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logged in

THE MAGAZINE FOR
SOCIAL NETWORKED INDUSTRY

- Drones, smart glasses and co: making **Logistics 4.0** possible
- A question of **mechanical responsibility**
- **Transfer projects:** making innovative leaps forward in tandem

Human-technology interaction in focus

How social networks serve as a model for new cooperation and communication systems

INNOVATIONLAB
Hybrid Services
in Logistics

01 editorial

Dear Friends and Colleagues, dear Network Partners,

IN THE NETWORKED ECONOMY OF TOMORROW, humans and technology will work together to an extent and with a level of quality which we have not experienced until now. In this context, experts at Fraunhofer-Gesellschaft have developed the future vision of a Social Networked Industry that sees itself as a further development of Industry 4.0. It puts a focus on the human element without questioning the validity of technology. It does not want machines to tell people what to do, but envisages that people will have to develop parallel to technology. With the Innovationlab Hybrid Services in Logistics we are making a significant contribution towards the development of this Social Networked Industry.

A human-centred Social Networked Industry is neither an end in itself, nor is it something that will run of its own accord. This is a development task for the whole of society where experts from a full range of disciplines have to be able to work together on equal terms. It is therefore a top priority to »consider the big picture«. Our integrated perspective is based on cooperation between engineering and social-science disciplines, with a socio-technical system approach in which the respective strengths and weaknesses of humans and technology are all taken into account, and a specific definition of human-technology interaction which enables Social Networked Industry to be considered in its entirety for the first time.

This magazine is intended to give you an insight into the many different facets of Social Networked Industry. We are looking forward to discussing this with you.

Your team at the
Innovationlab Hybrid Services in Logistics

»Creating an integrated design for Social Networked Industry« is the title of the most recent whitepaper by Fraunhofer IML in cooperation with the Innovationlab. It is available for download on the Innovationlab's website:

Eine Initiative des Bundesministeriums für Bildung und Forschung

Wissenschaftsjahr | 2018
ARBEITSWELTEN DER ZUKUNFT

The Innovationlab is continuing its dedicated work by putting on events and making other contributions in Science Year 2018.

02 impulse

In the Social Networked Industry humans and machines become a team

Whenever people have been speaking about the factory of the future in recent years, one picture dominated the discussion: the »factory empty of people«. The Social Networked Industry presents an alternative plan.

The concept of (fully) automated production was, for a long time, regarded as a guarantor for absolute performance and efficiency because of the low costs. In the meantime, people have realised that the flexibility of production falls by the wayside in a »factory empty of people«. But flexibility is still a significant competitive factor for industry in the future: consumers' demand structures have changed with a growing focus on individualised products in recent years. Industry must be the driving force and make it possible to change structures simply and quickly. There is now growing awareness that people can and have to take up a new role in this system. In the end, it is one of the undisputed strengths of people that they are able to react flexibly to changing processes, procedures and spaces. Having a high proportion of manual activities evidently leads to more flexibility.

People are taking centre stage again

To meet today's customers' requirements for individual, well-priced products, the strengths of both manual and mechanical work – i.e. flexibility and efficiency – have to be combined. This requires a completely innovative socio-technical system in which people and machines work together as a team.
Social networks, with their high degree of networking and their ability to act and interact, can serve as a role model

> **People and machines should communicate with each other in (digital) social networks in a networked industry.**
> Prof. Dr. Dr. h. c. Michael ten Hompel

for this new kind of cooperation and communication. In terms of the factory of the future, this means that people and machines should communicate with each other in (digital) social networks in a networked industry. This new social networked industry stands for an Industry 4.0 that puts people more in the centre of production (again) and

Prof. Dr. Dr. h. c. Michael ten Hompel is one of the authors of the position papers »Logistics as a science – key research questions in times of the fourth industrial revolution« and »Digitisation in Logistics – answers to questions of company practice« by the Bundesvereinigung Logistik (BVL).

When humans and technology interact, processes can be improved considerably with virtual information.

People or technology? This question is not relevant!

A significant condition for the implementation of the Industry 4.0 project in terms of comprehensive system design is a socio-technical system approach.

