



Fast Forward Factory

2015

Günther Schuh
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Nicolas Komorek
Michael Salmen
Thomas Kuhlmann





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WZL
RWTHAACHEN



Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University

With its 900 employees, the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University is globally synonymous with successful and pioneering research and innovation in the field of production technology. Four research divisions conduct research projects, some on fundamental methods, others oriented to the requirements of the industry. In addition to this, practical solutions are developed for optimising production processes. With the four divisions of Manufacturing Technology, Machine Tools, Measurement Technology and Quality as well as Production Engineering, the WZL covers all branches of production technology.

The chair of Production Engineering at the WZL has a staff of around 120 employees working on issues relating to sustainable success management for manufacturing companies. The topics range from business development and innovation management to operational production planning and control. The chair of Production Engineering focuses on close links between engineering and business economics research, which is passed on and developed further in consulting projects.

Imprint

Fast Forward Factory

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Authors: Prof. Dr. Günther Schuh, Dr. Martin Pitsch, Dr. Nicolas Komorek, Michael Salmen, Thomas Kuhlmann

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Laboratory for Machine Tools and Production Engineering (WZL)
of RWTH Aachen University
Steinbachstrasse 19
D-52074 Aachen
www.wzl.rwth-aachen.de



Prof. Dr. Günther Schuh

Günther Schuh was born in 1958 in Cologne, and holds the Chair of Production Engineering at the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, is a member of the board of directors at the Fraunhofer Institute for Production Technology (IPT) in Aachen, and is director of the FIR Institute for Industrial Management at the RWTH Aachen University. He is also a regular guest lecturer at the University of St. Gallen, and founder of the group of companies Schuh & Co.



Dr. Martin Pitsch

Martin Pitsch was born in 1983 in Wuppertal, and studied Industrial Engineering at the RWTH Aachen University, and at Chalmers University of Technology (Sweden). He obtained his doctorate at the WZL, and works in consulting and research, particularly in relation to strategy development, site networking and operational excellence. Martin Pitsch is a chief engineer, and head of the department of Business Development.



Dr. Nicolas Komorek

Nicolas Komorek was born in 1988 in Frankfurt, and studied Industrial Engineering at the Technische Universität München, at the RWTH Aachen University, and at the Universidad Técnica de Federico Santa María (Chile). He obtained his doctorate at the WZL, and worked in consulting and research, particularly in relation to strategy development, collaborative value creation and market intelligence. Until December 2014, Nicolas Komorek was a team leader in the department of Business Development.



Michael Salmen

Michael Salmen was born in 1987 in Paderborn, and studied Industrial Engineering at the RWTH Aachen University. He is in the process of obtaining his doctorate at the WZL, and works in research and consulting, particularly in relation to digitalisation, operational excellence, and benchmarking. Michael Salmen also works as a team leader in the department of Business Development.



Thomas Kuhlmann

Thomas Kuhlmann was born 1988 in Duisburg, and studied Mechanical Engineering and Business Administration at the RWTH Aachen University, and at the University of New South Wales (Australia). He is in the process of obtaining his doctorate at the WZL, and works in consulting and research, particularly in relation to market intelligence, operational excellence, and tool and equipment supply strategies.

We wish you pleasant reading!

Interested in a discussion or cooperation?

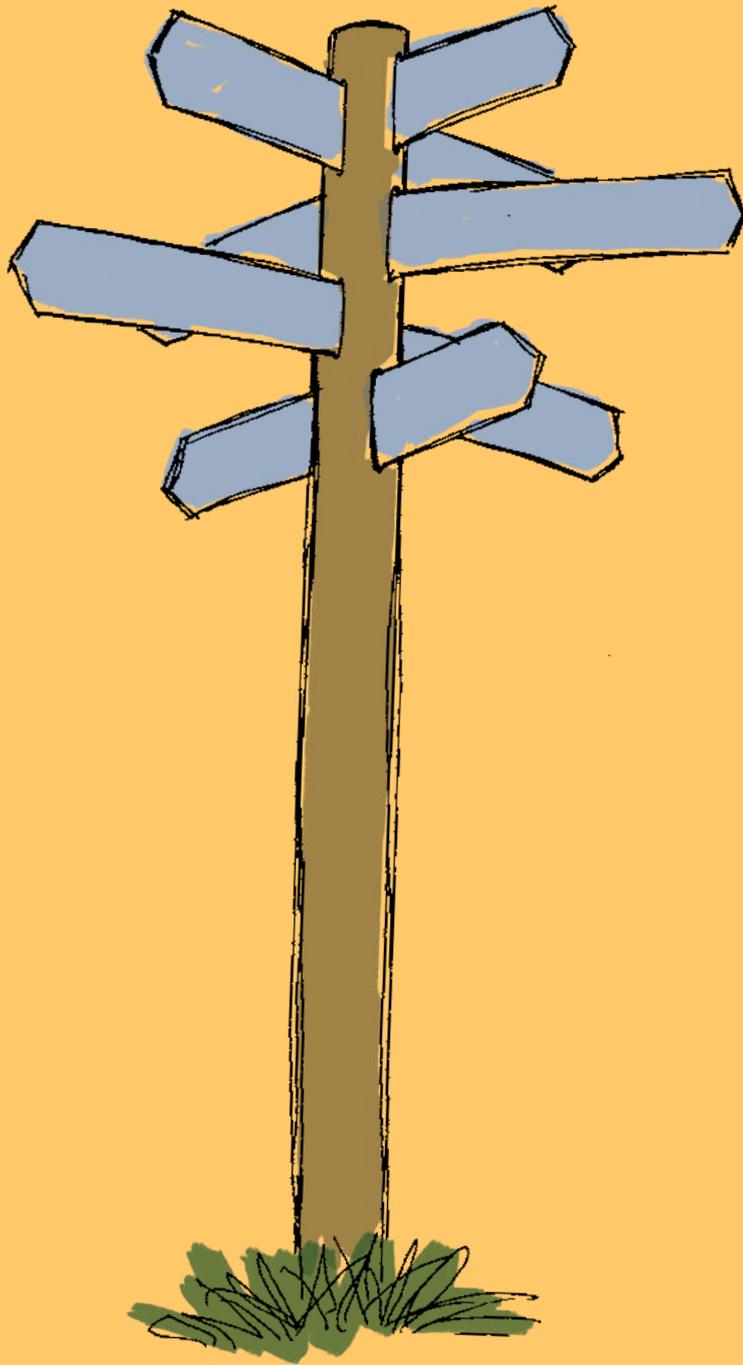
Contact us!

m.pitsch@wzl.rwth-aachen.de

m.salmen@wzl.rwth-aachen.de

t.kuhlmann@wzl.rwth-aachen.de

Our thanks to all success stories for working with us to develop the Fast Forward Factory.



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Executive summary

„That’s one small step for man, one giant leap for mankind.“ With these words, on 20 July 1969, at 03:56:20 hours CET, Neil Armstrong became the first man to set foot on the moon. What had still seemed unthinkable in 1961 became reality 8 years later with Apollo 11. What was the driving force behind the Apollo programme? Faster, better, further! Fast Forward!

Manufacturing companies also need to be in a position to master the art of faster, better, further. Specifically, they have to arrange their value creation process more efficiently. This allows them to survive in competition, and to continue developing their products in the long term. Lean Thinking has provided a useful formula for this. The up-and-coming Industrie 4.0 age now offers a new, fast infrastructure, and fundamentally changes people’s behaviour. But what benefits can Industrie 4.0 bring? How does that fit in with my target system, my industry, my company?

The answer is the manufacturing company of the future: the Fast Forward Factory. This focuses on nine success factors in the areas product, process and resources. The conscious design of these success factors is the path to more efficient value creation for manufacturing companies.

Product

Emotionalisation

Products can and should transport emotions in a targeted manner, convincing customers and securing their loyalty. The Fast Forward Factory utilises emotionalisation to link the technical potential of its products with positive associations for the customer – before, during, and after the sale.

Construction kit

Irrespective of production run sizes, products are designed to be modular, in order to manage complexity efficiently. The Fast Forward Factory utilises construction kit systems to combine standardised manufacturing with individualised products.

Smart Services

Products are combined with data-based services, in order to offer the customer new added value. With its Smart Services, the Fast Forward Factory combines the role of the manufacturer with the role of the knowledge manager.

Process

Synchronisation

Processes are designed with defined interfaces, in order to reduce errors and loss of information. The Fast Forward Factory utilises synchronisation to combine interface reduction with specialisation.

Glocalisation

Processes are organised using global standards and local solutions, in order to provide customers with an optimal service that is both global and local. The Fast Forward Factory utilises glocalisation to combine central control with decentralised flexibility.

Automation

Processes are executed using automated systems, in order to utilise the strengths of technology and qualified employees. The Fast Forward Factory utilises automation to combine mechanical routine with human skills.

Resources

Innovative engineering

Developments are advanced in short optimisation cycles, in order to achieve innovative results at an early stage. The Fast Forward Factory utilises innovative engineering to combine structured development with disruptive ideas.

Digitalisation

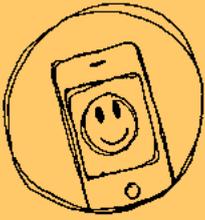
Data are recorded and knowledge made available across locations, in order to implement measures at an early stage and to learn more quickly. The Fast Forward Factory utilises digitalisation to combine small apps with large software solutions.

Working culture

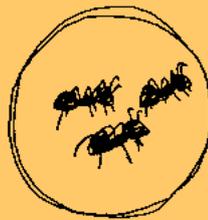
Open spaces are actively created, in order to work efficiently together with the employees in the long term. The Fast Forward Factory utilises working culture in a fluid transition to combine work and leisure.

In their practical organisation and implementation, all success factors are closely interconnected. Focussing purely on one success factor or addressing individual success factors is therefore insufficient. Fast Forward for more efficient value creation applies to the manufacturing company that consciously positions itself in all success factors.

Our 9 success factors



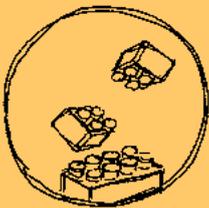
Emotionalisation



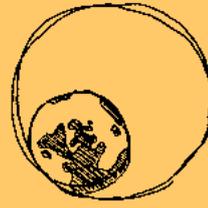
Construction kit



Smart Services



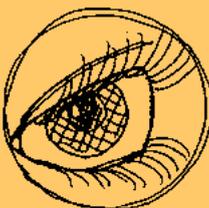
Synchronisation



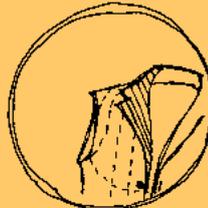
Glocalisation



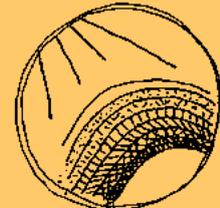
Automation



Innovative engineering



Digitalisation



Working culture

The Fast Forward Factory

Faster, cheaper, more reliable, more innovative? More successful!

Manufacturing industry is the basis for the development of the economy and of society in general. Its success acts as a catalyst for other fields, such as the services, logistics, communications and financial sectors. The road to success is a multisport race in the familiar disciplines of time, costs, quality and flexibility. While the relative importance of the disciplines varies between industries and from one company to the next, increasing success goes hand-in-hand with more efficient value creation: the value added by the performance of a company is decisive. The company that masters value creation sets a course for success!

Change is a constant

The environment of manufacturing companies is characterised by profound and rapid processes of change: custom-

ers, and hence also the value creation process, are becoming increasingly global. Products need to fulfil individual expectations, and must be continuously renewed, as well as amortising themselves over shorter service lives. In addition, new manufacturing processes and digital aids can be used, making possible new products and the continuous transfer of data, information and knowledge. People are central to this process, not only as customers, but also for value creation: the seamless interconnection of customer requirements, development plans and manufacturing solutions makes the competence of qualified and motivated employees essential.

Which way is forwards?

