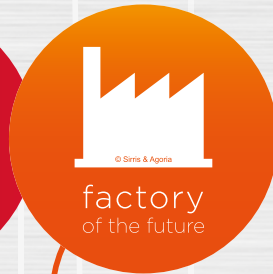


masterplan innovation

for the Technology Industry

The future of business, products and manufacturing:
a new era of opportunities and challenges



EXECUTIVE SUMMARY

Preface

In order to survive today, companies have to continually reinvent themselves by finding the sources of innovation that will enable them to create value. This does not only concern the products or services they have to offer, but also the way they produce and market them. In other words, finding the right balance between product/service, production and business model is essential.

The speed at which technology – with all resulting trends – appears and evolves is so high that companies are truly under pressure. Agoria and SIRRIS support member companies in their effort to gain insight, by providing them with an overview of macro-trends that should be considered as absolutely crucial for the Belgian technological industry, whether in terms of new products, production processes or business models. Agoria and SIRRIS also want to help them to understand major trend flows, in order to discover opportunities and establish the prerequisites enabling each company to find its own path to innovation, value creation and success.

This is the role of the Masterplan Innovation devised by Agoria and SIRRIS. We trust this plan can help you to expand your horizons and, above all, that it will give you an opportunity to discover lots of practical ideas.






Marc Lambotte
CEO Agoria



Herman Derache
Managing Director SIRRIS

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Acknowledgements

This Masterplan Innovation is a joint initiative of Agoria and Sirris, the former being the federation for the technology industry, the latter the collective center of the Belgian technology industry. Both partners conceived this plan to support companies in their search for innovation.

The plan has been co-created with the contribution of many people from different origin and background. First of all, we would like to thank the numerous industrial entrepreneurs who invested time in profound discussions and sparring to ensure the industrial insights presented in this plan.

The document itself has been developed and written with help and support from inside and outside both organizations, Agoria and Sirris. A special thanks goes to the team of the Expertise Centre Innovation of Agoria and the Corporate Development team of Sirris. Their perseverance and motivation over the last two years has led to this unique industrial perspective on innovation.

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Goal and concept

Why a masterplan innovation?

For decades, companies in the technology industry have been confronted with increasingly faster rate of evolution. Context has been affected by major changes in society, economies and also technology. Numerous organizations, both national and international, have been providing support for companies by way of analyzing and summarizing the evolutionary processes, detecting important future trends and trying to provide some insight with roadmaps and future studies.

Nevertheless, it remains a difficult, indeed unfeasible task for a single company to translate this flood of information into relevant and practical implications. Most companies are aware of the importance of knowing and understanding these possible implications for their daily operations and decisions. Although it would be true to say that most companies have neither the time nor the absorptive capacity to thoroughly examine these studies and identify the disruptive impact of some actual evolutionary processes.

The next, crucial step must also be taken in addition to these challenges. Once the evolutionary processes and trends relevant to its own business and business contexts have been understood, a company needs to translate these into products or services that create value, or that customers are willing to pay for. This actual process is complex and risky and it is called innovation.

Both Sirris, the collective center of the Belgian technology industry, and Agoria, the federation for the technology industry, have conceived a plan to support this process by drawing up an Masterplan Innovation.

masterplan innovation

What exactly is this masterplan?

This masterplan innovation contains a vision of industrial innovation in the near future. This vision takes into account societal, as well as economic and technological trends. The purpose of this industrial vision is to serve as a practical framework in which companies can develop new ideas for their future innovations.

This framework has been initialized by numerous roadmaps and future studies. About 200 roadmaps, relevant for the technology industry, and published in 2012-2015, were consulted as a source for the plan. These results have been confronted systematically, with the insights and visions from over a hundred industrial entrepreneurs and companies. Based on this, the masterplan has constructed a vision of what the actual trends and state-of-the-art may mean to the actual context of a company. It shows what a company should consider when starting to work on innovations for the near future.

The time horizon for this masterplan is just a couple of years. Long term predictions on societal, economic or technological evolutionary processes remain the playground for academia and research institutions. These long term trends are important and some of them are withheld from this masterplan because of the short term implications for companies.

This is because the underlying document does not strive for completeness and neither is it a “meta” roadmap of multiple roadmaps. The principle motivation behind including long term evolution in the masterplan, is the potential for concrete innovation from companies in the technology industry. The uniqueness of the masterplan doesn’t lie in the consolidation of these roadmaps and future studies, but in the evaluation and insights from hundreds of industrial entrepreneurs and companies involved with these trends and evolutionary processes.

This has resulted in an “industrial perspective” of innovation and therefore guarantees the applicability and relevance of the masterplan for companies.