The design-oriented approach assumes that the implementation of new technologies induces organisational and personnel changes and generally requires that the entire system of performance in production and service is considered. Although not always defined consistently, a socio-technical system is generally understood to be a production unit that consists of interdependent technological, organisational and personnel sub-systems.
The term »socio-technical system« has played a prominent conceptual and analytical role in research into work for a long time – in particular for investigating and designing engineered and automated work processes – and has found its way into the latest discourse regarding digitisation and Industry 4.0. However, technology-focused discourse is now often reduced to considering »new« forms of human-technology collaboration or new approaches to work organisation on the basis of intelligent assistance systems. But creating complementary designs of individual system elements to form a completely integrated system is significant: Complementarity here means that the specific strengths and weaknesses of technology and people are considered equally according to each situation and that there is a plan to share functions between people and machines to enable the entire system to work efficiently and without break downs The complementary design of the entire system should always focus on optimally exploiting the potentials of people-oriented work design. ‹

You can find the complete article on the internet:

About the authors

Dr. Peter Ittermann is a scientific employee at TU Dortmund University in the field of industry and labour research. Dipl.-Logist. Johannes Dregger is a scientific employee at the Faculty of Mechanical Engineering at TU Dortmund University.

being put to the test due to technological progress. That speaks even more in favour of the concept of »Social Networked Industry« with the increasing importance of (flexible) people.

Trustworthy cooperation

As a result, the principle behind such a Social Networked Industry sends out a significant message: Industry 4.0 needs people and serves people. To make the vision of people and machines working together become reality, industry has to get involved in this new way of cooperating, people have to be prepared for life-long learning, and the machines have to be equipped with a »mechanical sense of responsibility«. The relationship between people and intelligent machines will then be able to develop in a direction where we can talk about a sort of »trustworthy cooperation« in human-machine communication.
Specific steps towards developing a positive picture of the future of Industry 4.0, in which people and machines work in a team, have already been initiated in new research projects and networks. ‹

About the author

Prof. Dr. Dr. hc. Michael ten Hompel holds the Chair of Material Handling and Warehousing at TU Dortmund University. He is the Managing Director of the Fraunhofer Institute for Material Flow and Logistics IML and the Director of the Fraunhofer Institute for Software and System Engineering ISST.

Prospects for Work 4.0: How will we work in future?

It is without question that the increasing spread of digital technologies throughout the working world will cause sustainable consequences for industrial working processes. But does digitisation cause more unemployment or does it »upgrade« work? Two scenarios.

With respect to the question of possible job losses being caused by implementing new technologies, some far-reaching forecasts have been made. (...) In contrast, there are also some particularly optimistic forecasts that see positive labour market effects in the long term because of growth effects connected to Industry 4.0. Possible short-term job losses will be compensated by this. All in all, any fears caused by the idea of a factory empty of people are highly exaggerated. However, jobs and qualifications are most certainly going to change considerably. It is certainly not possible to make any real forecasts at the moment. Various scenarios are possible when it comes to developing qualifications for industrial activities.

Scenario one: Upgrading Qualifications

A first scenario can be described as »upgrading« qualifications. The range of tasks that need to be carried out is becoming more challenging, e.g. with more planning, scheduling and system surveillance tasks because the simple routine tasks will be automated. That leads to an increased requirement for an inter-workplace understanding of working processes and for the ability to use the available information effectively. Moreover, according to many of the companies asked, there will be more and more demand for optimisation and problem-solving skills, and for IT skills. According to this scenario, these trends apply to nearly all groups of employees in manufacturing and in indirect areas such as work preparation or production planning. In particular, the level of skills (and qualifications) for these jobs can be raised with the help of digitised information and assistance systems and therefore be shaped in a more integrated and sophisticated way. At the same time, it can be assumed that some simpler and more stressful routine activities will be taken care of by digital systems.

> **»All in all, any fears caused by the idea of a factory empty of people are highly exaggerated. However, jobs and qualifications are most certainly going to change considerably.**
> Prof. Dr. Hartmut Hirsch-Kreinsen