There are various problem-solving approaches and initiatives available to manufacturing companies for the promotion and development of the manufacturing industry. Lean Thinking is still absolutely up-to-date, and is about avoiding waste and optimising processes. Particularly in the English-speaking world, there is a focus on reindustrialisation to strengthen manufacturing industry. Companies, processes and

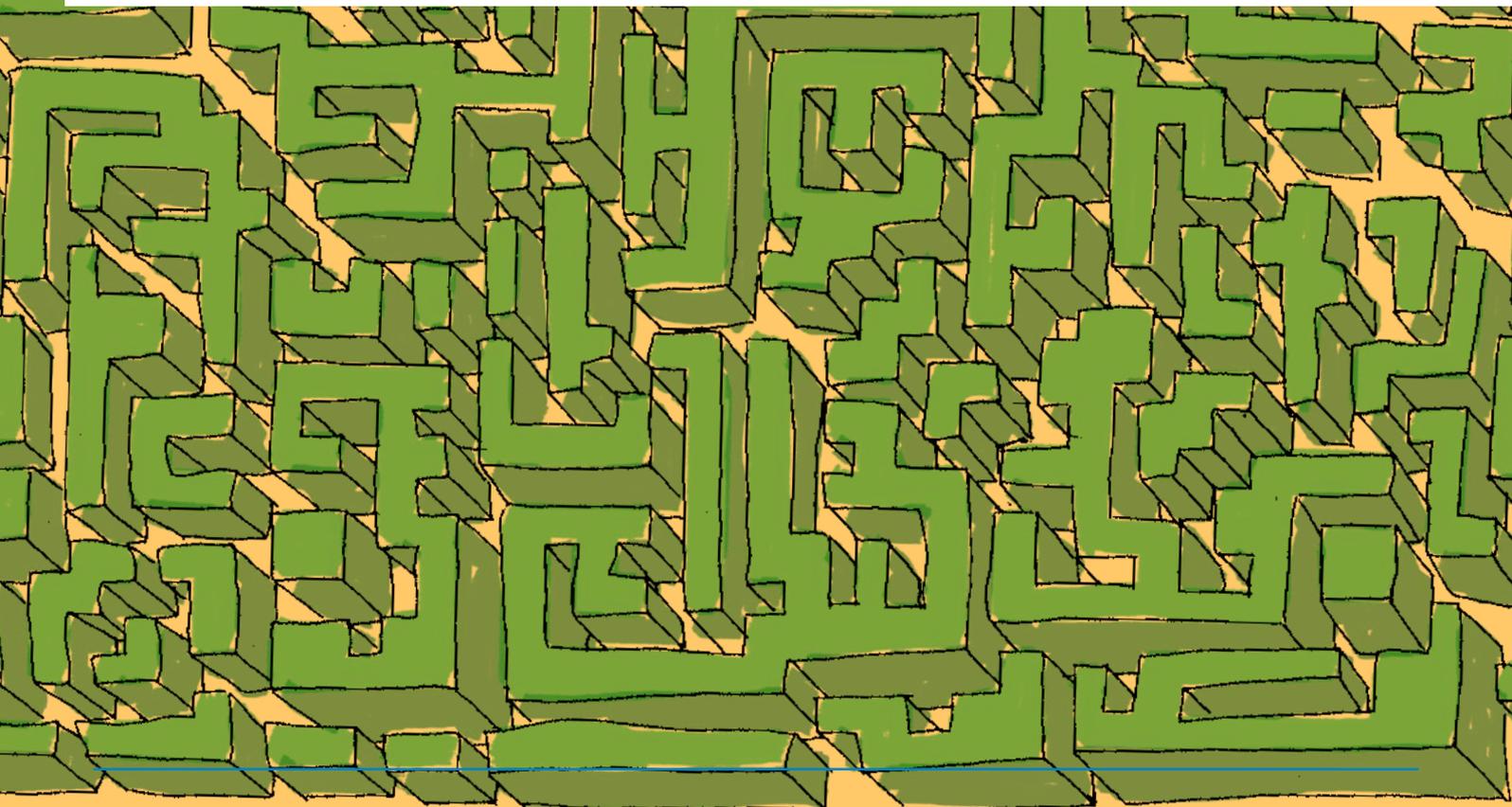
employees are becoming smarter and more networked. Industrie 4.0 is the current and fourth Industrial Revolution, and represents the next leap forwards in the productivity of manufacturing companies. Every manufacturing company faces the challenge of identifying the trends and problem-solving approaches relevant for themselves, adjusting to these, and adapting them to their own company. Success comes through the answers to the following questions:

What trends do I need to take into consideration for my company?
and

What problem-solving approaches bring about success in my company?

Fast. Forward. Factory.

Manufacturing industry and the associated engineering are a prime example: engineering is about solving challenges in a methodical and target-oriented manner. The term „engineering“ is used to describe a very wide range of activities: from the design activities of product engineering to the organisational activities of process reengineering, and even shaping interpersonal behaviour through social



engineering. From this perspective, the Fast Forward Factory was developed as the manufacturing company of the future. The Fast Forward Factory is successful: it masters value creation and rapid continuing development. It achieves this by exploiting nine success factors in a holistic system.

The success system

To engineer a more efficient value creation chain, the three areas of product, process and resources must be taken into consideration. Products are the interface with the customer, and make the value generated and efficiency of the value creation visible. The processes create products and generate value. And the resources are the substance of the manufacturing company. These make possible faster processes, more innovative products – efficient value creation! Product, process and resources are interconnected, and represent the structure of the success system for value creation. The Fast Forward Factory focuses on nine success factors. These pick up trends and the latest problem-solving approaches for manufacturing companies.

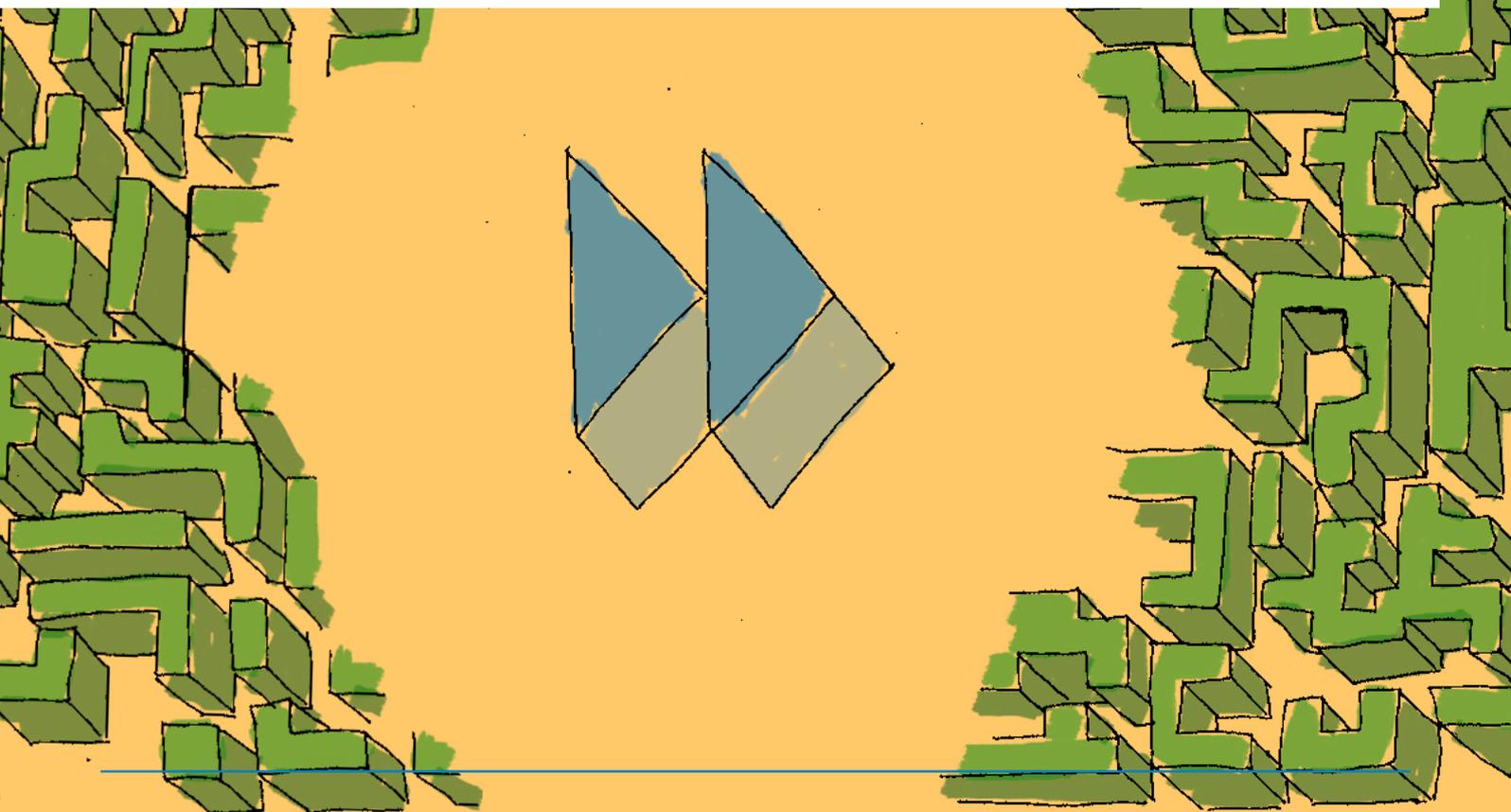
How can my company become a Fast Forward Factory?

All nine success factors are relevant for your company. As product, process and resources are closely interwoven in the value creation chain, so are the success factors themselves. It is therefore scarcely possible to achieve absolute excellence in all areas. Each manufacturing company must rather choose how it can and would like to shape each success factor – and how not to. The description of the success factors will show that there are various options for shaping a success factor: find the one that works for you, make your value creation more efficient, and start down the road to becoming a Fast Forward Factory!

Success needs role models

Manufacturing companies in Germany traditionally enjoy a high level of international respect for quality and innovation. Developments in recent years have meant that companies in high-wage locations have had to learn to leverage the opportunities of the globalisation and make their value creation processes more efficient. Traditionally, the products of large automotive OEMs in Germany have had

a high market presence. However, as the backbone of the German economy, the majority of the manufacturing companies are not known to the consumers. They market their services earlier in the value creation chain. In small and medium-sized enterprises, these hidden champions succeed in developing new solutions and asserting themselves as global market leaders in a wide range of business segments. Individual success factors of the Fast Forward Factory are already mastered by leading manufacturing companies. Dialogue with the companies has allowed these success factors to be refined, and success stories for each success factor to be described. These success stories are role models, providing orientation and a spur to manufacturing companies on the road to becoming Fast Forward Factories!





Emotionalisation



845

different emoticons come
as standard on WhatsApp

WZL 2015

Hearts are wild

Emotions have more social recognition than ever before: we look for opportunities to share, we „like“, what is real is becoming more emotional, and the objective is becoming more subjective. Companies, too, have recognised that the emotions of consumers lead to buyer decisions: „I'm loving it“ and „Sheer driving pleasure“. We make decisions about the trustworthiness of others in a fraction of a second. It takes a maximum of seven seconds to decide whether or not we like someone. Our emotions shape our opinions, and are inseparable from our auditory, visual and haptic impressions. The first seven seconds – can you transmit the right feeling for your product in that time?

Technical potential vs. positive association

Emotionalisation is the success factor for addressing the emotions of customers through products. Both the technical potential and the positive association must be taken into consideration to emotionally persuade the customer. The technical potential refers to the application capabilities of the product. A product with high technical potential can be used flexibly and under a wide range of different conditions. When it comes to technical potential, the focus is on the technical development of the manufacturing company. For the positive association of learning about the product and the buyer decision, the focus is on the emotion that is transmitted. The geometry, colouration and materials of the product itself, its presentation through packaging and advertising, and the contact to the customers, are also consciously engineered. A manufacturing company achieves this positive association through customer networking, marketing, and product design.

Show what you are!

It is not generally possible to determine the attractiveness of a product by means of quick comparison – the respective seven seconds – at trade fairs, on the internet, or in brochures. At the same time, differentiation in terms of technical potential is becoming increasingly difficult for manufacturing companies. Customers are no longer won through functional quality alone. The individualisation of products means that versatility is losing its strength as a selling point. Manufacturing companies therefore need to make active use of the emotions of buyers and end users. They have to show what their products stand for.

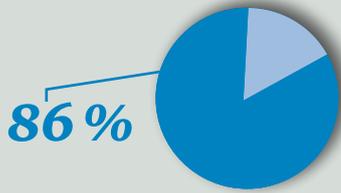
Emotion always needs substance

Happiness, joy, anger, fear: emotions are always intense. Emotionalisation means utilising positive emotions – and avoiding negative ones. Joy, dynamism, trust, security or future-orientation are promises that must never be let down. The presentation and the emotions generated need to be appropriate to the product and its characteristics. The match between the substance of the product and its auditory, visual and haptic presentation is the key to the positive emotions of the customer. A company that can link the product and its presentation in a coordinated manner is utilising the success factor of emotionalisation.



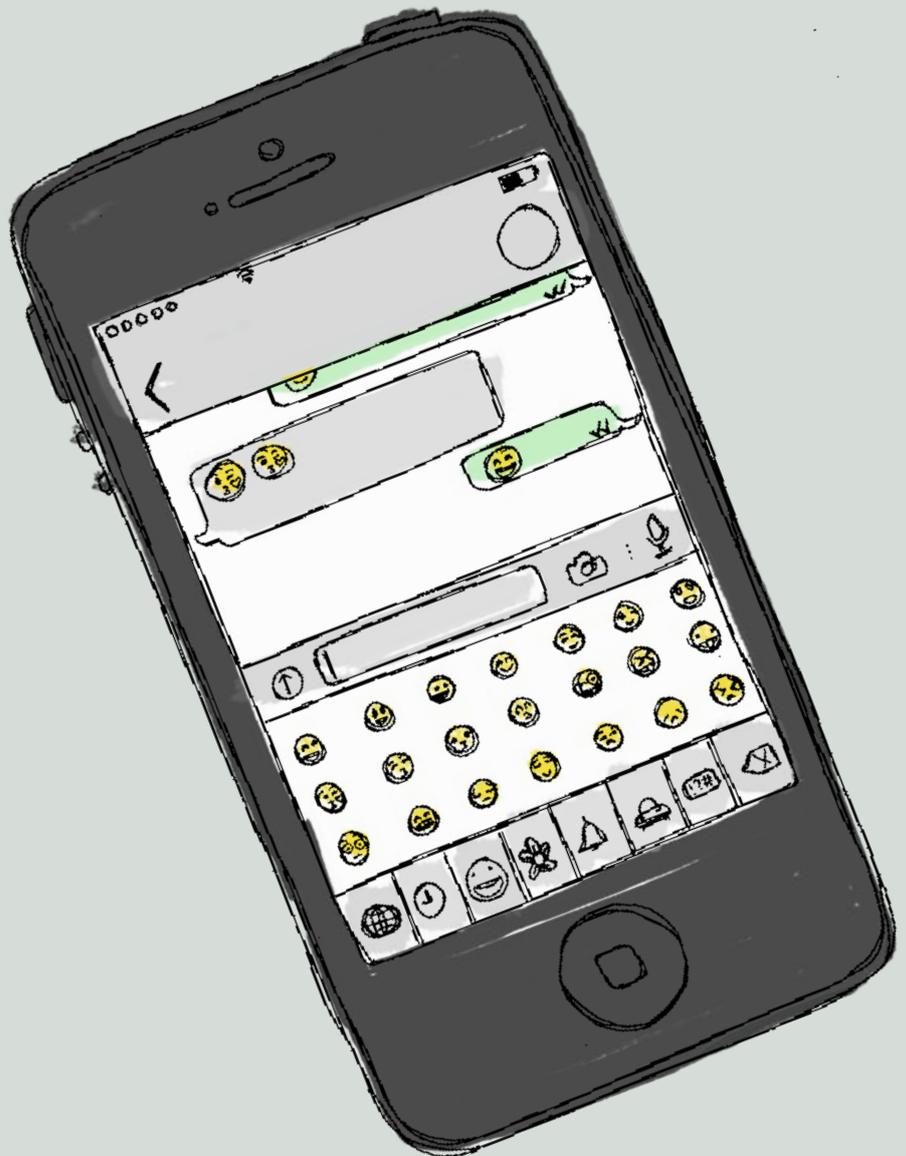
Customer loyalty to a brand is twice as common in B2C as in B2B

CEB 2013



86% of purchasers cannot distinguish between their suppliers in terms of functional criteria

CEB 2013



<00:01

It takes <00:01 seconds to decide whether a person is trustworthy when meeting them

Freeman 2014

00:07

It takes 00:07 seconds to decide whether a person is likeable when meeting them

Goman 2011



WINDMÖLLER & HÖLSCHER

The company

For over 140 years, Windmüller & Hölscher has been demonstrating its innovativeness, and with almost 2,300 employees and a turnover of more than 600 million euros, is now one of the leading suppliers of machinery and systems for the manufacturing and processing of flexible packaging. As a global market leader, Windmüller & Hölscher is a partner and system supplier that offers its customers complete solutions from a single source: From consulting and engineering services to the delivery of high-quality machinery, and even complete packaging production. In over 130 countries around the world, and with more than 5,000 customers, machinery from the three business segments of Extrusion, Printing and Converting is in use today. The comprehensive knowledge of production processes in the three business segments forms the basis for the continuous development of innovative and pioneering solutions. The result of these developments is a carefully coordinated product range of high-performance machines.