The ambition of this masterplan innovation is for it to become a dynamic document – constantly evolving and being updated – so that it provides a relevant influence and gives support to companies in search of new opportunities and innovations.

What is the plan structure?

To ensure the industrial relevance of the masterplan, the structure of the plan was built around some basic concepts that are well-known in industry. Companies run businesses. Therefore they conceive products and services. The products and services need to be manufactured. If the complex challenges of distilling the future impact of major trends and evolution processes on companies is to be challenged, then an attempt should be made to define the future impact on either the business, the product or the factory. This led to the starting point for the masterplan.

- When defining the **business of the future**, the impact of society, economy and technology on how companies are creating, capturing and delivering value towards their customers should be taken into account.

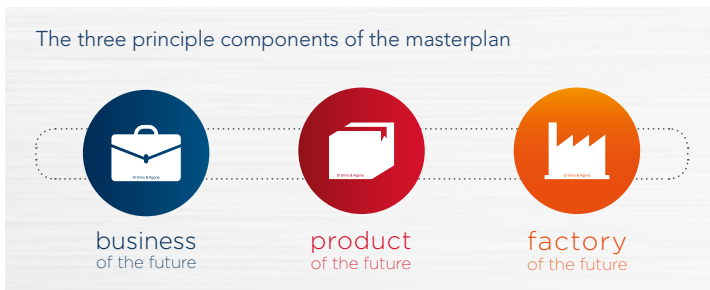
- Where there is a desire to define **products or services of the future**, questions about what functions and features will be needed to be successful in the future economy and markets also have to be tackled. What functions and features will be needed to sustain the future society ? What functions and features will be enabled by future technology? Or even more challenging, what new product and services could be necessary or possible?
- For **factories of the future**, the basic questions that have to be answered are related to what the future capacities factory requires when taking into account the current evolutionary process. The more challenging questions deal with the ability to manufacture even the products of the future within the context of businesses of the future.

It is clear there is an intense correlation between the business, products and factories of the future. It was a deliberate choice to split these themes in order to make complex implications comprehensible and explainable. A company's level of ambition in one domain will necessarily require a specific capability and maturity in another. These interdependencies are not the subject of this document, but are dealt with in more into detail elsewhere.

In this respect, the masterplan does not claim to be complete. The main purpose remains the same: providing an industrial view of innovation and deliver a usable and practical framework in which companies can reason and develop new ideas for future innovations.

Trend flows & models: the masterplan building blocks

This masterplan innovation is divided into three principle components, namely, business of the future, product of the future and factory of the future.



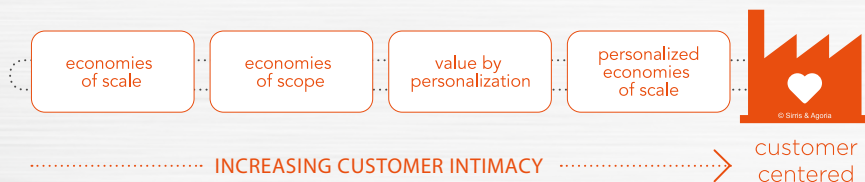
Each component has different trend flows. A trend flow describes a dominant pattern for the business, product or factory of the future, and how they could evolve in Belgium. These trend flows are selected and drawn up based on the input of numerous Belgian companies while taking into account the economic, technological and societal reality as described in the different national and international roadmaps.



Many trend flows can be seen as “worth consideration” when making plans for the near future at a company. They are drawn up from the point of view of the technology industry and in line with international trends and evolutionary processes. When considering a trend flow, a company should have a specific level of ambition and capacity in order to cope with the challenges presented. This required capacity depends on several parameters, which include their own specific identity, market position and internal competences.

To support differences between companies, each trend flow presents several models with different levels of impact. These models provide a specific description of what the implications could be for a company when taking account of the level of ambition present. There are no good or bad models. The company’s strategic context and choices must be taken into consideration in this respect.

Example: “Customer-centered manufacturing” is an important trend flow at the Factory of the Future and has four different models to describe different levels of application.



How to use the masterplan?

When developing new ideas for future innovations, companies in the technology industry can use this Masterplan Innovation as a framework and source of inspiration. Key questions such as, "What are the options for the near future taking into account the current evolutionary process in technology and society?", can be initially answered using this document.

Companies can find additional content online. Many of the most relevant roadmaps are summarized and available from Techniline, Sirris's online technology library. Several industrial case studies are available that illustrate different trend flows and specific models. A growing body of knowledge helps to encourage companies towards challenging their own ideas and innovations.

The Sirris and Agoria advisors are ready to support companies to apply this framework to their own industrial context. By digging deeper into the content, the advisors are able to assist with specific work forms that have been developed and to provide greater detail. For the different trend flows and models, various key characteristics are identified that can help with identifying the impact of certain insights within the organization. Implementing the models might require companies to acquire new skills, knowledge and technology infrastructure. More in depth knowledge about the underpinning skills, transitions and technology is being build up.