Scenario two: The Gap becomes larger

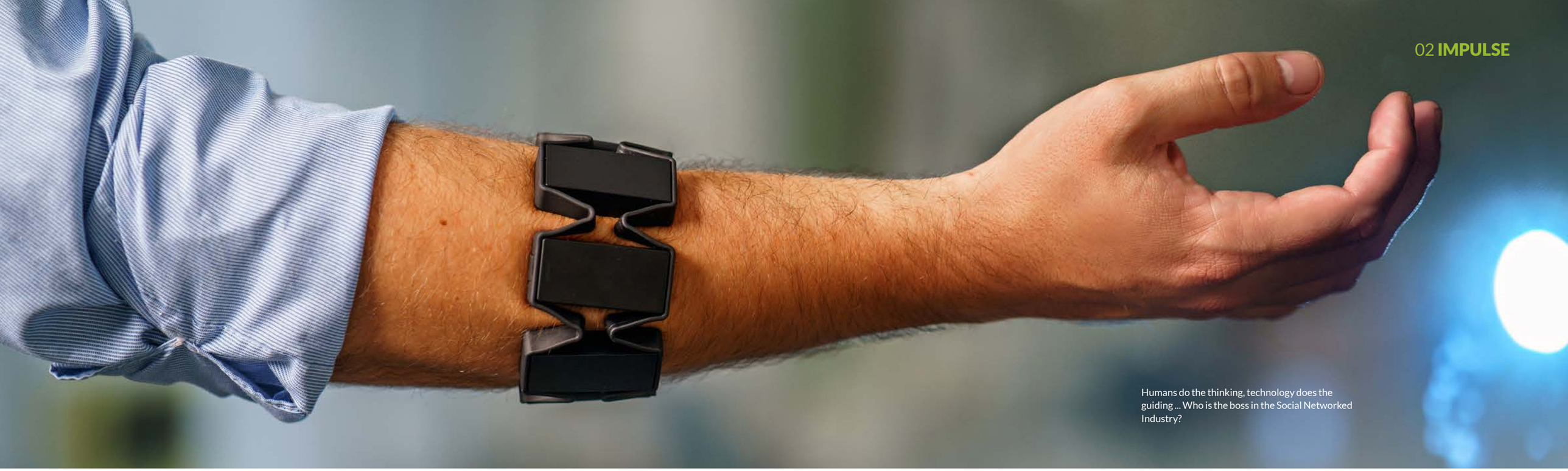
A second, contrasting scenario can be described as a »polarisation« of qualifications. The core of this scenario is that, to a large extent, medium-level skills groups such as qualified skilled workers would become less important. The gap between complex skilled activities requiring high levels of qualification on the one hand and simple activities requiring low levels of qualification on the other would become larger and larger. (...) In the long term, medium-level qualification groups will be of less significance in this scenario. ‹

You can find the complete article on the internet:

About the author

Prof. Dr. Hartmut Hirsch-Kreinsen works at TU Dortmund University as Head of Research into Industry and Labour. This article is an extract from a guest contribution for the German broadcasting service »Deutsche Welle«, during the »Future of Work« week in 2016.

Prof. Dr. Hartmut Hirsch-Kreinsen considers digital work to be a design project where the complementary design of technological and social innovations is of particular significance.



Humans do the thinking, technology does the guiding ... Who is the boss in the Social Networked Industry?

A question of mechanical responsibility

Modern technology is becoming more and more intelligent, it is mastering more and more complex tasks and even showing signs of taking on human traits. In view of this, cooperation between people and technology must be re-evaluated and redesigned. The Innovationab Hybrid Services in Logistics wants to initiate a discourse in society as a whole about the subject of mechanical responsibility.

The way risks and responsibility between humans and technology can be shared and distributed in logistics is one of the key research questions expressed by the Scientific Advisory Board of the global supply chain network (BVL) in 2017.

In today's logistics, automated systems like order-picking robots, storage and retrieval machines or fork lifters determine the perception of cooperation between people and technology. Yet, this cooperation will fundamentally change with the implementation of autonomous systems and artificial intelligence – away from people and technology working »side by side« and towards them working with each other. However, that is all still up in the air. But people are already dealing with a wide range of technological systems: whether they are robots or cyber physical systems, assistance systems or deep learning. For a long time now, this has not only been about communicating with technology, purely sending and receiving news, but about interacting and about how people and technology respond to each other and interact.

The majority of the systems used in the working world still allows us to see which decisions were made by people and which were made by technology. Usually, technology plays a role in preparing the decisions, then people give the go ahead – or not – based on personal experience, knowledge or feelings. However, the borders between people and technology are beginning to blur, the more intelligent technological systems become, and the more complex and organisational the cognitive tasks they manage are. People automatically hand over some of their responsibility to technology.

> **The more intelligent technological systems become, and the more complex and organisational the cognitive tasks they manage are, the more the lines between people and technology blur.**
>
> Carina Tüllmann

But how much responsibility can, should and may people hand over to technology? Which information or data can, should and may people share with technology to enable it to act responsibly? The challenges connected to these questions are, on the one hand, of a legal nature. Topics like security and liability are key. This discussion is already being led at a political level: right now, the European Parliament has just passed a resolution with a large majority that requires comprehensive laws for robots and artificial intelligence at European level. On the other hand, societal and ethical issues are also significant, such as those about considering attitudes to morality or about the »dehumanisation of the working world«. Questions concerning »mechanical responsibility« are gaining in significance.