Dr. Jürgen Vutz

Dr. Jürgen Vutz is the Chairman of the Executive Board at Windmüller & Hölscher.



„The emotionalisation of our products is an expression of the W&H brand identity, and hence a consistent further development in the B2B marketing of capital assets.

Intelligence and feeling are merged into our brand promise: passion for innovation, and profitability through unique W&H technology.“

Dr. Jürgen Vutz

**Productivity,
quality – emotion!**

„Passion for Innovation“ is the company motto as it is lived, and is hence the driving force for the development of excellent extrusion, printing and converting machinery. Where some machines have a value of millions of euros, excellent machinery needs to be able to amortise itself for the customer through superior quality and productivity. The passion was only part of the road to the products of Windmöller & Hölscher, and by no means the product itself. But can passion, emotion, also play a role for our customer, the operator of a blown film line? Can ideas, quality and productivity be turned into something that can be experienced? The answer was presented at K, the plastics and rubber trade fair: YES! As the newest generation of blown film line, the Varex is superior to its predecessors and competitors in productivity and quality – and it can prove it. Film manufacturing is turned into an experience through innovative technology, deliberate shapes, and targeted lighting. The result is impressive, and its market success vindicates Windmöller & Hölscher and emotionalisation. With emotionalisation, Windmöller & Hölscher has reinterpreted development and performed pioneering work. Confidence in one's own work and products is indispensable for success as a manufacturing company. The requirement to reflect this in the value creation chain is logical, creates transparency, improves customer loyalty, and opens a path to new ideas. By engaging with the form and presentation, in connection with the pioneering technology of the blown film line, Windmöller & Hölscher have also been able to develop a new dimension in efficiency and sustainability.

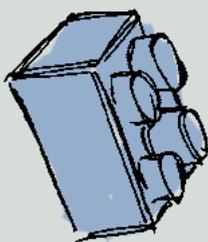


Construction kit



**One hectare of mixed woodland
holds 30,000 trees**

SDW 2014



Plug ,n Play

A guesswork question: how many different possibilities are there for combining seven 4x2 Lego bricks of the same colour? Here's a clue: to answer the same question for 25 Lego bricks precisely, a new computer would have to calculate for several million years. Lego imposes no restrictions on creativity. Standardised connection systems make it possible to create an unlimited number of new forms, irrespective of the age of the bricks or the original product series. The shapes of the individual bricks are trivial, and the connections ingenious. The Lego principle has become synonymous with controllable diversity.

Standardisation vs. individuality

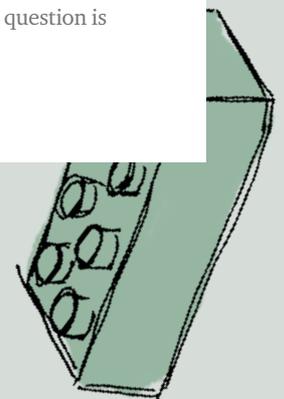
Construction kits are the success factor for efficient product development and creation. They resolve the tension in a range of products and services characterised by a maximum of internal standardisation and the greatest possible individuality for the customer. Standardisation facilitates rapid, low-cost, reliable product developments. Standardised products allow identical production sequences using uniform operating equipment. Individual services are required by customers, and also promise higher prices. Individuality is perceived by the customer on the basis of visible and experienced product characteristics, but also through the additional services available. These customer requirements can be determined by asking about defined individualisation characteristics. Keeping the customer involved in the process for as long as possible furthermore ensures the efficiency of the creation process.

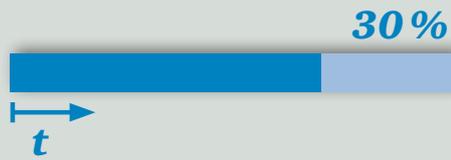
Everything is modular

From Lego bricks, we assemble shapes from our imagination; a high-definition television image is composed of 1920x1080 individual red, green and blue pixels; and a finite number of small calculation points make up the Finite Elements Model of heat distribution in a combustion chamber. Everything is modular, and consists of a correctly chosen selection of equal parts. Manufacturing industry has difficulty, however, in adapting this understanding to its products. Product families that have grown over time, with a steadily increasing number of variants and derivatives, make the task seem simply impossible.

Seeing the wood for the trees

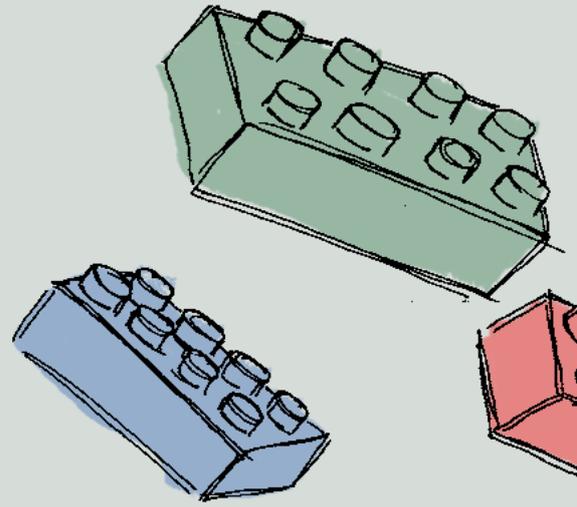
Construction kits do not mean an either-or decision: either standardised or individual. Standardising the individual leads to success, and allows positive economies of scale to be utilised along the entire value creation chain. Construction kits manage complexity. They do not prevent individuality, but give structure to variants and derivatives. They enable efficiency, and generate reliability through repetition in complex product and process structures. Construction kits are living, dynamic, and they continue developing indefinitely. Start small, with large modules, and then progressively increase the resolution! If you design construction kits in such a way that the competition notices them but the customer does not, you will be successful. P.S.: If you are still calculating, the answer to the estimation question is 85,747,377,755.





Potential for shortening manufacturing time through the use of construction kits

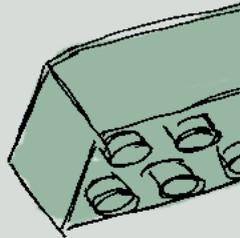
dapd 2014



7 Years

German automotive OEMs require 7 years to double the number of derivative products in their range

Rother 2014



One

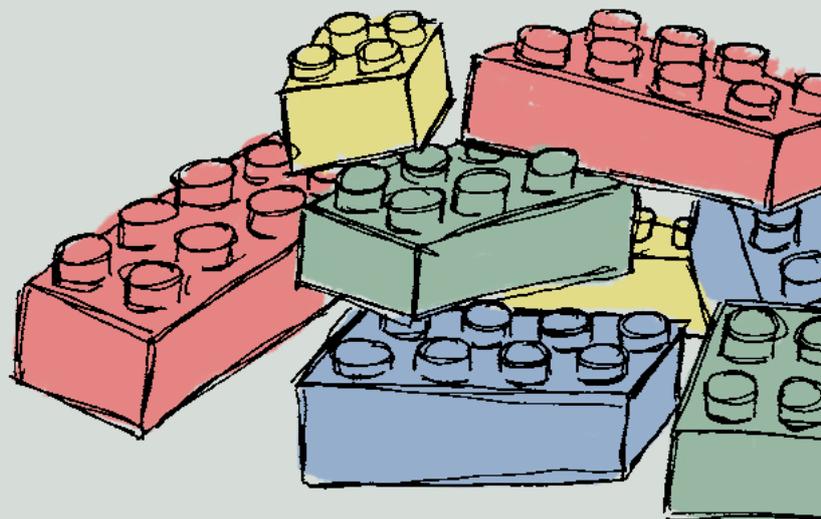
The number of different connection types in Lego systems

Eilers 2005

85.747.377.755

Possible constellations for combining seven 4x2 Lego bricks

Eilers 2005



Ortlinghaus

The company

Since it was founded in 1898, the Ortlinghaus Group has been about engineering excellence. Today, Ortlinghaus is a leading supplier of couplings, brakes, lamellas and drive systems in various industries. Under fourth-generation management, Ortlinghaus today has production facilities in Germany, Switzerland and China. With 550 employees, a turnover of € 82 million was achieved in 2013. Ortlinghaus stands for stability, innovation and growth.



Peter Ortlinghaus

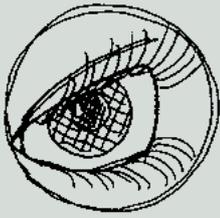
Peter Ortlinghaus is the managing partner of Ortlinghaus.

Relentless standardisation for individual customer solutions

The product solutions from Ortlinghaus are the connecting element between the drive system and driven side, and constitute safety-relevant components: Ortlinghaus stands for precise, reliable and efficient couplings and brakes in presses, construction machinery and marine applications. Every business market and every customer requires individualised solutions here. Ortlinghaus meets this challenge with construction kits. This is because for Ortlinghaus the meaning of construction kits is none other than precise, reliable and efficient coupling – in their own product. This works using a defined range of modules and clear instructions for development and design processes. Standardised modules generate economies of scale. The development of entirely new systems is replaced by the configuration of familiar ones. For this to work, construction kits require an intelligent structure: For each product group, the respective segment of the product range is analysed, and potential is calculated in terms of costs, delivery times, quality and availability. Construction kits are then successively designed. The number of modules and their specifications are individually defined for each product. Construction kits and customer-specific solutions are not in opposition to one another here, but merely define the solution space. Special components may deviate in terms of their specifications, but it must be possible to produce them using standardised processes and standardised tools. Standardisation takes into account both new and existing products, and hence facilitates reliable maintenance for all product generations. For Ortlinghaus, construction kits are both an end in themselves and a means. Standards in the product significantly increase efficiency of development, as well as in all processes, transitions and coordination – internally and with suppliers, from sales to dispatch. Construction kits allow Ortlinghaus to make precise, reliable and efficient couplings, even with the customer.

„Each employee uses the standards for themselves, in order to make their own processes faster, and to further develop existing solutions in a targeted manner. With the construction kit system, we implement universal standards, and benefit from them not in a single workplace, but throughout the whole company.“

Peter Ortlinghaus



Smart Services

Knowledge is power

250 gigabytes against Argentina. World Champion! In 2004, Germany was in tatters. One point short meant they never passed the qualifiers for the European Championship. The team was miserable, their instincts and abilities no longer seemed to be working. A change of course, and since then their games have been digital. Statistical programs analyse video footage and heart frequencies. Computers use images to calculate movements and passing accuracy. The result of all this is data-based squad selection, individual training, tailored tactics.

Manufacturer vs. knowledge manager

The success factor Smart Services is about data-based services that open up new added value for the customer. Alongside the manufacturing of products, there is increasingly a focus on handling knowledge, its application by the customer, and customer requirements. In addition to traditional services such as maintenance and repair, manufacturing companies can today utilise data to identify potential for the customer all along the value creation chain. A company that can generate this knowledge from data is in a position to provide more intelligent, i.e. smart, services. The knowledge manager recognises that the efficient long-term use of products is only possible through the individualised and proactive delivery of services for the customer. This involves the professionalisation of handling data from within the company, from customers, and from partners. Smart Services facilitate the connection between the manufacturer and the knowledge manager, bridging the gap from supplier to problem solver - and discoverer of potential.

No fear of data theft

Smart Services require data: data from within the company, from suppliers, service partners and customers. Big Data offers a great opportunity to generate knowledge and connect companies with one another. However customers, suppliers, and even companies themselves often feel anxious about exchanging data: they are too afraid of data or expertise falling into the wrong hands. Conscious engagement with the issue of data security is therefore essential. A residual risk remains, and must be weighed against tangible added value. Only when customers and partners recognise the opportunities is the way open for Smart Services.

Intelligent products through new services

Smart Services allow products to be linked with data-based services; intelligent solutions replace the traditional range of products. This means that products are networked, knowledge is exchanged, and individual added value is generated. Manufacturers analyse customer data and make the analysis available. Technical solutions such as secure connections and encryption technology support the safe exchange of data. Clear classification of knowledge helps to identify expertise that requires protection, and to protect it against unwanted disclosure. Simultaneously, knowledge is commercialised through the provision of new kinds of services. For example, paid subscriptions to optimised operating parameters for a production line – the original product! This creates new business models that change the future of manufacturers. The future is smart – and success will belong to those with knowledge.