In addition to this application of the masterplan within the context of individual companies, this plan also acts as a general framework for Sirris and Agoria when serving the technology industry as a whole.

- Being the collective center of the Belgian technology industry, this masterplan for Sirris acts as a guidance to steer the choices in its portfolio of technology domains.
- Regarding Agoria, which is the federation for the technology industry, this masterplan is the framework that helps it to determine the most relevant priorities and actions within the innovation domain.

The making-of

The starting point for this masterplan were several hundred roadmaps and future studies within the domains of economics, society and technology. They were all closely studied in order to distill the dominant trends and evolutionary processes within those domains. These results were validated and interpreted by more than a hundred companies from the technology industry. They generated more than 700 features and functions concerning the business, products and factories of the future.

The detailed findings were aggregated and summarized into ten different trend flows. They combine an industrial viewpoint in which the dominant trends are identified. The trend flows provide a clear picture of how the business, products and factories of the future might evolve.



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business
of the future

Business of the Future

Today companies are overwhelmed with trends, mega-trends and even paradigm shifts on an economical, societal and technological level. Those (r)evolutions could possibly turn their business upside down. Some of those evolutions are merely 'interesting to know', some are even irrelevant, but others better not be ignored. After all, many trend analyses are done in specific domains, markets and value chains. It is difficult to generalize and transfer their relevance and apply their conclusions to a broader audience than initially meant.

Nevertheless, some trends are vast, so that they will inevitably impact the technology industry and change the way companies structure their business in the future. It is about evolutions in a growing demographic structure, e.g. aging, distribution of wealth, labor force, digitization of economies and societies, causing a "*flat world*", (un)availability of natural resources, energy transition, urbanization and the organization of space and mobility. As a result, disruptive new business models are emerging and they transform the competitive landscapes across industries.

Companies in technology industry realize these are dynamic times, in which challenges can quickly change into opportunities and vice versa. While defining the business of the future for this masterplan, an industrial view has been developed with companies across the technology industry. The main idea was to find out what should be taken into account for the coming years, in order to anticipate the major upcoming changes. How do companies need to fine-tune or adjust their strategy or business model, in order to capitalize on the major upcoming changes?

Back to basics

It is widely known that effective strategies rest on three basic foundations: on how companies carefully create, capture and deliver value towards their customers. These basic foundations were used as a frame to structure the different inputs and points of view. Very soon it has become obvious that for each foundation a clear pattern can be identified, which is what we call a trend flow in this masterplan.



Creating value through collaboration in a changing world

For companies, it is all about understanding how customer needs will evolve, about understanding how technologies will evolve and how they can develop world class products and services that exactly meet customer needs. This is about the creation of new and superior added value.

Further on in this masterplan, the Product of the Future and the Factory of the Future will be discussed. It will be indeed about new ways of creating superior value. The smart inter-connected products of the future will merge the separated worlds of software and physical products. This will require complementary sets of skills to integrate the best of both worlds. Mastering these complementary sets of skills will be a key element to future success.

It will be a difficult task for companies to timely incorporate all necessary skills and knowledge at an affordable cost and risk. Since the rate of change is accelerating and more specifically, the disruptive nature and the simultaneous appearance of changes is increasing, it is probably not even a wise decision to do so. Collaboration as a catalyst for innovation will be inevitable. But no collaboration as we know it. It will be a dynamic combination of value creators, a smart combination of partnership and alliances, each mastering specific skills and knowledge and creating and adding specific value to your offering.



Servitization as a new way of capturing value

Capturing value is about the basic question every company asks itself: “Will these great ideas and products generate large amounts of money?” Creating value is not enough, it is essential to capture the value as well. Value can be captured through a variety of mechanisms, including the uniqueness of the offering, the complementary assets it encloses and the structure of the value chain. Being unique is all about controlling the knowledge generated by an innovation, being “the only game in town.” With complementary assets we mean those assets that allow a company to make money, even if the innovation or offering is not unique. It is about controlling the assets necessary to exploit the knowledge generated by innovation. Finally, it is about understanding the dynamics of power in the value chain concerned.

Servitization as a concept to capture value was already introduced in the eighties of last century. The technology industry has recognized a competitive advantage by offering services to better satisfy customer’s needs, to intensify customer relations or to extend the value proposition. The delivery of those services is heavily dependent on human intervention and resources. It scales linearly with the resources needed, resulting in high costs for service delivery.

This situation is rapidly changing as servitization grows out of its analog context. Innovative, digital technology allows automation and boosts productivity of service delivery and application of servitization at a larger scale, more closely linked to the customer and at lower cost.