People as conductors of the digital system

Principally, the form of cooperation between people and technology is determined by systems created by people themselves. Therefore, they are in control of designing not only the technical but also the working systems. As conductors of the digital system, they can relate people and technology to each other as they like – i.e. they can conduct! Last year, with its thought-provoking »Innovation Potentials of Man-Machine Interaction«, the German Academy of Science and Engineering (acatech) pointed out that the positive development of human-machine interactions is not going to happen on its own, but that it is an organisational task for society.

A task for communication

The discussion must include a variety of actors. Each of them has to contribute their own profession's and industry's point of view. In the end, the issue of interaction between people and technology remains a thrilling task for communication. It is all about giving priority to the enormous opportunities for business, society and for the individual. Challenges mustn't be kept secret but must be explained because transparency is the basis for accepting technology.

Last, but not least, the interaction between people and technology has to be visible and made alive – at best in realistic use cases and showcases like at the Innovationlab, and it must be explained by those that developed and implemented the digital technologies. Cooperation between people and technology will then be successful and have a positive impact.

WORKING TOGETHER, LEARNING TOGETHER

The topic of »context-based learning« is closely linked to the question of mechanical responsibility. This will also concern humans and technology. On the one hand, it is about the question of how people's individual knowledge and experience is preserved and imparted – e. g. when implementing assistance systems that help people to make decisions. On the other hand, it raises the question of how machines learn in the context of natural environments and in their interaction with people, in particular in processes with artificial intelligence. Which concepts support the joint learning of people and machines makes up part of the work of the Innovationlab.

About the author

Carina Tüllmann, Department of Strategic Initiatives at Fraunhofer IML, is responsible for Marketing and Communication in the Innovationlab.

03 innovations

Transfer projects: a tandem innovative leap

Transferring knowledge and technology to companies is a significant pillar of the Innovationlab. So-called transfer projects aim specifically at small and medium-sized companies – and they soon pay off in many ways.

In transfer projects, small and medium-sized companies can gain access to technologies, procedures and methods developed at the Innovationlab and transfer those projects into practice. With the support of the science community – and virtually in tandem – they develop hybrid services for socially networked logistics in the projects. The aim of the transfer projects is to enable companies to make major innovative and technological leaps forward.

Transfer projects are characterised by quick, lean and effective implementation within just a few months and with little administrative and financial outlay.

- Companies get support relevant to their current technological status.
- The specific requirements of medium-sized companies are taken into consideration accordingly .
- Companies can try out new technologies simply.
- By formulating precise and focussed questions in transfer projects, research results can be implemented immediately.

Employees benefit from scientists

Right from the beginning of a project, i.e. during the ongoing process, the employees in the company benefit from the scientists' methodological skills: they can copy models and solutions for their daily business that reduce their workload immediately.

The results from any project – from optimising internal processes and setting up new business models, through to implementing new innovative products – stay in the company and can be used immediately.

> **The transfer projects at the Innovationlab promise small and medium-sized companies straightforward access to R & D – with assessable risks and noticeable effects.**
>
> Andreas Nettsträter

It is vital for both transfer projects and other research projects to realise that investigating future topic areas in this way can ensure companies are at the cutting edge with their knowledge and gain them a competitive advantage. And: customers clearly rate this sort of commitment as a positive indication of a company's sustainability!

About the author

Andreas Nettsträter, Department of Strategic Initiatives at Fraunhofer IML, is responsible for Network Management and Knowledge Transfer in the Innovationlab.

DIGITISATION AS A PROBLEM SOLVER

Digital technologies help companies to find solutions for challenges and problems which have often existed for years. Three sectors, three assignments.

EXAMPLE: RETAIL.
For years, enterprise resource planning in retail has been coping with processes that demand a lot of time and personnel, such as stocktaking or stock replenishment. Nowadays, mobile data collection devices usually help staff to perform and document these tasks. New augmented reality technologies, like the ones being tested in the Innovationlab, promise new efficiency and cost advantages for such enterprise resource planning processes in the retail sector.

EXAMPLE: TRANSPORT.
Prior to dispatch, trucks at logistical hubs (harbour terminals, distribution centres etc.) generally have to put up with extremely varied waiting times today. Intelligent assistance systems developed in the Innovationlab are – unlike today's processes – in a position to consider all factors for optimum dispatch and offer staff a valid basis for making their decisions.

EXAMPLE: INDUSTRY.
Facility downtime, losses of quality and lack of availability due to »maintenance on demand« still pose problems for industry. Preventive maintenance – combined with new hybrid business models for mechanical and plant engineers –not only makes sense but is also made possible by means of digital technologies. It requires integrative concepts such as those currently being developed in the Innovationlab.

