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Industry 4.0 – New Tasks for Innovation Policy

good society –
social democracy
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2015 AND 2017

What is a Good Society? For us this includes social justice, environmental sustainability, an innovative and successful economy and an active participatory democracy. The Good Society is supported by the fundamental values of freedom, justice and solidarity. We need new ideas and concepts to ensure that the Good Society will become reality. For these reasons the Friedrich-Ebert-Stiftung is developing specific policy recommendations for the coming years. The focus rests on the following topics:

- A debate about the fundamental values: freedom, justice and solidarity;
- Democracy and democratic participation;
- New growth and a proactive economic and financial policy;
- Decent work and social progress.

The Good Society does not simply evolve; it has to be continuously shaped by all of us. For this project the Friedrich-Ebert-Stiftung uses its international network with the intention to combine German, European and international perspectives. With numerous publications and events between 2015 and 2017 the Friedrich-Ebert-Stiftung will concentrate on the task of outlining the way to a Good Society.

For more information on the project:
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AT A GLANCE

For the most part, *Industry 4.0* – a digitised and networked production – is still a vision, but global competition for the best ideas and most successful concepts is already steaming ahead. The solutions sought so far mainly fall within the technological domain. People, however, play the lead role when it comes to the innovation process: as co-creators and producers, as users and innovators. The key is to understand *Industry 4.0* as the interplay between technical and social innovations. For that we need a systemic innovation policy – not a policy in the mere sense of policy-makers' activities, but one that includes firms, unions, civil society and academia. Only when these processes occur across policy fields and disciplines can technical innovations contribute to social progress.

Increasing digitisation will change the economy as well as our society enormously. In Germany, this discourse revolves around *Industry 4.0*. Policy-makers are facing four central questions:

- What is *Industry 4.0*?
- What effects can we expect?
- How do we promote *Industry 4.0*?
- And how do we make sure that these developments benefit not only a small group within society – but as many people as possible?

THE VISION BEHIND INDUSTRY 4.0

The vision: people, things, processes, services and data – in the future all this will be networked together. Intelligent objects equipped with actuators and sensors, with QR codes and RFID chips that manoeuvre themselves through the smart factory and then out into the world – along the entire value chain from product development to customer service. This is how in future all the relevant information will be available to both people and machines – as well as customers and business partners. Then resources will be used and enterprises can produce more efficiently.

There is already a great deal of talk about the "fourth industrial revolution" due to the pressure that growing digitisation is putting on traditionally successful business models – and enabling completely new ones. Hence, many opportunities come with these new developments but so do many risks and challenges for the economy as well as civil society. Some of these are the blurring borders between work and unresolved issues of data privacy, protection and security. Furthermore, certain jobs may be made redundant through automation. Qualification requirements will multiply and whole new tasks will arise.

OPPORTUNITIES AND RISKS OF INDUSTRY 4.0

Exactly how *Industry 4.0* will impact companies and branches, economies and societies is a matter of much dispute. However, most agree about the potential opportunities:

– Real time networking of industrial processes will make production cheaper, resource friendlier and more efficient.
– Digital networking allows for direct influence of customer desires and cost-effective customisation of products and services.
– The world of work could also be made more humane.
– Furthermore, *Industry 4.0* promises an enormous potential for new products, services and solutions that will enrich the everyday lives of people.

Opportunities for some are risks for others. The traditional industrial leaders could quickly find themselves in the role of mere suppliers, who are completely interchangeable, if they are unable to provide consumers with custom-fit "smart services". Open innovation processes, integration of (end) customers in the design and production process along with targeted big data analytics enable a variety of new business models – but these also put the time-tested ones under considerable pressure. This is the case in Germany, too, particularly in the sectors responsible for the success of a "coordinated market economy", e.g. machinery, facility and vehicle engineering. A major proportion of turnover for these industries is earned via sales of spare parts, upgrades and services. Over the years, providers have built a dense network of sales, service and customer support partners in order to have as much customer proximity as possible. *Industry 4.0*, however, taps into intelligent software with appropriate data analysis at the existing interface between manufacturer and customer, allowing for new entrants to the market: providers will thus offer manufacturer-spanning services, preventive maintenance and quick supply of spare parts.

STRUCTURAL SHIFTS IN LABOUR

What do these developments have in store for people and society? Let us begin with the world of work. Today, the following trends are already emerging:[1]

1 The organisation of work is becoming more flexible in terms of time and space.
2 Work processes are ever more digitised, less hierarchic and decentralised.
3 Work processes are becoming more transparent.

Contrary to the discussions of the 1980s, today it is no longer about humans versus machines. Rather, most of the scenarios revolve around a more complex relationship.

1 The **automation scenario**: Systems direct people. Monitoring and control tasks are taken over by technology. It prepares and distributes information in real time. Employees respond to the needs of cyber-physical systems (CPS) and primarily take on executive tasks. The abilities of lesser skilled workers are thereby devalued.
2 The **hybrid scenario**: Monitoring and control tasks are performed via cooperative and interactive technologies, networked objects and people. The demands on employees are faced with increased flexibility pressure.
3 The **specialisation scenario**: People use systems. CPS is a tool to support decision-making. The dominant role of qualified workers is maintained.