Digitized servitization offers opportunities for the development of innovative product-service systems and for new disruptive business models. It allows a company to reclaim parts of the value chain and control their collateral assets more tightly. The ultimate consequence of this trend flow is that products and services become more integrated, sophisticated solutions, allowing companies to defend their competitive position in a totally new way.



Ownership is changing the way value is delivered

Last but not least, the value needs to be delivered to the customer. It is actually executing the strategy using appropriate business models. Companies need to manage their organizational competence, linking research & development to their business. They need to handle the difficult fundamental tradeoffs between functional focus, customer focus and product focus.

But the customer has changed. Customers buy a product or service for a specific purpose: to get a job done. Perceived value for the customer as well as the value delivery towards the customer is no longer exclusively based on a transfer of ownership. The “sharing economy” generates new ways of delivering value. Possession and ownership of a product as such is becoming secondary compared to the effective job that the product or service gets done.

The traditional model of ownership will evolve as societal and environmental pressures encourage people to demand more integrated products and services. This gives tremendous new opportunities for companies to re-engineer their business models. Their new value proposition focuses on solutions that perfectly execute the job-to-be-done, because this reflects the customer’s true definition of value.

This trend flow focuses on how a company can improve or maximize its value offer and delivery towards (new) customers, by understanding their needs and using a job-focused mind-set.

CASE Econation

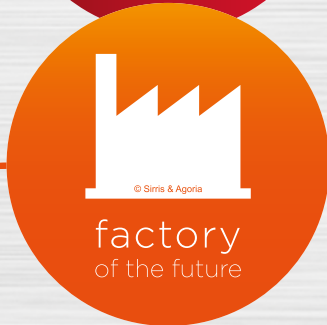
Perfect execution of job to be done

The needs and wants of contemporary customers have changed their behavior towards ownership and the way they perceive value. As a result business models involving a trade-off at time of purchase or a total cost of ownership over the life-cycle are being extended with models based on experience or the perfect execution of the job-to-be-done. In the last model, the value proposition focuses on practical solutions that perfectly execute the job-to-be-done, because this reflects the customer's true definition of value. Customers don't buy or care about products and services; they hire various solutions at various times to get a wide array of jobs done. Hence, the 'right to own' the product becomes secondary compared to the 'the job that gets done'. A 'product in the future' is not necessarily a 'product' anymore.

Econation: daylight without investing in a daylight system

The LightCatcher is a compact, intelligent light dome that enhances and spreads daylight into a building in the most optimal way. It enables to switch off the light fittings up to 3,650 hours a year. Econation installs intelligent skylights on the roof of its clients. It shares the benefits of energy savings with it. They receive the same intensity of light as previously but for a guaranteed lower price.





masterplan innovation overview



servitization



ownership



software
as utility



sustainable



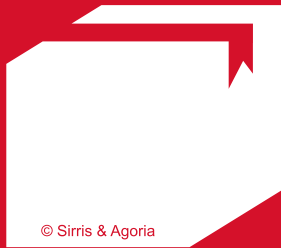
responsive



digital



sustainable



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product
of the future

Product of the Future

It is difficult to fully understand the present meaning of a “product” and all its connotations and consequences for the future. If we take a step back, we can try to grasp the complexity of the product of the future.

People have always tried to shape their environment to suit their needs. In early times, this led to the creation of objects and tools such as the wheel and the plow. Later on, this led to more sophisticated products using all types of skills and technology like the printing press or the wristwatch.

With the industrial revolution in the eighteenth century, and the “great inventions” of the nineteenth century, we entered an era of continuous, explosive growth and innovation. Since then, inventions are coming at us at an increasing rate. The invention of the automobile gave us personal mobility. The telegraph and telephone enabled the transmission of messages over long distances. Each of these advances emerged as a result of experimentation, failure and success that was spread over long periods of time.

Initially, these innovations were seen as curiosities, or exotic artifacts. They were familiar only to those “in the know” and were affordable just to a small elite. Full value was only realized when they were made robust and were connected through larger networks and infrastructures, and finally came within the reach of the masses. Further technical changes, such as those that expanded the food supply chain, and enabled longer lifespans, helped to accelerate world population growth. Which in turn raised new challenges.

What happened was a metamorphosis. Demographic changes in developed countries began to fuel the growth of something much bigger and more complex than the world had ever seen before. The inventions of the previous decades, like the automobile, the telephone, the radio, were themselves complex, but they were all self-contained. To be successful, they had become part of something else. For instance, the electric light was part of a technical energy system that included the power plants generating the electricity, the transmission lines bringing it to the light bulb, and the coal mines supplying the fuel for energy generation. Those coal mines themselves needed transportation systems, etc. Over time, these systems and infrastructures required standards, regulations and sometimes government involvement.