It takes 2 years for the total global volume of data to double

Jüngling 2013



The profit margin for services in plant engineering is 4x greater than that for new plants

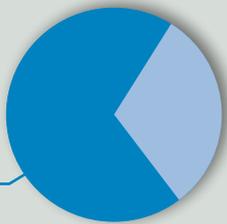
Schmiedeberg 2010



7,000,000 data points are generated by 10 footballers in 10 minutes with 3 balls

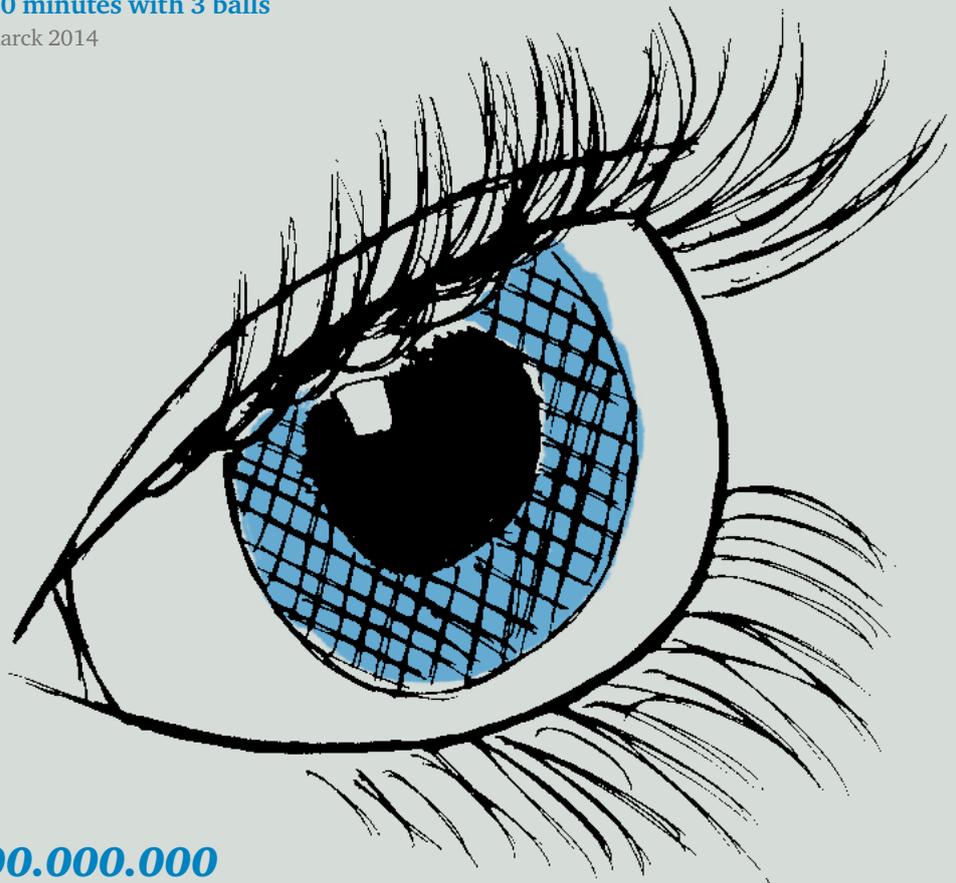
Karck 2014

69%



of the GNP in Germany was generated by services in 2013

Statista 2014



40.000.000.000.000

gigabytes (or 40 zettabytes) will be generated worldwide in 2020

Statista 2014



KOMET®

GROUP

The company

The company was founded in 1918, and provides customer-specific solutions relating to efficient machining. As a comprehensive supplier, the KOMET GROUP develops, manufactures and distributes the most comprehensive and modular portfolio for bore machining, ranging from solid drills to special and custom tools. The group of companies manufactures particularly in Europe, North America, China and India. More than 1,600 employees in around 50 countries and on all five continents provide technical and innovative support for international corporations, for large and medium-sized companies, and for small businesses. In the financial year 2013, the group achieved a turnover of 170 million euros. The KOMET GROUP has its headquarters in Besigheim.



Dr. Christof Bönsch

As executive director, Dr. Christof Bönsch has been responsible since 2007 for the divisions of Technology, Sales and Marketing for the KOMET GROUP.

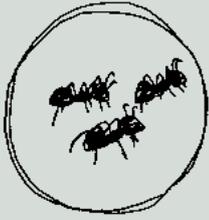


Tools plus ideas – Tools with added value

As one of the leading comprehensive suppliers for precision tools, the KOMET GROUP operates internationally as a problem solver. The corporate philosophy is as follows: Offer the customer tools with added value. The added value consists in data-based services – Smart Services – as a strong supplement to the technical solutions. The basis of the available services is the extensive network of global service partners, which are associated with the KOMET GROUP by means of a franchise system: proximity to the customer meets professionalism. The partners receive access to databases, and product and customer knowledge. This allows them to advise and support customers in using the tools and ordering replacement parts. The service partners are also licensed to manufacture simple custom tools. The added value for customers lies in the fact that the flexible partners are fast, and communication is direct. Through the close link to the partners, the KOMET GROUP also continuously gains knowledge – and is thus able to provide new knowledge-based services. For example, app-based advisory services for customers, which are supported by KOMET's own TechCenter. Mobile apps can provide support upon request in selecting the correct thread milling cutter, including the appropriate CAM program, can read precision drilling systems via Bluetooth, or provide assistance with technical translations. The KOMET GROUP generates and networks knowledge – and is thus able to use Smart Services to offer tools with added value.

„We consider ourselves more than simply a tool manufacturer, but as a supplier of innovative ideas. We provide our customers with a boost in support and services for the technical products: TOOLS PLUS IDEAS.“

Dr. Christof Bönsch



Synchronization

Seventy percent

of the information in entertainment is communicated non-verbally

Azziz 2012

No genius without chaos

Building, mating, controlling, collecting: ants have specialists for every purpose. In this process they have many participants, various processes, flat hierarchies, and fulfil their tasks reliably, without errors, without waiting time, with high workloads, and all simultaneously! Ants use two tricks to master the challenge that defeats manufacturing companies. Firstly, ants communicate one-dimensionally using formic acid; communication is a one-way street, and there is no discussion. Secondly, each ant knows its special field of activity, and does nothing else. Recurring processes are always concluded successfully, without waste, planning or any system of control.

Specialisation vs. interface reduction

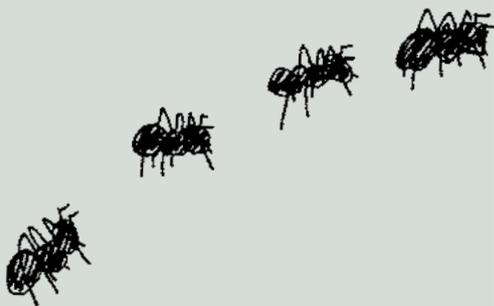
The success factor of synchronisation is about efficient processes in manufacturing companies. Processes can each be performed by specialists, in order to optimise competence and speed for a task. With consistent interface reduction, waiting times and information losses are minimised. By dividing tasks into repeatable processes, the design of specialised training, activities, machinery and auxiliary equipment can be optimised. Maximum specialisation means maximum efficiency for a repeatable process. With consistent interface reduction, the focus is on the process as a whole, from start to result. Interfaces require planning, communication, and interpretation, and they represent sources of error. By consistently eliminating them, sources of error are reduced. Specialisation and interface reduction each permit increases in efficiency. The success factor of synchronisation is created through the integration of these two orientations.

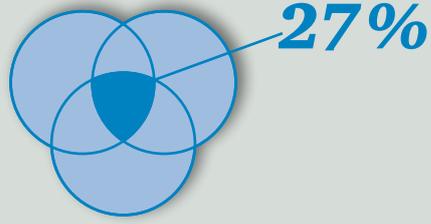
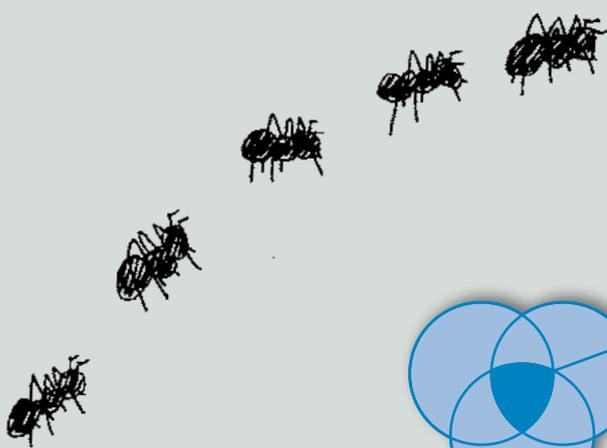
Old targets, new paths

The secret of success is over 100 years old. Efficiency through repetition: this is Taylor, this is Toyota, this is Lean. Milestones, Quality Gates – the standardisation of processes is the tool for process optimisation. At the same time, our products are becoming ever more individual, and require the same from our processes. For improvements, we create space for more ideas and more discussion. With planning and control, the PPS system, we bridge this gap between standardisation and flexibility. The result is reprioritising orders, retooling machinery, and reorganising employees. However, more solution space means less standardisation. While the target is old and familiar, our solutions need to fit the new requirements. The space for solutions must be clearly separated from the standardised processes.

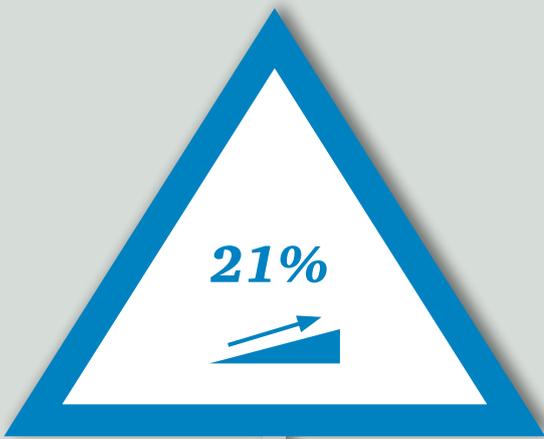
Consistent competence with defined interfaces

Efficiency can be achieved in all processes, without transfer losses, if we learn from the ants! Clear tasks, clear interfaces, clear communication: Tasks cannot be changed in ongoing processes, interfaces are institutions, communication is a standardised message. Improving, reacting, and increasing flexibility are never interruptions, but represent separate standardised processes. Disruptions such as errors, short-notice orders or failures are handled through targeted control processes, are never an everyday occurrence, and never come as a surprise. Synchronisation means utilising standards, knowing about disruptions, facilitating improvement.





Interfaces between people, machinery and systems are multiplying at a rate of 27% per year
WZL 2014



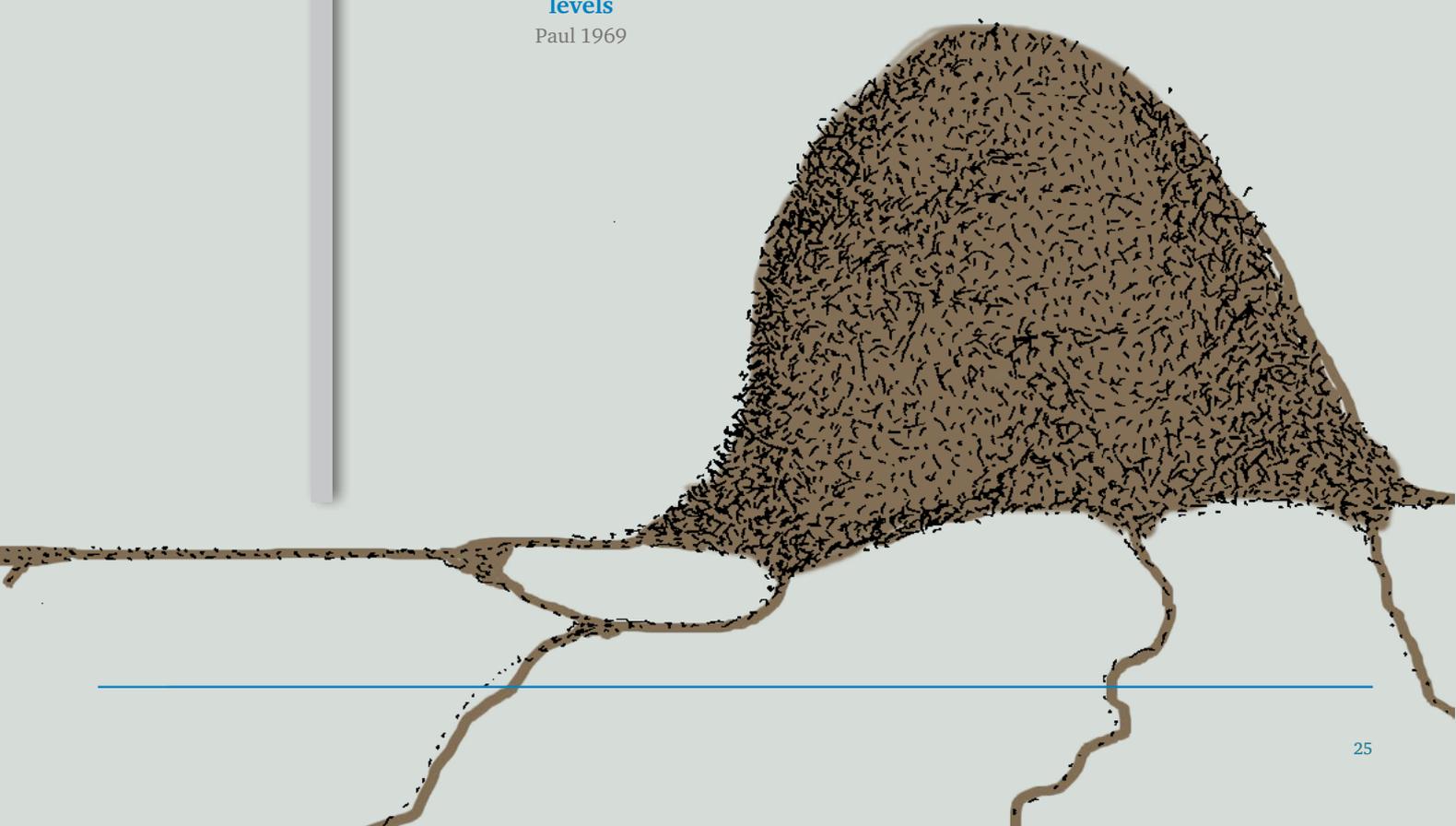
Job enrichment can increase productivity and raise motivation levels
Paul 1969

≈ 11

The average German company has 11 employees
statistia 2014

< 4.000

ants live in an average ant colony
Flanagan 2012





The company

RATIONAL is the company of chefs. At the location in Landsberg am Lech, combi-steamers are manufactured for restaurants, hotel and large kitchens, catering companies, food service industry and canteen catering. A RATIONAL combi-steamer offers a wide range of different application capabilities, and is therefore an established component of a commercial kitchen. Almost all cooking processes of a traditional kitchen can be performed by a single unit. With approx. 1,300 employees, RATIONAL AG achieved a turnover of 461 million euros in 2013. In the field of thermal food preparation with combi-steamer technology in professional kitchens, RATIONAL by far the market leader, has a global market share of 54%.