Digitisation and *Industry 4.0* will therefore massively change labour in the future. Traditional production-line workers' and knowledge workers' tasks will algamate to an ever greater degree.[2] As a result, many labour processes will be carried out more efficiently and effectively in the future. Furthermore, they will lead to the devoplement of a variety of new assistance systems, increasing the automation of administration and production processes. New options will open up to certain work processes and thereby to certain labour groups (especially the highly qualified) to design their own working life, both in terms of where and when they do their jobs as well as the nature of the activity and access to the task at hand.

A polarisation of employment is thus assumed to be on the horizon in which certain jobs with mid-level skill requirements and pay will be the first to be substituted through automation ushered in by *Industry 4.0*. The flip side to this is that vocations at the lower and upper ends of the qualification spectrum, which are less automatable and based more on experience and interaction would gain in relevance. This is also where we can expect to see completely new fields arising.[3] Furthermore, due to increased outsourcing, the droves of "click workers" and "cloud labourers" who are poorly paid and less socially secure as freelancers will most likely grow.

PEOPLE AS DRIVERS OF TECHNICAL AND SOCIAL INNOVATIONS

It is thus imperative that the employees should be involved in the (re-)design of work organisation in *Industry 4.0* from the very beginning – as co-designers and co-deciders as well as the central drivers of technological and social innovation. Acceptance is an important prerequisite for the success of new solutions. Social innovation occurs, when solutions are found for societal challenges. The benefits to society are in focus rather than the benefits to a single innovator. This is why it makes sense to develop such solutions in a participative way right from the beginning. A social innovation can take many forms, a principle, law, organisation, behavioural change, business model, product, process or technology. Usually, social innovations result from a combination of these components. Thus from today's perspective, many innovations can be classified as social innovations – from book printing to health insurance, universal suffrage and energy efficiency, fair trade or the Internet – innovative solutions that have brought major societal benefits. These are examples for novel solutions that bring about major societal benefits and thus contribute to social progress in the long-run.

Social innovations have the greatest impact on a system-wide level. Hence, technical innovations can very positively influence the diffusion of social innovations. And vice versa, technical innovations often only develop their true potential in combination with a social innovation. This needs to happen for new technologies to be welcomed by broader sections of society. Successful business ideas can thus offer both economic benefits as well as social progress. Especially in the context of *Industry 4.0,* we need to keep this goal in mind at all times

in order to ensure that the returns from digitisation are generated by as many people as possible and distributed amongst as many as possible.

TASKS FOR AN INNOVATION POLICY

According to an *Industry 4.0* index survey, three quarters of respondent companies lack relevant political support.[4] Thus, we have to act. Policy-makers should encourage both technical and social innovation, taking all the possibilities into account on the supply side but on the demand side as well. A systemic understanding of innovation policy is required, one that includes strategy and coordinated implementation. Various actors have to be included – companies, associations, unions and academia all have to take active part. Several concrete tasks thus call for political action: stimulating collective learning – also by integrating non-research-intensive enterprises – so that new technologies and new knowledge can diffuse faster. Innovation policy should promote interdisciplinary project coalitions and competence centres through competitions or initial project funding. It should support the transfer of basic research findings into application development through real-world laboratories, living labs and factories that demonstrate these future technologies. This, in turn, encourages communication and cooperation and prepares the ground for further innovations. The demands are mainly in the areas of data privacy, protection and security. In regards to supply and demand in this area, innovation policy could support (in)direct procurement, development of secure infrastructure, vocational training and qualification opportunities. Moreover, Europe itself must be understood as an opportunity for *Industry 4.0*. As a lead market, it has the potential to set standards worldwide.

Only when the developments within and around *Industry 4.0* result in social added value, when new technologies, regulations, services and organisations establish themselves in the society and when these social practices prove to be "better for people", will we have recognised and put the potential for *Industry 4.0* to work. On the path toward these goals, coordinated speed and active policy are needed – policy that promotes and demands, that sets clear rules but also has the courage to invest in the future.

CONCLUSION

Industry 4.0 allows for a fusion between many things: virtual and real world, production and services, software and hardware. In the future, companies will network their equipment, storage systems, employees, suppliers and partner companies with their customers via socio-technical systems (cyber-physical systems). Thus, there is enormous potential behind *Industry 4.0*: individual customer demands can be taken into account and even one-off production may become profitable; production will become faster and more flexible, increasing resource efficiency and improving productivity.

Employee productivity may very well also greatly improve. Flexible work options could allow for better work-life balance in terms of both time and location because it is conceivable that certain production processes could be shifted (back) to Germany and into urban areas.

Even if the topic has so far been analysed and driven from a technical standpoint, the human being is an integral part of a decentralised and self-organised *Industry 4.0*. Labour, however, will change a great deal in many areas. Tasks will become more complex and the value creation networks more dynamic, which will require a high degree of flexibility. New learning tools are in demand: assistance systems, robots, e-learning, etc.

This is how *Industry 4.0* will be able to maximise its potential for digital innovations, new services and business models. This could mean major opportunities for start-ups and entrepreneurs. Indeed, if we want to grasp the opportunities that digitisation presents, we have to understand them in their full potential. It is in this "second machine age"[5] that people will take the charge as developers, designers and co-producers. Therefore, we have to look more closely at the social innovations alongside the technical ones[6] – even in developing an innovation policy for *Industry 4.0*.

Author

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Notes

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