The metamorphosis of systems that are increasingly interacting with each other, continues to accelerate. The twenty-first century is characterized by continued population growth, and an ongoing transformation of how we globally communicate, both with others, and with the physical world - all thanks to the internet.



*This evolution towards system thinking and system engineering was recognized as an important industrial challenge and dominant pattern for the product of the future. Accordingly, this pattern was framed as a “**Smart Inter-connected Product Systems**” trend flow.*

The role of ICT, software, mobile technology and the internet in this systems metamorphosis cannot be underestimated. Throughout the last decade, software and ICT tend to pop up in more and more domains, also those domains that have no historical software background or experience. Discrete manufacturing, service providers, retail, travel agencies, marketing, payment systems, recruitment, news and media, transportation, education, etc., have all been transformed by software.

Today, software provides a new framework for innovation. It has become a crucial value creator for products and systems. How companies use software will be key to the way in which they innovate, scale and expand their businesses. Technology in general, and software specifically, can transform major aspects of businesses — minimally optimizing and at best, innovating. Software is therefore a primary driver for differentiation that leads to new growth.



*Software as a key value creator for future products and services was identified as a dominant pattern for companies. However, making software has become less and less profitable. The “**Software as a Utility**” trend flow explains how companies can exploit the full potential of this so-called software paradox.*

Some unexpected side effects have arisen as technological capabilities continue to improve, and the world’s population continues to grow, and with it, the need for greater systems that must be developed and engineered.

Although some aspects of the systems and infrastructures discussed above were designed with a specific purpose and mission in mind, for example transporting people, many of their present-day effects were not anticipated. Take traffic jams for instance, something early developers did not even think about. Or the impact of electricity production resulting in global air pollution. In the early days of these inventions and systems, no consideration was given to whether they would be stable and sustainable over the long term. In fact, the general mindset in the decades immediately following World War II, was that resources seemed essentially to be inexhaustible.

Things changed when many systems reached a critical size or “tipping point”. While component technologies continued to evolve rapidly (e.g. cars, computers, aircrafts, etc.), the underlying infrastructure networks that had also help form the regulatory frameworks, stagnated and failed to anticipate change, or simply

did not keep up with the growth. This resulted in unexpected consequences caused by products and technology that were often not in harmony with underlying systems, social norms and regulatory structures. Rapid industrial growth and the resulting pressure on the natural environment, increased globalization of trade and commerce, and a perception of limited availability of resources become the touchstone.

Current models are reaching their limits and in the long term are becoming unsustainable. Environmental sustainability has become a primary moral and economic imperative. Technology and technical systems must be harmonized by environmental and social processes and policies that allow individual needs to be met, while not harming the environment or society at large.



The need for alignment within regulatory frameworks, and even the need for harmony with environmental and social norms, has become an imperative condition for success. The impact and possible opportunities for companies are described in the “Sustainable Product” trend flow.

Global trends: basis of future growth markets

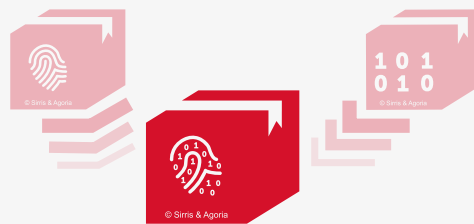
Today, the boundaries between the large-scale technology-based products and systems are becoming increasingly blurry. This increasing degree of complexity and inter-connectedness poses formidable challenges and opportunities for new generations of engineers, scientists and managers in the twenty-first century who will need to develop and engineer the products of the future.

Global, societal challenges and mega trends are transformative, global forces that define the future world, such as: aging, urbanization, health, personalized lifestyles, mobility, urban manufacturing, and scarcity of resources. They will shape

the future, with far-reaching impact on businesses, societies, economies, cultures, and individual lives. They will create huge business opportunities for the products of the future, serving the customers of the future in the ecosystems of the future. In order to be successful, companies must fully understand the implications, the critical forces and the impact on their products and technology offer.

A close encounter of the third kind: skills in a converging world

The separate worlds of software and physical products are converging. Hardware is integrating with sophisticated and complex embedded software and is becoming more like software. Software exploits cyber-physical systems in order to bring new generations of context-aware innovations to the market. In the meantime agile software engineering methodologies are confronted with robust, mechatronic product engineering, and vice versa. This converging world will require complementary skill sets in order to integrate the best of both worlds. Mastering these complementary skill sets will be the key element for success.



CASE Smart Inter-connected Product Systems

One of the trend flows in Products of the Future is that they will be part of smart inter-connected product systems. Four models illustrate how the source of superior value and differentiation will shift towards adding functionalities and capabilities by multi-disciplinary engineering, integrating intelligence and an active control in the product, an optimal interaction between products and a broader systems-thinking towards the services provided by product systems.