Peter Wiedemann

Peter Wiedemann was appointed Chief Technical Officer (CTO) 1999, and is a member of the executive board at Rational AG.



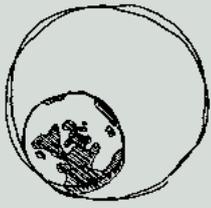


„Providing the customer with the greatest benefit means a consistent focus on the customer order. We achieve this through synchronised processes. This means plenty of communication, fast feedback, and few interfaces.“

Peter Wiedemann

Proudly assembled by...

The RATIONAL idea is clear and simple: „We offer the greatest possible benefit to people who prepare food in large and industrial kitchens.“ In order to meet the human need for outside catering, chefs, nutritionists, physicists and engineers develop complex combi-steamers. A variety of dishes can be prepared in a single unit in such a way that they are ready simultaneously. The entire process organisation of RATIONAL is simultaneous or utilises coordinated timing, i.e. it is synchronised. All activities are organised along a customer order. This makes traditional departments superfluous, and eliminates interfaces. A processing time of 3 hours, 4000 variants, 1 employee. Each employee in the 5 assembly lines assembles a complete unit. Division of labour? Negative. For this to work, RATIONAL hands over responsibility to its employees, and pursues the principle of Entrepreneurial Management. Independently responsible employees make the decisions required in their areas. The focus is always on the greatest benefit for the customer, and on the big picture. „Proudly assembled by“ can be found on every RATIONAL product. This is because synchronised processes only work with independently responsible, motivated employees.



Glocalisation



of graduates of European universities are prepared to move abroad for their first job

HRM 2014



The world is getting closer together

The arrivals hall after a 10-hour flight: pungent smells, sunk deep into the carpets. Crowds of people, loud and dynamic. You get out fast. Humidity, heat, and porters you can't get rid of. Finally you're in the taxi. Undefined music. A taxi driver trying to communicate simultaneously with his fare, his mobile, and all the other cars. Stress. And then salvation, the golden arches, a Big Mac. Globalisation means the world is getting smaller. A piece of home, far from home. One feeling is continually getting stronger: home is always best. How does your company bring together home and abroad? Old and new? Risk and stability?

Central vs. decentralised

Glocalisation refers to the process of mastering international value creation networks. Central tasks applicable worldwide form the guide rails for local, decentralised control. Centrality ensures efficiency, quality, and protection of the core of the brand. Decentralisation creates flexibility, saves resources, and utilises the existing market intelligence of local employees. In addition, decentralised structures make it possible to assimilate local knowledge rapidly. This process lets go of national borders and nationality, facilitating cooperation and communication. Putting down roots, particularly in foreign countries, while not forgetting one's origins, is the essence of a glocal internationalisation strategy.

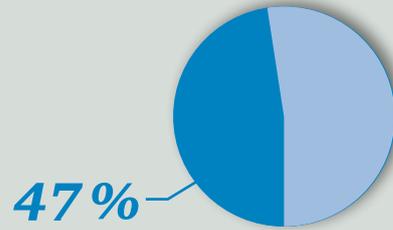
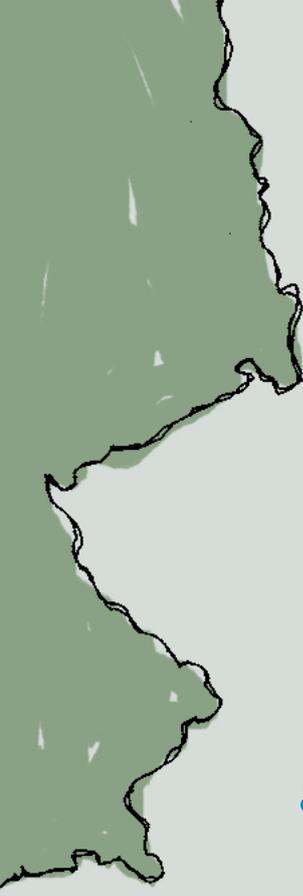
Learning, not saving

Globalisation has caused companies to change radically. More than two thirds of all companies in industrialised countries maintain international business relations. Manufacturing companies from Germany have benefited more than average from globalisation, when

compared to other countries. Over the course of many years, the title „Export World Champion“ has documented this exceptional international reputation. Today, 60% of all German companies are failing to meet their internationalisation targets. Simple export-orientation is no longer enough to participate in the global economic growth. Self-aware international customers with individual requirements expect more than „Made in Germany“. An understanding of local culture is a prerequisite for being perceived as a partner. This requires access to local value creation, and the courage to see this not only as potential for efficiency, but also as an opportunity for gaining knowledge and experience.

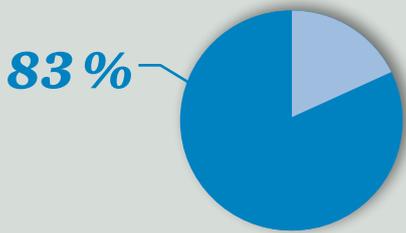
Think global, act local!

At the same time, globalisation leads to sociological homogenisation and particularisation of cultures. Globalisation requires glocalisation. Manufacturing companies cannot and must not ignore local differences. Instead, they need to learn all about them. At the same time, companies will only be successful abroad if they can retain their identity, and also pass on the associated essence of the brand to foreign employees. Market intelligence must be built up through communication and networking. Value creation is engineered together in a collaborative network with global partners. The globalised world holds immense potential for this new understanding of internationalisation. It can be shaped by a young generation of employees who have grown up with a variety of cultures and languages. It has never been easier to unite global and local perspectives: Think global, act local!



of German companies with international locations primarily use local suppliers

WZL 2014



of German companies with international locations staff them with local management

WZL 2014



224,65€

3,32 €

0,09 €

Costs for a 3-minute telephone call from New York to London in 1930, 1990 and 2014

Busse 2002, WZL 2014



The company

With a history stretching back over 100 years, DORMA supplies holistic solutions relating to opening and closing systems for doors, from hinges and door closers to automatic doors systems and time and access control systems. Major production facilities are located in Europe, Singapore, Malaysia, China and North America. In the financial year 2013/14, the group achieved a turnover of 1,060 million euros. DORMA employs a staff of around 7,500 worldwide. The international DORMA Group has shareholders in over 50 countries, and its headquarters are in Ennepetal.



Oliver Schubert

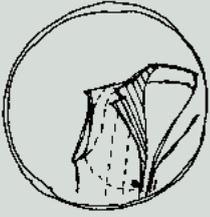
As Chief Operations Officer (COO), Oliver Schubert is responsible globally for research and development, purchasing, quality, production and logistics.

„For DORMA, the interaction between local solutions and global standards is the key to innovation, quality and individuality – for every customer, around the world.“

Oliver Schubert

One world, divided into five regions: one value creation

Football stadiums in South America, concert halls in China, museums in the USA, office buildings in Germany – DORMA offers its customers individual solutions all over the world. For purposes of direct customer orientation, DORMA has divided the world into five regions. This allows customer requirements to be complied with in terms of design, quality, reliability and speed. Different requirements result in different products: over 100,000 active product article numbers are manufactured in more than 30 company-owned facilities and 6,000 supplier operations. The production facilities manufacture globally standardised components and assemblies, which are configured and assembled specifically for markets and customers. The standards ensure quality and cost control globally, for every customer. The research & development centres in Europe, Asia and America, and design centres for customer communication in important metropolitan areas worldwide, represent a key to strengthening innovativeness. In this way, DORMA learns from its customers and suppliers around the world. DORMA is always in contact with its customers locally, and is thus able to design its products to meet requirements and provide the customer with services locally. Dynamic networking in the DORMA value creation network means that all locations benefit from local developments and optimisations. DORMA is the orchestrator, using the value creation network to supply global customers with optimal local services.



Automation

30 cm



distance from the car in front
required by self-driving cars

Doll 2014

Tailor-made

A suit is made from 5 metres of cloth, over 80 individual parts, and a whole lot of thread. Manufacturing a tailored suit takes 60-70 hours of manual labour, including measurements and fittings. The result is a tailor-made suit and a perfect fit. Can this process be automated? The answer to that is yes, but also no. Almost all suits produced are manufactured in fully or partially automated processes. The manner of production has not fundamentally changed in the last 100 years, and it has thus become possible for the process to be reproducibly automated. Suits have become affordable mass commodities. Why would anyone still make suits by laborious manual work? Tailored suits fit better because they have more flexible seams. Individual for each customer, with every stitch. A machinery can do the same. However, the same material has the same power. Always the same standard.

Automatic vs. manual

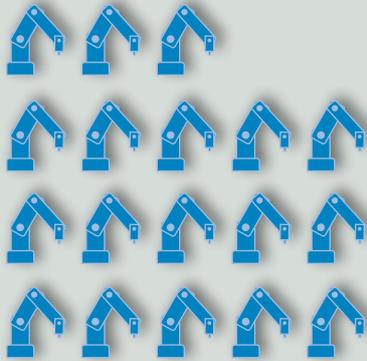
Manufacturing companies are always looking for new ways to become more efficient. Automation makes processes reproducible and hence error-free. Machinery knows only one way of doing things: first time right. 24 hours a day, 7 days a week, all year round: machines are always available and have high capacities. They reduce costs and lead times. The question quickly arises, whether all processes can be automated. Is there no alternative to automation? Automation represents a high starting investment, which needs to amortise itself through capacity, savings on human resources, and shortening production times. This only works, however, where manual activities have previously been explicitly defined and can be translated into machine code. There are limits here, unless machines start being able to think.

Can machines think?

A human being has five senses. He can see, hear, smell, taste and touch. Machines also have these senses, and in many cases are better at them. They can perceive sounds in unimaginable frequencies, and can see in high resolution. Machines are also already able to smell, taste and touch using sensors. Manual work predominantly takes place through touch. Touch in the sense of feeling, perceiving, experiencing. The tailor, for example, feels the material, perceives its quality, and visually imagines the tailored suit. Mental images are part of the thinking process. So, can machines think? No! Machines have no imagination, no emotional intelligence, and therefore cannot actively think.

Master and servant

In order to achieve automation, a profound understanding of the process is required, as is stable control of the process. Building on this, processes can be standardised and automated. This requires humans. They are needed to practically replace machine intelligence, so as not to waste their qualifications. 80/20 is currently the rule: 80% time for 20% routine. Driving or housework are time-consuming, simple activities. Machines are however capable of adaptively learning from experience, and can therefore unburden humans of routine activities. They become valuable and intelligent servants. The fact here remains: the humans are the masters and the machines the servants.



179.000

industrial robots were sold
worldwide in 2013

IFR 2014

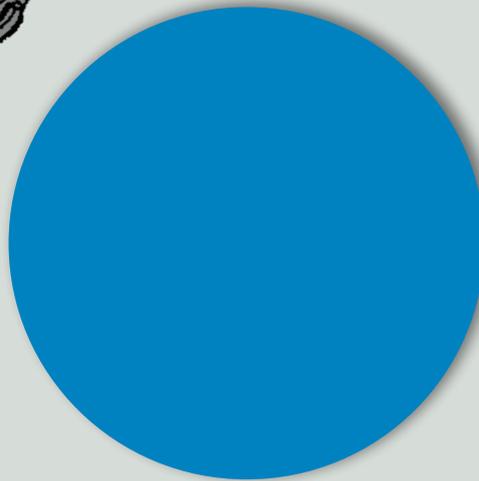
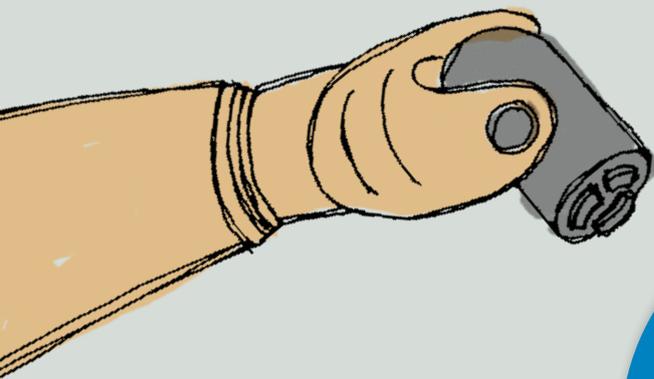


