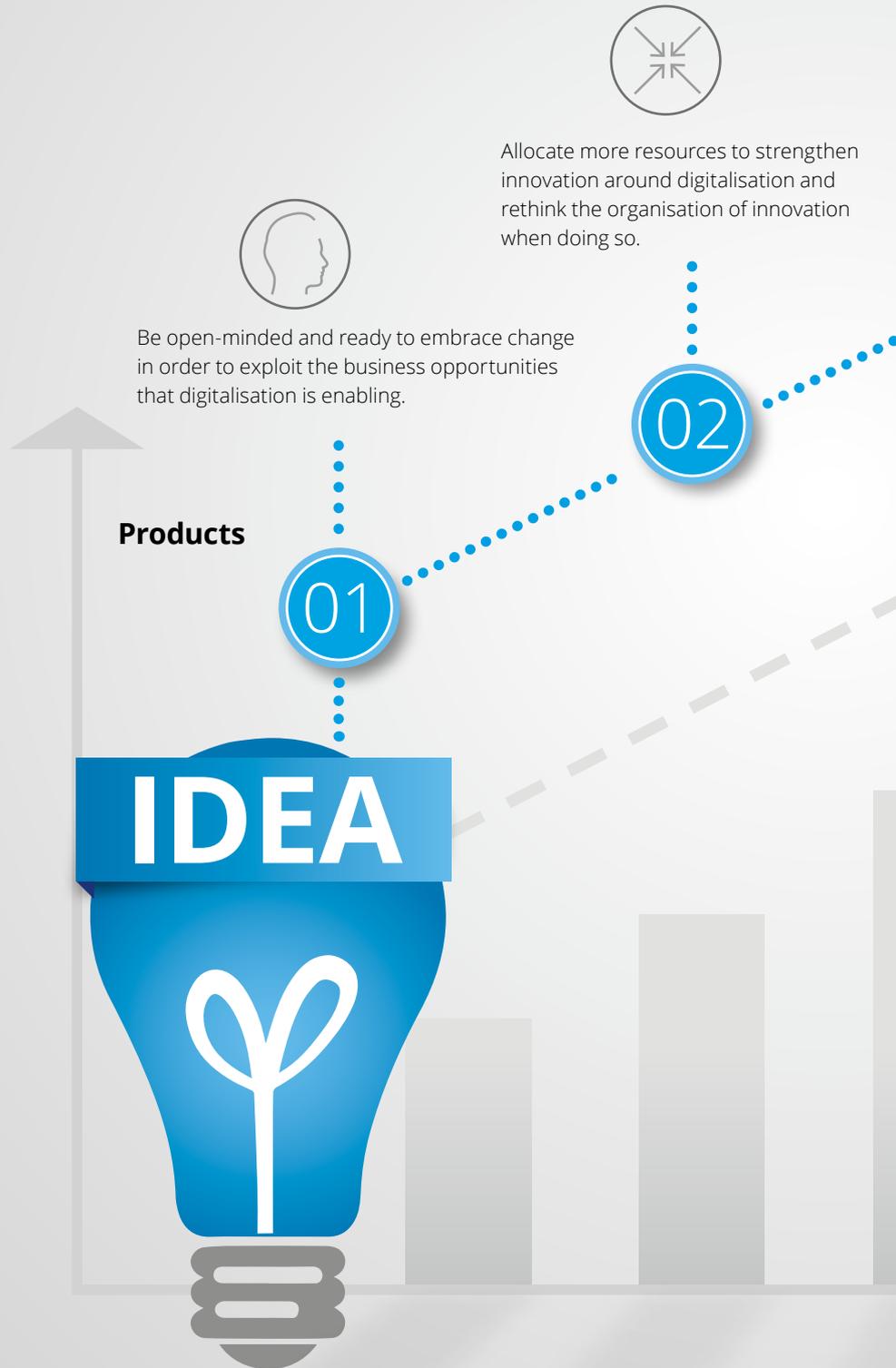
Vice President Service Market



Conclusions

In order to be successful in the future there are several main points that managers should keep in mind when organising innovation in the digital era. Managers need to shift to a system innovation mind-set with a cross-functional and integrated management of innovation. Managers will have to strengthen the internal collaboration within the innovation process and form multidisciplinary innovation teams. Managers must also create a shared digital innovation vision that is aligned with the strategy of the company through people high up in the organisation. We also believe that fast, agile, and flexible innovation processes must be created. This should be done by managing the integration of software into upgradeable hardware products and use continuous software updates to keep the hardware products up to date. This should be supported by short-term and flexible strategic planning with small launch strategies around digitalisation.

Managers should also consider that the introduction of digitalised products is likely to disrupt the current business models since the data associated to the digital interaction and involvement is triggering a servitisation in the manufacturing industry. Therefore, they will need to rethink their business in order to exploit this powerful change. These new business models will be full of more personalised and flexible products that provide individualised solutions in the form of extra and proactive services or add-on functions, which are not necessarily related to the core business. This is forcing the managers to be open-minded and ready to embrace change in order to take full advantage of digitalisation.



Be open-minded and ready to embrace change in order to exploit the business opportunities that digitalisation is enabling.

Allocate more resources to strengthen innovation around digitalisation and rethink the organisation of innovation when doing so.



Keep a strong focus on end user demands and needs by continuously interacting with them.

03



Create multidisciplinary teams as an indispensable characteristic throughout the whole organisation.

04



SUCCESS

99%

Case study

This white paper is based on a master thesis that was written by Jorge Peydro and Stefan Stanica with support from Deloitte. A number of leading Swedish manufacturing companies were approached and participated. A survey was conducted as well as 18 interviews with people of senior position within three different functional areas; R&D/IT/Digital, Marketing & Sales, and Strategy and Business Development.

This white paper analyses the impact of the digitalisation of end products, with a focus on Swedish manufacturing companies whose products are operated by end users and the direct systems connected to the products, such as databases or digital channels. This includes making the touch points with customers for marketing, sales, and services digital plus digitally enabling the products themselves.

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