The changing nature of products towards smart inter-connected product systems also disrupts value chains, forcing companies to rethink and retool nearly everything they do internally: from how they conceive, design, and source products; to how they manufacture, operate and service them; to how they build and secure the necessary IT infrastructure.

The example of heating and ventilation of a house demonstrates how products and systems can be approached from different engineering perspectives, leading to other and quite often complementary solutions.



Source: Niko

	Multi-engineered	Smart	Inter-connected	Product system
Heating & ventilation systems	A multi-disciplinary engineering product with superior performance and value.	A hybrid solution for intelligent heating/ventilation system	A solution for optimal heating connected with other sub-systems in a smart house.	Living comfort and wellbeing in a connected house.
Behavior	<p>The lightweight low-H₂O heater (radiator) of Jaga combines copper, aluminum and stainless steel. They contain up to 10 times less water and much more responsive than traditional models. Moreover, they are designed so that the air flowing through it, is as little as possible subjected to resistance. The result is an unprecedented high heat output.</p>	<p>On-demand controlled components create more comfortable, healthy and energy efficient spaces.</p> <ul style="list-style-type: none"> • Smart technology ensures that each zone in the house is optimally ventilated, according to the resident's activities. Humidity, CO₂ and/or VOC sensors measure the extraction air 24 hours a day. • The energy from the extracted ventilation is recuperated through heat recovery and applied for sanitary warm water and low temperature heating. 	<p>Home automation systems such as Niko Home Control connect products and sub-systems in a smart house.</p> <ul style="list-style-type: none"> • A thermostat connected to other smart units in a home automation system, knows i.e. that there is still a window is open, it may lower heating or optionally switch off the heater. • Heating and ventilation are integrated. Niko Home Control optimizes their functioning to each other. • Users can monitor and watch over the performance of the whole system, rather than the individual units. 	<p>All systems in the house automatically adjust to your dynamic life style:</p> <ul style="list-style-type: none"> • The house knows when you leave or arrive. The car informs the exact time when you will arrive. The house automatically adjusts all systems, e.g. to assure for the desired temperature. • The system is aware of all influencing parameters (weather predictions etcetera), the smart grid informs about availability and cost of energy. • The house is aware about all systems and autonomously adjusts them to reduce overall cost of heating, cooling, ventilation, ...



Source: Jaga



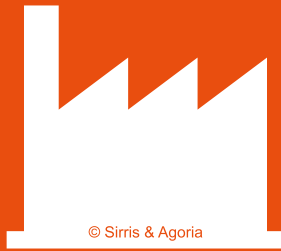
Source: Renson



Source: Niko



Source: Building as a Service



factory
of the future

Factory of the Future

The importance and revival of manufacturing in an innovative economy

In an innovation driven economy, there will be a renaissance in manufacturing. Every product of the future has a manufacturing process behind it. After all proximity of an industrial manufacturing system and the combination of design and fabrication capabilities are key for bringing innovations to market.

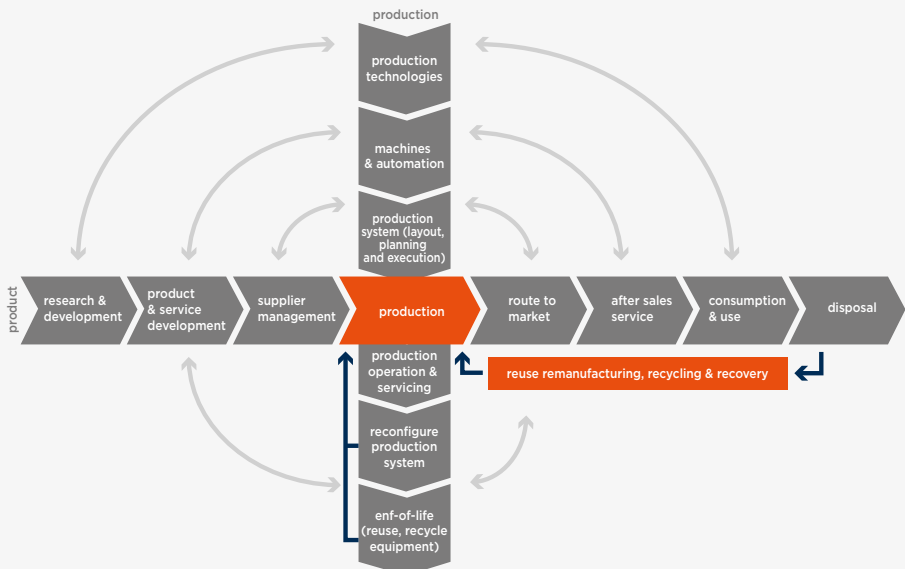
Manufacturing has traditionally been understood as the production process in which raw materials are transformed into physical products, involving people and other resources. This production-focused perspective has been used to make the argument that developed economies have entered a post-industrial age. Productivity gains in manufacturing, combined with a loss of market share due to international competition from emerging manufacturing countries, have led to a decline in production and manufacturing jobs. Only few industrialized countries (e.g. Germany, Sweden or Austria) have retained high levels of industrial added value despite a decline in jobs. Meanwhile, Belgium and other European countries are faced with a decline in industrial employment and value added.