2 years

6 months

The average German spends 2
years and 6 months in cars

Geo Wissen 2005



11.000 kbit/s

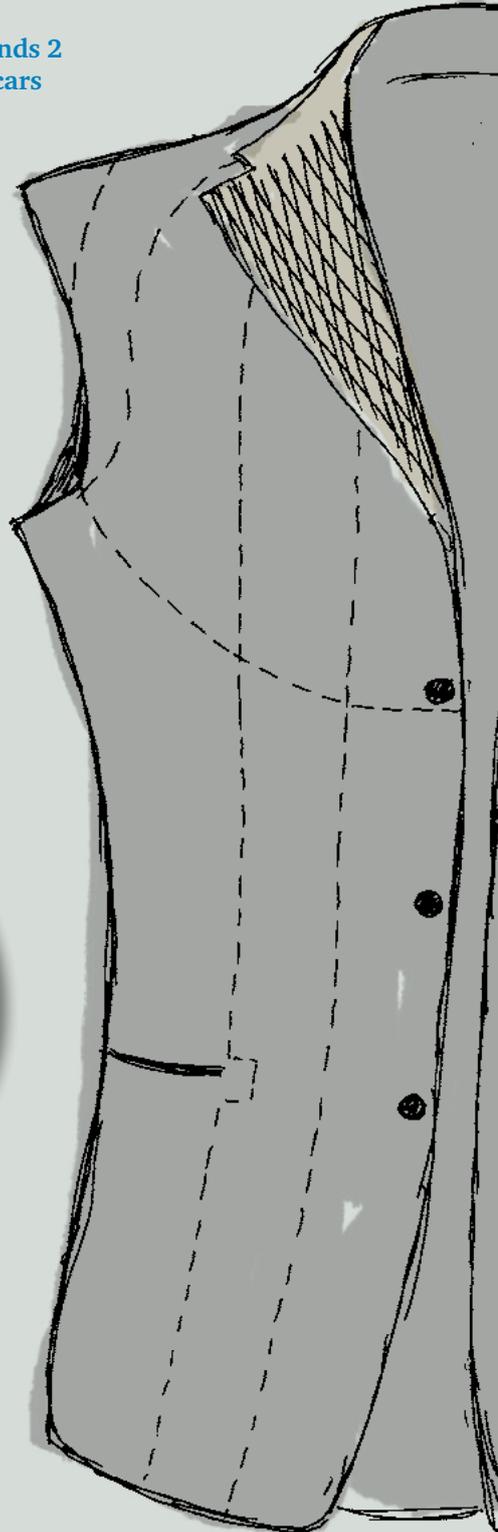
is the transmission rate in the
central nervous system of a
human being

Konrad 2014

100.000 kbit/s

is the transmission rate in the
upstream/downstream of V-DSL

1&1 Internet 2014





Pushing Performance

The company

The HARTING Technology Group has its headquarters in East-Westphalian Espelkamp, and is a global market leader in electrical and electronic connections technology. The business divisions of the company offer a broad spectrum of tailor-made solutions for applications in the industrial sector. The product portfolio includes plug connections, device connection technology, network components and preassembled cables. HARTING products connect and network devices, machines and systems with data, signals and power. The family enterprise HARTING currently employs a staff of almost 4,000 employees in 42 sales companies and 12 production facilities.



Philip F. W. Harting

Philip F. W. Harting, executive board of Connectivity & Networks, and personally liable partner of the HARTING Technology Group

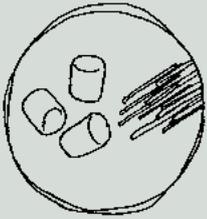


„For almost 70 years, the name HARTING has stood for quality products. Virtually every machine and every plant operates with a HARTING plug connector.

This success is based on quality and innovations. And on around 4,000 highly motivated employees around the world.“ Philip F. W. Harting

Automation, not against employees but for them!

Mass production as custom production – Like tailored suits, plug connections are increasingly being individualised. Modular combinations of very different communication media and insulators are becoming more common, along with customer-specific and project-specific labelling and marking of plug connections. This is only being made possible thanks to automation. The seamless integration into customer processes generates enormous complexity, which can only be solved through automated processes. At HARTING there is a particular focus on assembly processes that can be automated. The assembly units are modular, and can perform various different assembly steps. Supply capability is ensured through highly flexible processes rather than through stockpiling. The next stage is the elimination of rigid manufacturing sequences. Work schedules will become flexible, automatically adjusting themselves to bottlenecks, potentially by means of Industrie 4.0. The assembly concept developed by HARTING is called FlexiMon, and is currently being developed within the framework of a project by the technology cluster „it's OWL“. Not all processes can be automated, however. At HARTING, decisions for or against automation solutions are always based on a feasibility study. Particularly in terms of sensitivity and creativity, humans are superior to robots and assembly systems. Robots cannot think or feel. However, the demographic change in Germany means that the planned growth in turnover cannot be achieved without automation. Automation makes growth possible in Germany as an industrial location. But it also always means change. With the help of the HARlis production system, such changes can be introduced together with the employees. New robot cells are thoroughly demonstrated and piloted. The objective of the automation process is always to improve the quality of the tasks performed by the employees, on a basis of qualification and enthusiasm. The recipe for success is to pursue automation - not against employees, but for them.



Innovative Engineering



80% of production costs are defined within the first 20% of the development process.

Hiller 2014

Back to kindergarten

Innovative solutions, fast solutions, better solutions: these are the stimulus for market leadership and growth. Development with qualified employees is the asset of the manufacturing company. But how can I develop innovatively, fast, better? A development experiment: 1 marshmallow, 20 spaghetti, 18 minutes, the highest marshmallow on a structure made of spaghetti wins. Economists, lawyers and executives lose... to kindergarten kids! The recipe for success defeats experience, knowledge, logic and analysis: children use short loops – building and optimising, as opposed to the ideas, concepts, discussion and theories of professionals.

Structured engineering vs. disruptive innovation

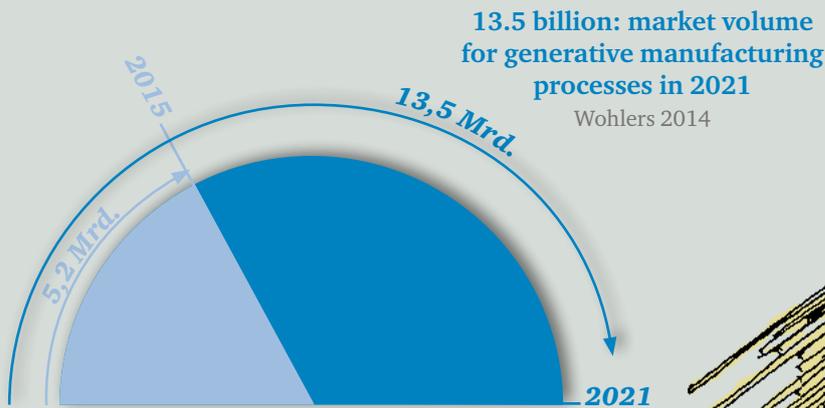
Innovative engineering is an elementary resource and success factor for the development of innovative, fast, better solutions. To this end, manufacturing companies can combine aspects of structured engineering and disruptive innovation. Structured engineering is the professional project manager for the path to solutions. Defined development projects, stages and approvals make it possible here to reliably take into consideration requirements and restrictions. The driving forces for new solutions are industry trends, ideas from the development department itself, and problems from the technical departments. Disruptive innovation creates freedom for new solutions. Here, the driving forces for developments come from outside the industry, allowing new perspectives to open up. The development process is initially independent of the technical departments; solutions are designed disruptively, and tested without taking into consideration the full spectrum of existing requirements and restrictions. Development, therefore, represents the proactive exploration of new possibilities, without a clearly defined solution space.

Creativity and efficiency go hand-in-hand

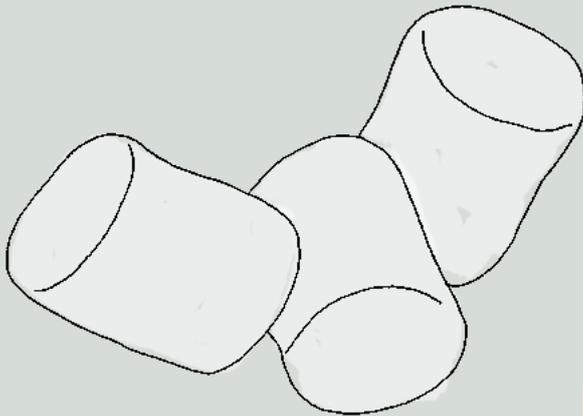
Today, manufacturing companies attempt to generate solutions through structured engineering. Simultaneous engineering, integrated development or development standards take the place of efficiency-boosting initiatives. Validation of new products and manufacturing them in a real setting are mostly too expensive. Defined processes are therefore utilised to ensure the application and manufacturing feasibility of new product solutions at an early stage. But this is exactly what is done differently in industries with short product lifetimes, such as the IT industry: solutions are initially designed, tested and optimised in short cycles, where the focus is on making them more innovative, faster, better – before degrees of freedom are narrowed by requirements and restrictions. The focus is thus on the solution, and allowing it to be manufactured efficiently at a later stage.

Integrated engineering with disruptive innovation

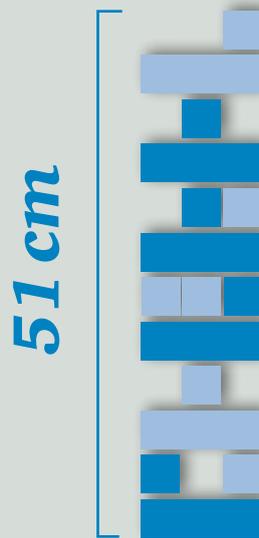
Manufacturing companies now have capabilities at their disposal that allow the testing of new solutions: Printers can create prototypes overnight, production simulations identify deficits in the manufacturing process, and demonstration factories allow production validation in a real setting. Development needs to be understood as exploration, and must make use of disruptive innovations to design even more innovative, faster, better solutions for the market. At the same time, the defined standards of an engineering department connected with all technical departments ensure the development of solutions that can be applied and manufactured: error costs are development costs, not production costs.



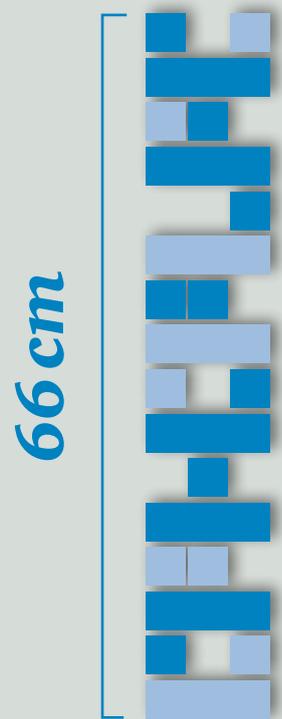
5.2 billion: market volume for generative manufacturing processes in 2015
Wohlers 2014



Kindergarten children use optimisation cycles in the Marshmallow Challenge
Wujec 2010



51 cm is the average height of the Marshmallow Towers of all professional groups
Wujec 2010



66 cm is the average height of the Marshmallow Towers of the kindergarten children
Wujec 2010

ottobock.

The company

Since the company was founded in 1919, Ottobock HealthCare has pursued the vision of using innovative products to improve the mobility of people with disabilities. The owner-run medical technology company is the global market leader in prosthetics, and is impressive above all for its innovative products, and its close cooperation with customers and end users. The company employs a staff of over 6,300 worldwide, and maintains a network of sales and service companies in over 50 countries. In the financial year 2014, Ottobock HealthCare achieved a turnover of 773 million euros. The company's headquarters are in Duderstadt, Lower Saxony.



Dr. Sönke Rössing

Dr. Sönke Rössing is the head of the department of Strategy & Human Resources. His field of responsibility covers strategy development for the Ottobock Group, and its mergers & acquisitions activities. This is in keeping with his responsibility in the Ottobock HealthCare for global personnel management and learning & development, as well as for human resources shared services within the Ottobock Group.



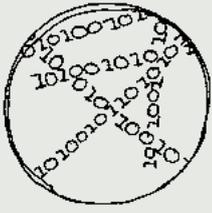
Understanding what motivates end users

Innovation along the entire value creation chain is a success factor for Ottobock HealthCare. At the start, there is product development. In order to take the local requirements of end users into consideration at the stage of product development already, this process is both decentralised and global, being performed not only at the main development sites in Duderstadt, Vienna and Salt Lake City, but since 2014 also in Brazil. „Demand-Driven Development“: close to the market, fast in development. Numerous partnerships, e.g. with universities and research institutions, secure their position as technological market leader. The implementation of new processes and technologies in the field of operations is characterised by continuous innovations. Global excellence centres for key processes such as purchasing, logistics, manufacturing and after-sales transfer new standards and developments to the operational sites located around the world. And forwards integration through close partnerships with orthopaedic competence centres, together with the operation of a company-owned patient care centre, increasingly ensures that innovations are also created in the customer-specific adaptation of prosthetics and orthoses. It is thus increasingly common today for the traditional plaster cast of the stump to be replaced by a digital measurement, and the subsequent production of the shaft in the central manufacturing facilities. This increases the quality of care, while simultaneously reducing the costs for the healthcare system. For Ottobock, innovative engineering means understanding what matters to the end user – throughout the entire value creation process.

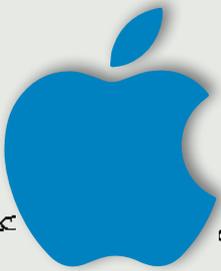
A modern, brightly lit museum or exhibition space featuring several white mannequins displaying various prosthetic limbs. The mannequins are arranged on a white, curved platform. In the background, there are large glass windows and a large digital display screen. The overall atmosphere is clean and professional.

„Innovative engineering does not take place in the development department in our company, but along the entire process chain“

Dr. Sönke Rössing



Digitalisation



1.200.000

Number of apps available from
the Apple App Store

Apple 2014

Knowledge to go

From 300,000 articles to 1.7 million articles. From 8 years per edition to 12 edits per minute. From Encyclopaedia to Wikipedia. From analogue to digital. A look back in time: in 1990, the World Wide Web is developed. In 1996, Deep Blue beats Gary Kasparow, electronic data processing defeating the world chess champion for the first time. In 2002, the volume of digital data storage capacity exceeds analogue capacities. Today, life without almost 2 billion smartphones is almost unthinkable. Calendars, weather forecasts, entertainment, communication, and shopping, have all become digital, and are used billions of times per day. Digitalisation means finding information: in your trouser pocket, on the sofa, at the airport, out for a walk... and at work?