87 % of logisticians see an urgent necessity to deal with the digitisation of business models. Source: Logistic Trend Index 2017

From smartglasses to drones: Where Logistics 4.0 becomes possible

The research and application centres form two testing grounds which, due to their full-scale digitisation (»100 % digitised factory but not empty of people«) can, for the first time, comprehensively explore, evaluate and further develop innovations for hybrid services and man-machine-interaction in practise-oriented industrial applications.

In both halls, the entire intralogistic supply chain is represented with a focus on work in the future. Application-related demonstrators enable cross-process solutions and innovations to be tested on »living objects«. The research centre serves the experimental – fundamental – testing of new methods and technologies. Equipped with a variety of freely configurable and flexibly adaptable trial equipment, it serves the initial and experimental testing and evaluation of technical feasibility. In contrast to this, the application centre focuses on the real, practical demonstration of new methods and technologies in the context of a Living Lab. The knowledge gained in the research centre is adopted step by step in the application centre and demonstrated as part of operational processes. The focus lies on integrating the human element, and to connect it more intensively with both the physical and the digital world. The research and application centres can be flexibly adapted for various testing scenarios at any time.

> **Our testing grounds serve as reference systems to measure the quality of technology innovations, control algorithms or ERP systems and evaluate them in long-term tests.**
> Arkadius Schier

The dynamic, modular concept means existing demonstrators can be exchanged quickly with new technological solutions.

About the author

Arkadius Schier, scientific employee at the Fraunhofer Institute for Material Flow and Logistics IML, is Head of the Innovationlab Hybrid Services in Logistics project.

USE CASES IN THE INNOVATIONLAB

The new networked working world increasingly enables companies to develop and offer hybrid services. In the application centre at the Innovationlab five use cases, so-called showcases, from different logistics fields demonstrate the use and potential of hybrid services. There are a total of seven functional areas equipped with innovative technologies: goods in, control centre, storage, order picking, assembling, packaging, and goods out. Each use case is presented by an individual experience path connecting different functional areas with each other.

01 **Intralogistics/retail.** This use case shows which processes can be triggered by an order process in different functional areas and improved or designed more flexibly by closely integrating people, machines and new technologies.
Contact: benedikt.maettig@iml.fraunhofer.de

02 **Production logistics.** By following an urgent order, it is possible to observe across several functional areas how new technologies, e. g. augmented reality, can simplify an assembling process or how work at an assembly bench can be designed to suit an individual employee by using automatic ergonomic settings.
Contact: lukas.nikelowski@iml.fraunhofer.de

03 **Transport.** In this use case, relevant functional areas demonstrate how external transport can be coupled with flexible and dynamic logistics concepts by means of continuous information exchange to ensure that there is always a secure transport and information chain.
Contact: maximilian.schellert@iml.fraunhofer.de

04 **Maintenance.** A failure message from a machine installed in the application centre initiates this use case and demonstrates the use of assistance systems for error identification or mobile devices for maintaining and restarting the machine.
Contact: michalik@lfo.tu-dortmund.de

05 **Virtual Training.** The way logistics centres in virtual reality identify requirements for restructuring, check them for feasibility and train their employees is demonstrated in the Virtual Training Lab.
Contact: benjamin.korth@iml.fraunhofer.de

Focus on humans

Workplaces of the future are being designed in the Innovationlab right now: digital technologies open up new fields of application and attractive ways of working.

Learning realistically:
virtual training methods
How »social structures« emerge between humans and technology

From rolling transport drone to autonomous flying robot
Designing processes more efficiently:
drones for logistics

Supporting decisions:
augmented reality
This is how humans benefit from visible supplements to reality

Collaboration instead of coexistence: the robot generation

New technological systems mean people can work together in completely new ways. Soon, it will be completely normal for us to talk to intelligent machines as if they were colleagues. This is an overview of the current status of human-technology interaction using the example of robots.

Generally, there are three different forms of cooperation between people and robots. The most popular is that of **coexistence**: people and robots accomplish their work in separate spaces sometimes only separated by a light curtain but completely independent of each other. The robot accomplishes its work at a constantly optimal speed while the human gets on with their own tasks. If a human has to work in the robot's working space, rigorous security measures click in and force the robot to come to a halt. The next level of working together is **cooperation**: human and robot share one working space that is designed for a specific process. They depend on each other to fulfil their task – for example when handing over a piece of work.