Recent thinking considers production as a critical part of a much wider manufacturing 'value chain', linking innovation to production and creating major new sources of revenue and value beyond the production and sale of products. The focus is back on production in high-wage countries and the critical role that domestic manufacturing capabilities play in bringing innovation to

life and also the ability to rapidly upscale the production of new products based on advanced technologies. This has resulted in a competition shift from focusing on cost reduction, towards focusing on providing sustainable high-added-value. The cessation of local production leads to a reduction in the knowledge of how things are made, followed by product development disappearing.

The strategic importance of “new manufacturing” as an engine for creating wealth and income, requires to adopt a more integrated view of manufacturing in the 21st century. In the past, most factories focused on product innovation and neglected production facilities, resulting in only incremental steps being made in manufacturing innovation. The next industrial revolution will be locally based within industrialized regions. Using the right advanced manufacturing technology, we could re-shore our production from low wage regions, in order to spur innovation and create sustainable growth at home.

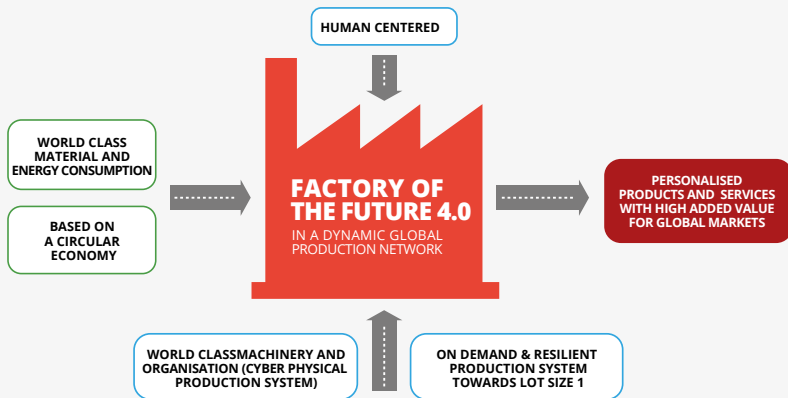
Simplified model of the wider manufacturing value chain, integrating the life-cycles of products and production and closing the loop through reuse and recycling.



The industrial manufacturing requirements are rapidly changing

Megatrends, new market opportunities, evolving customer requirements, tighter competition and opportunities from emerging technologies in a dynamic and highly competitive global environment, result in considerable impact and drive structural changes in nearly all manufacturing sectors.

Structural changes towards Factory of the Future 4.0 in high wage countries
(Source: Made Different)



If companies want to achieve a leap in their productivity and fundamental performance indicators like e.g. lead time, delivery reliability, quality, cost and variability, they must evolve and tackle these structural changes and evolutions. To enable the insight in these evolutions, four dominant industrial trend flows are identified. They cover the majority of the industrial challenges manufacturing companies need to evaluate.



Customer-centered Manufacturing

Increased customer intimacy through customer-centered production

- ▲ High value manufacturing, producing an increasing number of high tech and smart products and responding to increasing demand for products that precisely match customer expectations.
- ▲ A leap in productivity to deal with competitive pricing regarding qualitative, customized products in high wage countries.



Responsive Manufacturing

Responsiveness to volatile markets and changing customer needs

- ▲ Dealing with dynamic demand (demand-driven production - towards batch size 1).
- ▲ Dealing with fast changing product cycles (ramping up times for new products).
- ▲ Dealing with faster deliveries in local markets.



Digital Factory

Driven by the empowering role of ICT and smart systems, manufacturing will eventually evolve into dynamic production networks. Companies will become Digital Factories and increase productivity through ICT enabled collaboration.

- ▲ Operate integrated production chains that interconnect parts, products, machines and people across various production plants.
- ▲ Link into digitized supply & value chains and partner networks.



Sustainable Factory

Sustainability with regard to environment and people

- ▲ Less resource consumption within factories: material and energy efficient (<50%).
- ▲ Based on a circular economy: reuse, re-manufacturing and recycling products and resources.
- ▲ Resilience when dealing with periodic scarcity of resources (e.g. energy, water, other commodities).
- ▲ Human centered and maximizing the potential of creative and committed employees and dealing with scarcities of talent and employees.