Quick assistants vs. holistic solutions

The success factor of digitalisation puts manufacturing companies in a position to save information, to link it together, and to use it. It is therefore an elementary resource for the Fast Forward Factory. In addition, both small tools and holistic software systems can be used. Apps on smartphones or tablets are digital assistants. They are specially programmed for one task. The advantages of this include high flexibility and adaptability. One disadvantage of this is the large number of interfaces between the apps. On the other hand, a holistic software system can reduce this. In contrast to a wide range of small tools, this solution is comparatively rigid and inflexible. A single database means clear identification of the origin of data, however, without a lot of interfaces or redundancy.

The glass is half full

The capabilities of digitalisation can be recognised by companies on an everyday basis: Archives are on hard drives, designs are three-dimensional, and manufacturing processes do not require drawings. At the same time, manufactur-

ing companies require significantly more time than other industries to integrate new digitalisation solutions. The obstacles are that nowhere else are the complexity of the value creation process, the average age of the employees, and the aversion to interdisciplinary working higher. In many cases, the high volumes of data and information, the extensive experiential knowledge and shortage of „digital natives“ lead to conscious decisions against new systems, against web-based communication, against virtual realities: against digitalisation. The obstacles to digitalisation simultaneously describe its potential: mastering complex value creation processes, making knowledge available, and utilising new impulses.

Embrace the chaos!

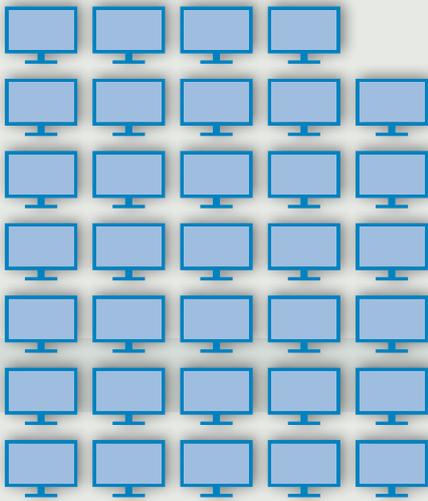
Information technology often seems chaotic to engineers. Its solution space is significantly less restricted than in mechanical engineering. Accept digitalisation as also being a question, and not just an answer. Accept heterogeneity, and instead shape and optimise the interfaces. Utilise the strengths of different disciplines, and ensure a structure that turns Big Data into Smart Data. This process is facilitated by data models that have defined dependencies and connections. Data governance remains a management issue, authorisation management prevents data misuse, and data sets are maintained by data stewards. Single Source of Truth is an essential principle here, so as to avoid contradictory data sets. Defined interfaces are utilised, in order to use data with a wide range of different systems. The entire system is modular, providing maximum flexibility: apps deliver solutions for special applications. Gamification allows employees to absorb new knowledge by playing, to network with one another, and thus to further develop digitalisation within the company.



300 Mio.

Page views per month in the
German-language Wikipedia

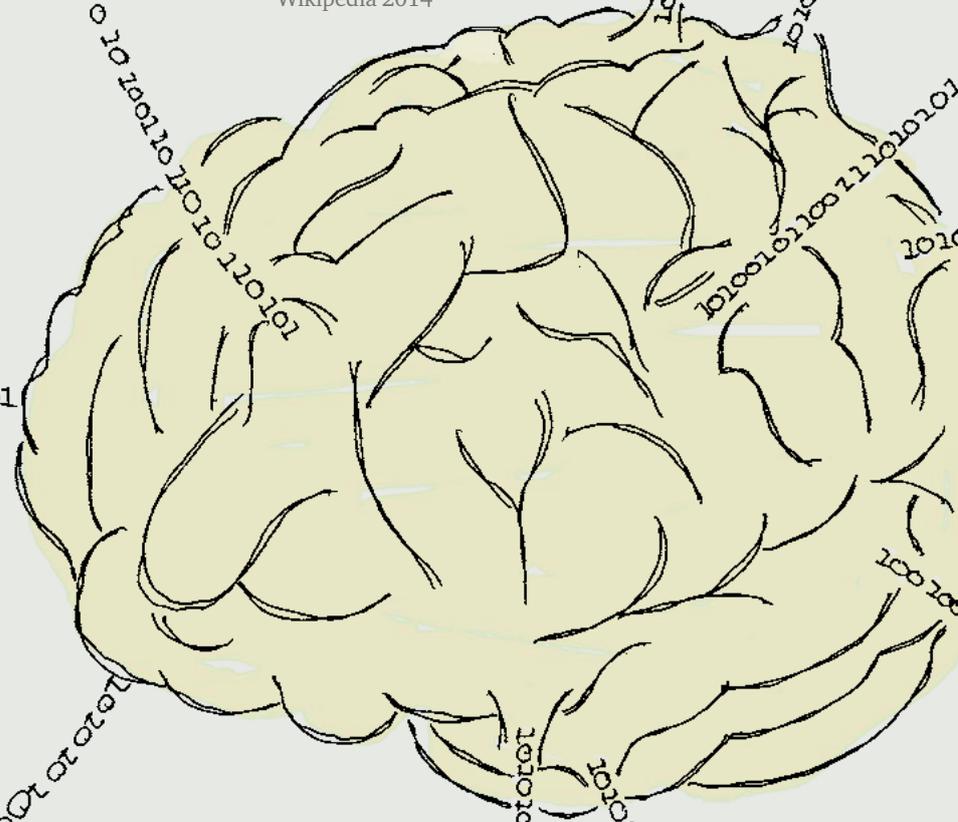
Wikipedia 2014



340×10^{6561}

Number of new IP addresses
under the IPv6 communications
protocol: 340 undecillion

ICANN 2010



196.300.000.000

emails were sent worldwide in 2014

Statista 2014



WITTENSTEIN

The company

WITTENSTEIN stands for mechatronic drive technology with the highest standards of innovation, precision and capability. The company was founded in 1949, and benefits from mastering and further developing all relevant technologies in mechatronics and drive engineering under a single roof. Its key product range is for zero-backlash planetary and servo gear units with extreme torque density. With an export rate of 60%, the company is internationally oriented, and has a total staff of 1,900 employees. In the financial year 2013/2014, WITTENSTEIN achieved a turnover of 254 million euros. The company headquarters is in Igersheim.



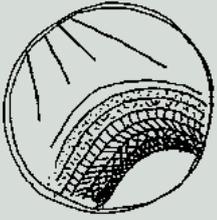
Dr. Jochen Schlick

Dr. Jochen Schlick is head of the future-oriented business segment of Cyber-Physical Systems, and responsible for implementing the potential of Industrie 4.0 at WITTENSTEIN.

„Digitalisation at WITTENSTEIN is not a revolution ordered from the top. It is the expression of a continuous engagement with the already existing potential of an intelligent, networked environment.“ Dr. Jochen Schlick

Continuous transparency through digital networking

Mechatronics brings together the worlds of mechanics and electronics. Therefore, it is interdisciplinary, just like digitalisation. On WITTENSTEIN Industrial Campus, digitalisation is a reality lived by mechanical engineers, electrical technicians, and computer engineers, as well as students, researchers, end users and professors. This is where digital solutions are developed for the entire group. For WITTENSTEIN, digitalisation means the digital networking of objects, people and machines. It makes operational excellence possible through digital processes, and opens up new business models through digitalised products. Many approaches from the predevelopment are piloted at the Fellbach site. All orders are already scanned using QR codes. Order data are analysed by external experts to calculate the shortest routes for internal logistics. The milk-run driver is guided to the next destination by an app. A mobile escalation management system and an optimally visualised production planning process round out the complete digital package for the factory of the future. The digital information for all this are stored in central databases, which are linked to one another using defined interfaces. The objectives of WITTENSTEIN's digitalisation strategy are omnipresent networking, omnipresent assistance, and a self-optimising production process with a (semi-)autonomous control system. The key to digital success is to break down existing patterns of thought. Ensuring total data security? Impossible! Instead, the aim is to systematically evaluate and control risks. In the factory of the future, humans will be making the decisions at the centre of the production process. Digital assistance reduces the work required to making qualified decisions. And this can still best be done by a human.



Working Cluture

**1.250
to
1.250**

is the ratio of
workplace seating to
common space seating
at Google in London

Hoffmann 2012

Google, Facebook, Apple

Why are Google, Facebook, Apple successful? What sets them apart from the rest? Why are they more innovative, faster, more flexible, better? Silicon Valley has become a symbol of a fundamental and successful cultural change in the world of work: new media, social networks, playgrounds for adults, flexibility, flat hierarchies, and open spaces and lateral thinking are just a few characteristics. Traditional industries, and in particular manufacturing companies, have a hard time accepting and actively participating in this rapid change, despite a wide range of studies having shown that culture has a significant effect on the success of a business.

Work vs. leisure

Every company has a corporate culture. This is an expression of personality and culture, and shapes the attitudes of employees in terms of values, communication and modes of working. Progressive digital networking, Generation Y questioning existing structures, and the desire for greater individuality and design freedom are major characteristics of the prevalent cultural transition. The strict separation of work and leisure is firmly embedded in many corporate cultures, and has been out of date for a long time. Just as a rainbow is an atmospheric and optical phenomenon, a new working culture must form the foundation and boundary conditions for a fluid transition between work and leisure.

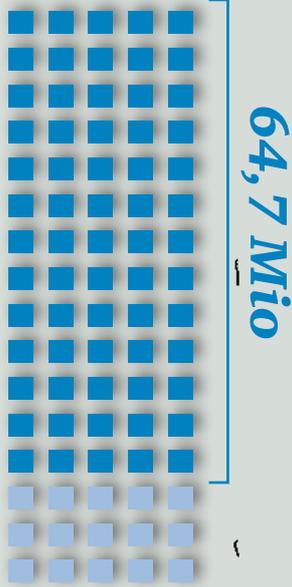
Actively creating open spaces

Actively creating open spaces in terms of time, content, and personal conditions is the first step towards engineering the working culture. A working day must never consist of more than 8 hours of

attendance at the workplace. Where and when results are achieved is irrelevant. Rather, what is important is the quality of the work results. Employees must be offered a forum for creativity where they can try things out and make mistakes. Freedom to make mistakes, and handling these, are decisive building blocks for success. Open spaces are actively used in combination with individual development through further training programmes, expanding the variety of tasks performed, and increasing the content of tasks. Furthermore, integration into the architecture of the workplace should be made tangible. New ways of thinking and viewing things demand barrier-free rooms, a lot of space, and bright colours.

Understanding people, leading people, loving people

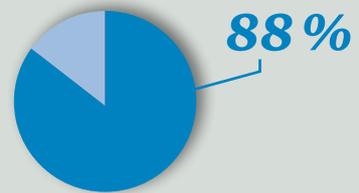
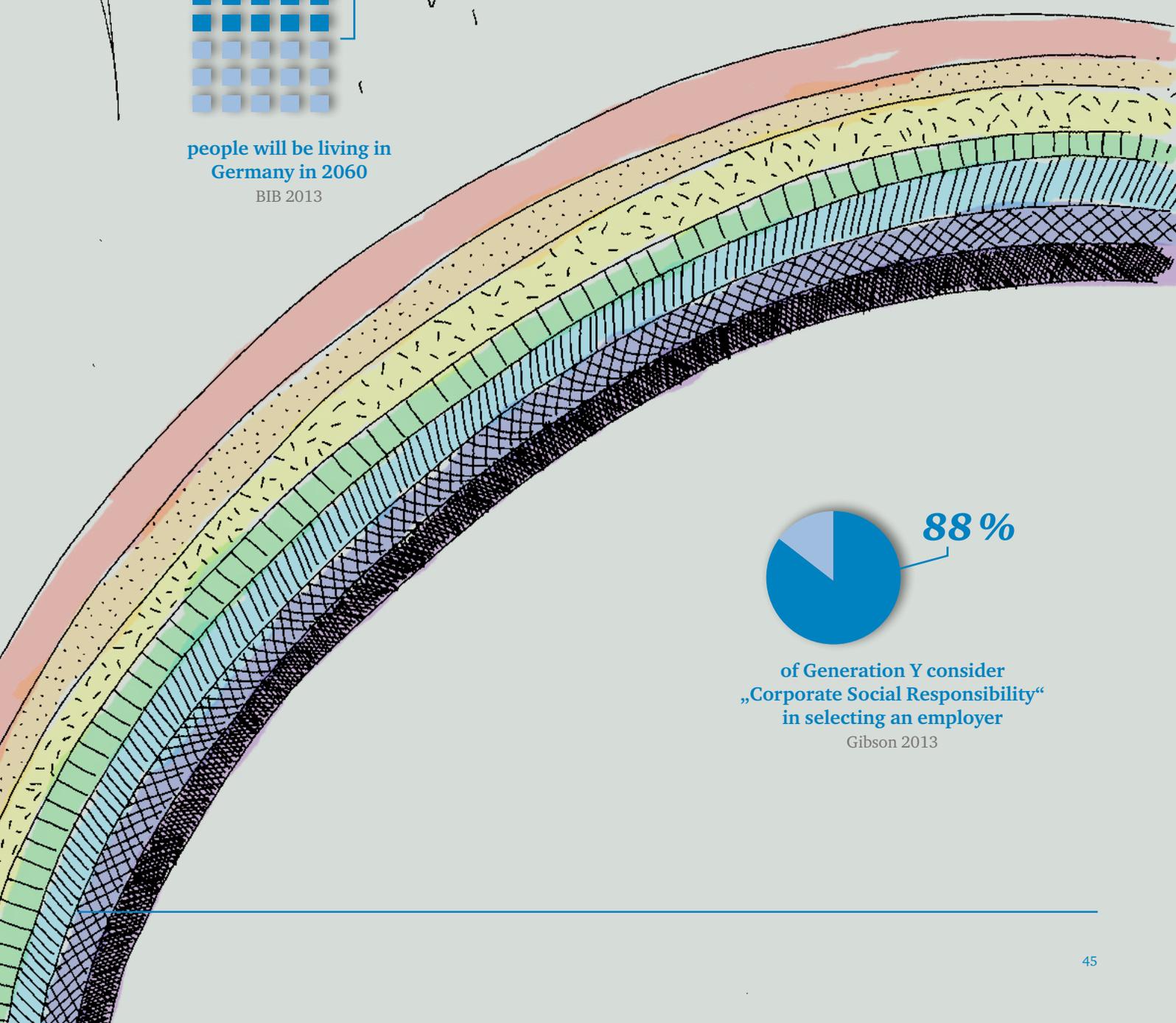
The most important resource of a company is its employees. They are responsible for developing new products, opening up unknown markets, or designing innovative processes. Employees in manufacturing companies have various fields of work, individual capabilities, and very different qualifications. In order to take these into account, understanding the employees is a central component of the working culture. Only when a company understands its employees it is possible to lead them using their personal objectives and appreciate their performance. This is because the meaning of working culture is none other than, understanding people, leading people, loving people!



people will be living in Germany in 2060
BIB 2013



companies have their own Facebook pages
Facebook 2014



of Generation Y consider „Corporate Social Responsibility“ in selecting an employer
Gibson 2013

The perfect sound

Joy, sadness, love. All kinds of emotions can be communicated using a single unique medium: sound.