The Innovationlab has categorised robots as special types of technical system under the main heading of »technology«.

Today, there are already numerous examples of this form of cooperation. The highest form of working together, however, is **collaboration** that necessitates immediate contact between humans and machines in order to fulfil the task. For example: the robot hands over a piece of work to the human. The human performs a certain stage of production. Robots that collaborate with humans are becoming more and more important, because they combine the merits of technology that mainly lie in accuracy, speed and stamina with the merits of a human being. As »cognitive allrounders« humans can adapt to new tasks flexibly – and they still do that better than technology. In this context there are various possible scenarios today where a robot takes over the handling of heavy objects while the human stands by the robot's side as a coach to help deal with new situations.

Costs and security still an impediment

Fully automated or manual? This question no longer needs to be asked in view of the opportunities and potentials provided by collaborating robot systems. The new robot generation enables variable levels of automation to be realised for the first time. The possibilities for applications are immense. However, the costs for **acquiring** such robots are (still) high. The same applies to the costs for the **security technology**. And then there are the costs and effort involved in attaining **certification**. These three factors still form the biggest impediment to the use of collaborating robot applications. Basically, the following applies: investments will pay off quickly if the companies find the right applications.

Intelligent power packages

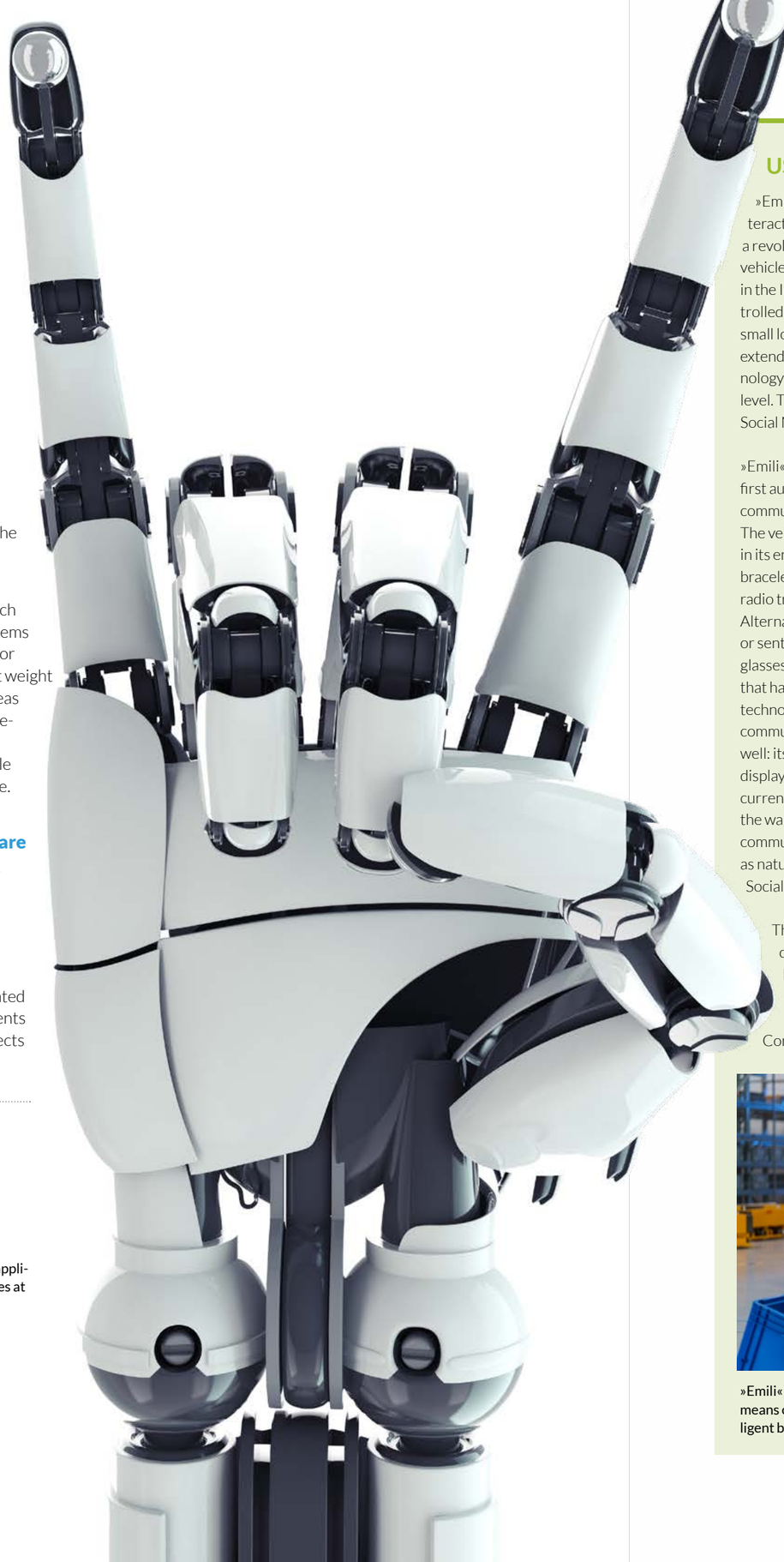
Collaborating robot systems have not made much headway in industry yet – but the following systems can already be found in operation in companies or certainly could be used in real applications: light weight robot arms are already starting to be used in areas where loads are usually moved manually. Double-arm robots are particularly interesting because of the predictability of robot movements. Mobile robots are gaining more and more in significance.