Manufacturing technology itself is evolving rapidly and plays an important and central role in these trendflows. The application of leading-edge production systems, emerging technology, technical knowledge and expertise for production processes and associated services, has strong potential for transforming manufacturing. It will also give the companies the ability for the manufacturing of the product of the future, a product that among others combines advanced materials, with functional surfaces and a precision range increasing with one order of magnitude.

Factories must evolve into agile and digitized high-tech manufacturing organizations, also called "Factories of the Future 4.0". They will have to produce the products of the future, as well as supporting the business of the future.



How can companies realize this?

This masterplan gives an industrial perspective on what the Factory of the Future 4.0 will look like. To make manufacturing companies future proof, a more practical and individualized transformation path is needed. These concrete transformations are treated in a specific action plan called Made Different (www.madedifferent.be).

This Made Different action plan informs and helps companies to define and realize their transformations in order to become a true Factory of the Future. Besides the four industrial trendflows described in this masterplan, Made Different also focusses more on the important consequences in practice of human centered production, the impact of simultaneous product development and production and the use of world class production technology.



CASE Continental Automotive: a Factory of the Future

Continental Automotive Mechelen is one of the first Belgian Factories of the Future. It produces and assembles, with a highly automated and robot-supported production system, Anti-lock Brake System (ABS) components and complete electronic brake systems for passenger cars. The tuning of optimization, new production technologies with an extensive, smart automation increased the efficiency and quality of the production system, beyond the performance of similar production lines at sister companies within the Continental group. A new modular and smart manufacturing concept enables fast removal, re-tooling or replacement of machines in a production process and enables scalability and flexibility for future products. The Continental plant in Mechlin (Mechelen) became a competence Center for the entire group, from which technology is disseminated to other production sites. On top Continental applies a socially responsible entrepreneur style with a lot of attention for the personal and professional development of employees. After automation, production line operators are trained to a higher technical level so that they can remain employed in the company. This enabled to maintain a stable employment, in a Factory of the Future combining an increased capacity and output with a reduced ecological footprint. Management strongly believes in the future of Continental Automotive in Belgium. The presence of an R&D department, which works closely with the production, supports the development of new products and their production systems. Continental Automotive proves that it can compete with other countries and sees opportunities to diversify its activities even further.



Source: Continental Automotive

Conclusions

This masterplan contains a vision of industrial innovation in the near future. This vision takes into account societal, as well as economic and technological trends. These trends have been confronted systematically, with the insights and visions from over a hundred industrial entrepreneurs and companies.

This has led to an “industrial perspective” of innovation, i.e. a vision of what the actual trends and state-of-the-art may mean to the actual context of a company. It shows what a company should consider when starting to work on innovations for the near future.

The time horizon for this masterplan is just a couple of years. Long term predictions on societal, economic or technological evolutionary processes remain the playground for academia and research institutions. These long term trends are important and some of them are withheld from this masterplan because of the short term implications for companies.

This plan does not strive for completeness and neither is it a “meta” roadmap of multiple roadmaps. The principle motivation behind including long term evolution in the masterplan, is the potential for concrete innovation from companies in the technology industry.

The uniqueness of the masterplan does not lie in the consolidation of these roadmaps and future studies, but in the evaluation and insights from hundreds of industrial entrepreneurs and companies involved with these trends and evolutionary processes.

Besides being a practical framework for companies, this masterplan will also be a guideline for both organizations Agoria and Sirris in defining their priorities in the domain of innovation.

Towards your own Masterplan Innovation!

This document is an executive summary of the Masterplan Innovation. It only contains the general introduction to the basic concepts of business, product and factory of the future. The identified trend flows are only mentioned shortly and the underlying models are not included.

Companies who want an in-depth discussion how this can help them to build their own Masterplan Innovation, can contact us at info@masterplan-innovation.be.

Sirris and Agoria advisors are ready to support you to apply this framework to your own industrial context. By digging deeper into the content, we will support you with specific work forms that have been developed and provide you much greater detail. For the different trend flows and models, various key characteristics are identified that can help with identifying the impact of certain insights within your organization.

Member companies of Agoria and Sirris will have access to more specific information on industrial cases, roadmaps and much more via their respectively online platforms Agoria Online (<http://online.agoria.be>) and Techniline (<http://techniline.sirris.be>).



collaboration



servitization



ownership



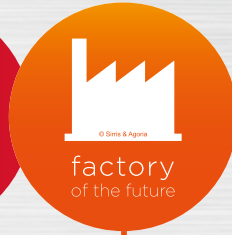
smart inter-
connected



software
as utility



sustainable



customer
centered



responsive



digital



sustainable