People not only hear through eardrums, but also through their skin and even their eyes. The Sennheiser company began its quest for the perfect sound almost 70 years ago. Its premium products are loved and appreciated by people all over the world. Behind the development and production of these premium products are employees and a company with a working culture based on decision-making freedom, trust, and sustainability. These values are reflected not least in the consistent practice of teamwork. Semi-autonomous assembly teams with around 20 employees organise themselves, and elect a group spokesperson and capacity planner. Holiday and working times are coordinated within the team.

Employees do not punch in and out for breaks, and coffee is free of charge. Sennheiser trusts its employees, and turns participants into stakeholders. Entrepreneurial spirit requires the freedom to make decisions and develop one's potential. The employees thus apply the principle of „cardboard engineering“ to shape their own workplaces, and independently develop new solutions within the team. Inclusion is more than an empty word at Sennheiser, but becomes a reality through the active integration of people with disabilities. The perfect sound is created through a perfect working culture.

„For almost 70 years, our name has stood for quality products. To this end, 2,500 employees search for the perfect sound on a daily basis. Trust and decision-making freedom are the pillars of our success.“

Dr. Andreas Sennheiser

PHOENIX CONTACT

The company

Phoenix Contact engineers pioneering solutions in connection and automation technology for the world of tomorrow, wherever they are required, e.g. in transportation infrastructure, electromobility, clean water, regenerative energies, intelligent utility networks, and energy-efficient mechanical and plant engineering. The company has grown continuously since it was founded in 1923, and in 2013 it achieved a turnover of 1.64 billion euros. With its premises in Blomberg in the Lippe district, and more than 13,000 employees, Phoenix Contact today has production facilities in ten countries, over 50 of its own distribution companies, and is represented globally by around 30 additional local companies.



Dr. Heinz Wesch

As executive director of Phoenix Contact, Dr. Heinz Wesch is responsible for global production, mechanical and tool engineering, purchasing, and quality management.



Partnership and freedom for innovation

Since the formation of the company over 90 years ago, Phoenix Contact has stood for innovation and quality. The continuous growth of the company has been achieved through three key values: Phoenix Contact is independent, designs innovatively and engages in trusting partnerships. These key values are not top-level strategies of the company, but guiding principles for every employee worldwide. Business units, departments and teams are deliberately given space to develop innovative solutions. The objectives of the executive board are logically broken down over all levels, right down to the shop floor. Every employee makes a clear value contribution. At Phoenix Contact, leadership means defining clear targets and creating the best possible conditions for reaching those targets. A field of tension is created between the freedom to decide independently and specific expertise on the one hand, and targets of predefined results and achieving growth on the other. Phoenix Contact resolves this tension with its trusting teamwork and collaboration, combining local optimisations to create shared success. The focus is not on one-off optimal solutions, but on sustainable cooperation. This self-image applies both within the company and in all dealings with those outside: suppliers and customers are partners for a long-term development. The realisation of these three key values turns the working culture of Phoenix Contact into the resource for sustainable success, and acts as a means of identification for every employee: Blomberg is the capital of the world of connection technology.



“Independence, innovation and partnership can be communicated independently of one another, but sustained success is only achieved through the anchoring of all three values in our working culture.”

Dr. Heinz Wesch

Prospects

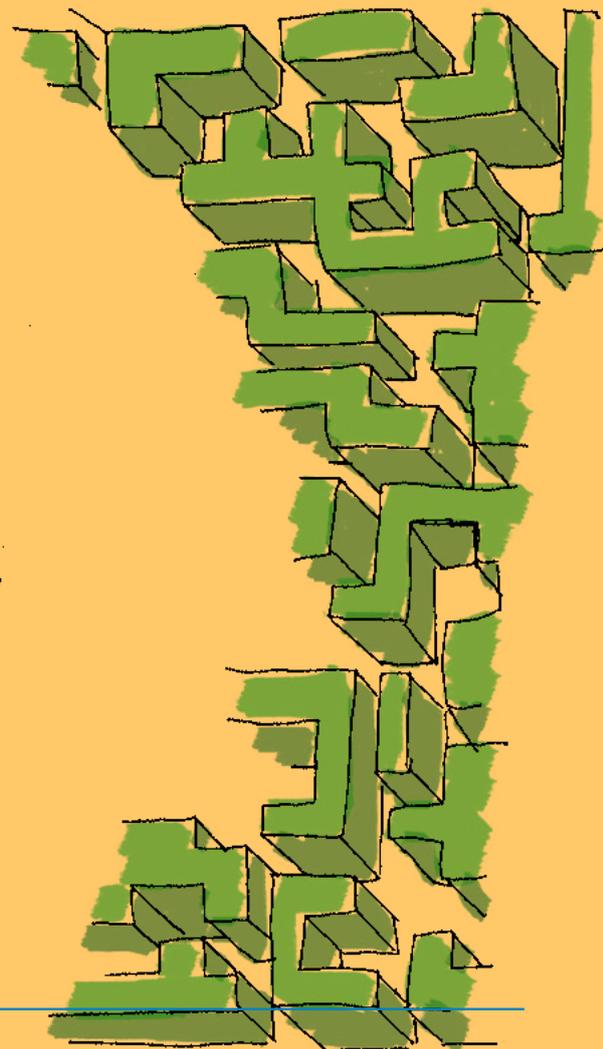
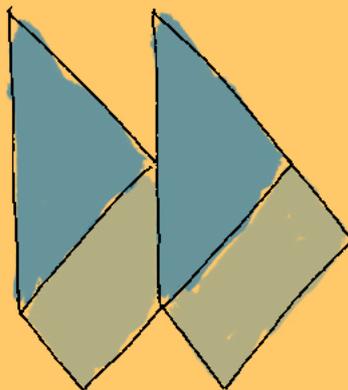
With these nine success factors, manufacturing companies can now set a course for success, and control their value creation process more efficiently. The Fast Forward Factory brings together all success factors, in order to continuously engineer its value creation chain, from products and processes to the resources: Glocal processes are digitalised; working culture means that employees and customers are understood; products are emotionalised; construction kits facilitate automated production; and Smart Services are developed to be synchronised with iterative cycles. The Fast Forward Factory shows how to respond to current trends and challenges, and how to achieve success in the coming years.

The success factors are not a final objective, however. They show the way to a more efficient value creation chain. This path is shaped by our social, economic and technological development. Change and transformation will continue to be constant in the future. The Fast Forward Factory takes this transformation into consideration. It is openness, learning, and decision-making that make the Fast Forward Factory possible.

Openness allows changes, trends and challenges to be perceived at an early stage and actively. The Fast Forward Factory can collect and absorb ideas or concepts from other companies, industries or areas. Learning starts by engaging with these external changes, and through developments within the company. Changes always lead to something new, not simply to something better or something worse. Dialogue

with employees, customers and partners allows their perspectives to be utilised, their opinions heard, and sustainable solutions can thus be developed. All internal and external stakeholder groups expand the knowledge of the company. This only functions as support because this knowledge is reflected internally, and a conscious decision is made in favour of the Fast Forward Factory. Decisions define targets, allowing a clear course to be set. Openness, learning, and decision-making allow the Fast Forward Factory to navigate constantly as changes occur.

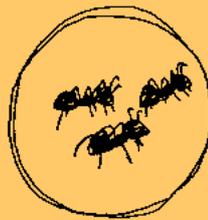
A company that is open, that learns, and that makes conscious decisions... that company is more efficient, that company is Fast Forward!



The Fast Forward Factory ...



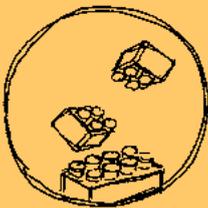
... is persuasive in 7 seconds.



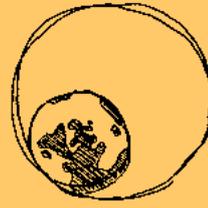
... engineers interfaces.



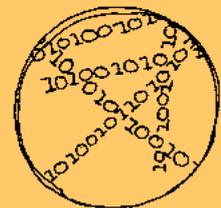
... develops the kindergarten way.



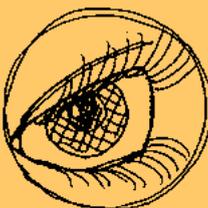
... thinks in modules.



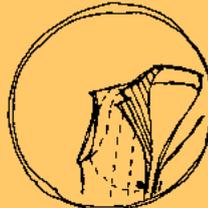
... shrinks the globe.



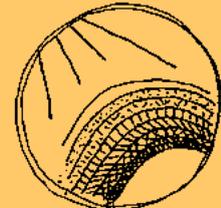
... finds knowledge.



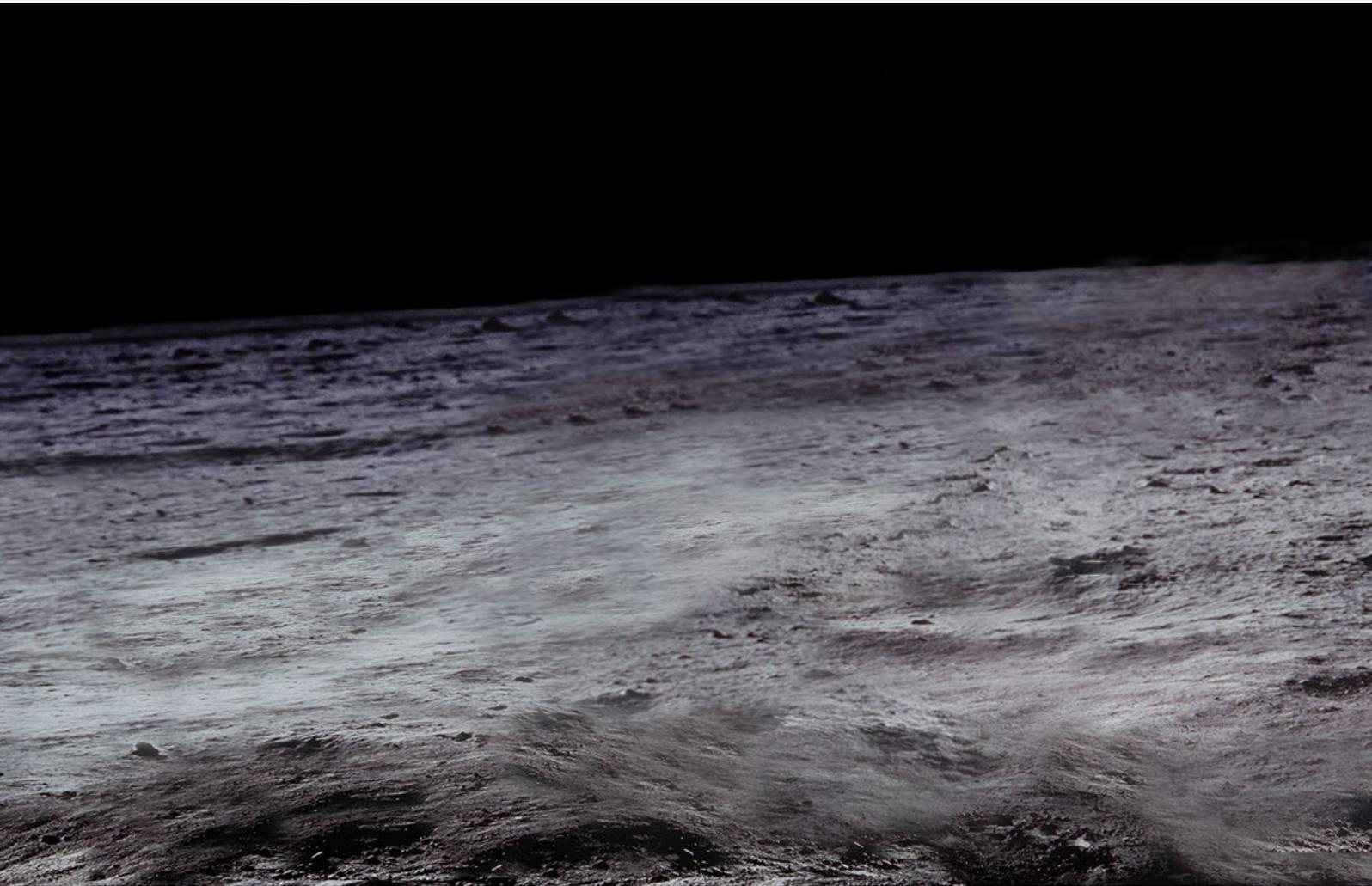
... understands the customer.



... recognises strengths.



... creates open spaces.



Publisher

Laboratory for Machine Tools and Production Engineering (WZL)

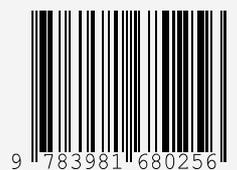
of RWTH Aachen University

Steinbachstrasse 19

52074 Aachen, Germany

www.wzl.rwth-aachen.de

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