> **»Humans as cognitive allrounders are still indispensable in Industry 4.0. Our unbeatable advantage: we can adapt flexibly to new tasks.«**
> Benedikt Mättig

These are lightweight robots fixed to an automated guided vehicle or specially produced developments like order picking robots that can pick cubic objects from shelves.

About the authors

Benedikt Mättig, contact partner at the Innovationlab application centre, and Semhar Kinne are scientific employees at Fraunhofer IML.



USE FOR »EMILI«

»Emili« – short for »Ergonomic, Mobile, Interactive Load carrier for Intralogistics« – is a revolutionary interactive automated guided vehicle (AGV) for intralogistics that is deployed in the Innovationlab for Hybrid Services. Controlled by means of gestures, it is the size of a small load carrier (slc) with a retractable and extendable undercarriage; it takes human-technology communication to a completely new level. This is a milestone on the way towards a Social Networked Industry.

»Emili«, a development by Fraunhofer IML, is the first autonomous AGV that enables intuitive communication between humans and machines. The vehicle interacts directly with the people in its environment. Wearables – like intelligent bracelets – transfer the gesture information via radio transmission from the employee to »Emili«. Alternatively, the vehicle can be waved nearer or sent away via smartphone, tablet or smart glasses. The aim is that it is not just the human that has to adjust to technology but also that technology has to adapt to the humans. »Emili« communicates information to the humans as well: its »virtual face«, an energy-saving e-ink display, can immediately display details about current conditions and give feedback about the warehouse of the future. That makes the communication between the staff and vehicles as natural as possible – a basic condition for the Social Networked Industry.

The vehicle is currently located in the application centre at the Innovationlab and can be included in a wide range of different scenarios as part of the »showcases«.

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»Emili« can be controlled using a smartphone or by means of gestures: this is the prototype of the intelligent box

Robotic power using exoskeletons? Research is still in its beginnings. But it seems to make sense to use such supporting structures for manual load handling and also for overhead work.

MOTION DETECTION IN REAL TIME

The high-performance Motion Capturing system in the research centre at the Innovationlab provides exact 3D localisation and data mining by tracking technical devices or humans in imagined scenarios. A laser projection system provides a lively presentation of how which objects communicate – and all in real time of course.

ROBOT TRAINING

By using the data collected from observing human processes – for example during order picking – robots can be programmed so that they reproduce that activity exactly. The system is so accurate that it can even train a robot hand to behave like a human hand. This is done by recording the movement of each part of the human hand as it grips and handles different things.

What logistics can learn from Hollywood

Virtual crowds of people and individual characters are all being animated more and more realistically in Hollywood movies today. The procedure behind that is Motion Capturing – and it can also be used for detecting objects within intralogistic systems. The largest facility of its kind in Europe is to be found in the research centre at the Innovationlab.

A photo-realistic 3D animation offers unique insights into the world of the research centre. This way to the film:

Motion Capturing – short MoCap – is understood to be the process of detecting the movement of an object, transforming that motion into a format that is computer compatible and transmitting the information to a virtual image.
This is based on the assumption that bodies or objects consist of several rigid parts and are connected to each other by connecting elements. This allows the shape of humans, animals or mechanical props to be parameterised and recognised as an organisational shape (e.g. a human skeleton). The paths of the motions are determined by markers fixed to the object. The first systems were deployed for clinical applications to analyse the human gait.
Later, the procedure entered the entertainment industry and conquered Hollywood.

About the author

Haci Bayhan, scientific employee at TU Dortmund University, is the contact partner for the research centre in the Innovationlab.

»One of the thrilling things about our MoCap system is that we can detect the motion of drones end-to-end and therefore make a groundbreaking contribution to cooperation between humans and technology.

Haci Bayhan

CONTRIBUTION TO INDUSTRIAL SAFETY

Tests carried out with the Motion Capturing system make a significant contribution to the Social Networked Industry: by analysing motion processes within intelligent systems, the health and safety of employees – in particular when it comes to barrier-free work between humans and technology – can be improved.

The research centre at the Innovationlab possesses a MoCap system with 38 cameras which can track up to 100 objects at the same time. Locations and positions of the objects are determined accurately to the millimetre with up to 300 pictures per second. In other scientific disciplines such approaches are already being practised successfully: the College of Engineering at Boston University, for example, set up a system with 40 cameras that allow real time tracking of robot vehicles in the town. In the MAST Lab at Glasgow University, there is a system with 18 cameras for tracking different devices.

04 news

Positive annual balance at the first milestone meeting

At the first milestone meeting of the Innovationlab, representatives from the different work packages in the Fraunhofer Institute for Material Flow and Logistics IML in Dortmund presented the latest status of their research work – in both theory and practice. Representatives of the Federal Ministry of Education and Research (BMBF) and from the accompanying Projektträger Karlsruhe (lead partner) spent an entire day finding out about the current activities. After keynotes by Prof. Dr. Dr. h. c. Michael ten Hompel, Managing Director of Fraunhofer IML, and Prof. Dr. Hartmut Hirsch-Kreinsen, Head of Industry and Labour Research at TU Dortmund University, representatives from the work packages and from both of the research and application centres presented the current status of their work. The representatives of the Federal Ministry of Education and Research and of the lead partner were also informed about the progress of the activities during a tour of the mobile demonstrators.

14 **stations with innovative technologies and real use cases presented by the Innovationlab with partners at the Future Congress Logistics in Dortmund in September** in a so-called »Digital Sandbox« – from »Augmented Reality in Retail« to »Cognitive Ergonomics in Logistics«. On the basis of demonstrators and prototypes, visitors experienced how humans and technology interact as partners in tomorrow's logistics. They also had the possibility to discuss technological innovations with the developers as well as topics such as Management 4.0, labour sociology and labour physiology in logistics and production. All in all, the guests got an impression of how Social Networked Industry works – and which solutions could be interesting for their companies.

Website strengthens dialogue about Human-Technology Interaction

The topic of »Human-Technology Interaction« is a key focus on the website for the Innovationlab Hybrid Services in Logistics. The German website went online in the spring of this year at www.innovationslabor-logistik.de, the English version is available now at www.innovationlab-logistics.com. Of special interest are the numerous technical contributions on the site that deal with tasks connected with Social Networked Industry.

This way to the english website:

Intensive exchange with Future Work Lab

The Innovationlab Hybrid Services in Logistics and the Future Work Lab in Stuttgart intensified their cooperation this year. At mutual visits, representatives from both lighthouse projects found out about the latest status of each other's work. At the Future Congress Logistics in Dortmund in September, the Stuttgart Lab presented its learning world »Fit für die Arbeit der Zukunft« (fit for the work of the future). Like the Innovationlab, the Future Work Lab also carries out research into the effects of Industry 4.0, but with a main focus on work organisation.

Innovationlab introduces itself in Silicon Valley

In the context of the world's biggest symposium Augmented World Expo (AWE for short) on the topics of Virtual Reality (VR) and Augmented Reality (AR), in Santa Clara/Silicon Valley, USA, Jana Jost, Benedikt Mättig and Thomas Kirks from the Innovationlab gave insights into a case study on AR-assisted order picking in their presentation »AR for Optimizing Processes in Intralogistics« and also introduced the Innovationlab. Augmented World Expo attracted about 5,000 participants.

You can find information about the next symposiums at www.augmented-worldexpo.com.

About us

The Innovationlab Hybrid Services in Logistics is an interdisciplinary research project in which technological innovations are developed for a Social Networked Industry. The focus is on human-technology interaction. Our so-called showcases – which are organised in the five fields of trading, production logistics, transport, maintenance and virtual training – guarantee that innovations are transformed into hybrid services.
The Federal Ministry of Education and Research (BMBF) is sponsoring the project with a total of 10 million Euros over a period of three years. On the one hand, the Innovationlab is intended to strengthen Dortmund's pioneering role in services and logistics, and, on the other, to accelerate the acceptance and implementation of technical solutions in the context of Industry 4.0. Academic and industrial partner networks and social partners and multipliers from the Ruhr metropolis and beyond are integrated in the work of the Innovationlab.

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