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FRAUNHOFER GROUP FOR INNOVATION RESEARCH

INNOVATION AND COVID-19: FOOD FOR THOUGHT ON THE FUTURE OF INNOVATION

UPDATE 2021

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PREFACE

With new topics and technologies emerging at an increasingly faster pace in our globalized and digital world, the outbreak of the Covid-19 pandemic in 2020 added to the considerable challenges facing the European and global innovation system. Just as its effects can be felt in virtually all sectors of society and the economy, the pandemic is also impacting innovation systems and therefore the development and implementation of innovations.

If we are to safeguard and expand Germany's and Europe's competitiveness, it is imperative that we identify relevant development trends for innovation systems at an early stage and understand the implications. Only in this way can we make innovation systems fit for the future and competitively develop and implement innovations. This is the anticipatory task that stakeholders in industry, science, the political arena and society must confront.

To help meet this challenge, in 2018 the Fraunhofer Group for Innovation Research developed five theses for the future of innovation on the basis of a system analysis with the year 2030 as the target. The effects of the Covid-19 pandemic now call for these theses to be put to the test in order to gauge the future opportunities and risks for the innovation system in Germany and Europe as best possible.

In this spirit, we hope you find this update to the "Impulses for the Future of Innovation" paper to be an inspiring planning tool on the journey from a country of inventors to a nation of innovators.

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INNOVATION AND COVID-19

The development of relevant trends for innovation systems in the context of the Covid-19 pandemic

How will innovation systems develop in the future? This is one of the central questions the institutes in the Fraunhofer Group for Innovation Research address. To improve understanding and support the development of successful innovation systems in industry, science, politics and society, we discussed five theses on the development of innovation in the period through to 2030 in the 2018 paper "Understanding Change, Shaping the Future. Impulses for the Future of Innovation" (Fraunhofer Group for Innovation Research (publisher) 2018; Bauer and Schimpf 2020).

Virtually all areas of life were plunged into crisis when the Covid-19 pandemic struck in 2020. While innovation offers paths out of the crisis, many aspects of innovation are themselves feeling the effects of it. Against this backdrop, the question is how the Covid-19 pandemic will impact the future of innovation. In the following section, we will examine this by reviewing the "Understanding Change, Shaping the Future. Impulses for the Future of Innovation" paper in a pandemic context. Starting with the relevant trends for innovation systems identified in 2018, and the theses developed on this basis, we would once again like to take you forward in time to 2030. From this vantage point we will look back on the impacts of the Covid-19 pandemic on innovation systems and examine the resulting opportunities and risks in more detail.

The development of relevant trends for innovation systems in the context of the Covid-19 pandemic

To understand the evolution of innovation systems, it is important to be aware of the key influencing factors and assess future development trends. In our paper, we identified and prioritized five relevant trends for innovation systems and projected them into the future based on expert opinions. These projections are scrutinized below in the context of the Covid-19 pandemic:

The **digital transformation** is opening up new perspectives for the innovation process. The driving force of digital technologies will result increasingly in the smart interconnection of people and objects. The Covid-19 pandemic has accelerated this path to digitalization in many ways, which is why it is also referred to as the digitalization booster or accelerator (Danzinger and Hossbach 2020; Hofmann et al. 2020). More than anything, the pandemic forced many people to work remotely, resulting in the large-scale digital transformation of previously analog communication and interaction.

Further to this, the pandemic hastened the pace of digitalization of entire business models and the further digitalization of manufacturing. Looking towards 2030, digitalization and the use of artificial intelligence will be among the most important trends to shape innovation systems.

The **growing complexity of innovation systems** due to the digital transformation and the increased convergence of disciplines and sectors has been a constant in the context of innovations for decades. The Covid-19 pandemic has added new dimensions to this complexity. Currently we can see that issues such as crisis management and the resilience of innovation systems are playing an ever more important role in strategic innovation decisions. And while the longer-term scale of the impact of the Covid-19 pandemic is difficult to predict, it is safe to assume that the complexity of innovation systems will continue to grow in the future.

The **continuously expanding stakeholder base** in the innovation process is the direct result of both the growing complexity and the trend towards the development of holistic solutions. Interdisciplinary collaboration and the use of open innovation approaches and platform models will therefore continue to become increasingly important in the future. On balance, the Covid-19 pandemic is likely to have a neutral effect on the trend towards a broader stakeholder base: on the one hand, the digitalization of communication and interaction makes it more difficult to establish trust in direct person-to-person contact; on the other hand, digitalization makes it easier to include globally distributed stakeholders. Similarly, the reaction in crisis management is either an opening of innovation systems - and the expansion of the stakeholder base this entails - or the opposite in the form of increased depth of innovation throughout the innovation life cycle coupled with the forward and backward integration of innovation activities in businesses. On the basis of our original assumptions, the continued expansion of the stakeholder base in innovation processes is therefore likely in the period through to 2030.

The ever more frequent use of **Open Science** approaches combined with the increased internetworking and digitalization of all areas of life will drive the greater availability of knowledge. It is virtually impossible to deliver a definitive assessment of how the Covid-19 pandemic will affect this development. Both the more frequent use of open approaches and growing reluctance to share knowledge can be observed in response to the crisis situation. Accordingly, it is likely that the longer-term trend – independent of the crisis – towards the greater availability of knowledge will continue through to 2030.

With innovation systems becoming more and more user-centered, innovations are increasingly evolving towards **holistic and systemic solutions**, in which products, services and business models are developed together in the development process. This trend remains relatively unaffected by the Covid-19 pandemic. Therefore, in the period through to 2030 innovation systems will continue to be geared increasingly towards the value an innovation can offer its users.

In addition to the relevant trends for innovation systems presented in the paper, new developments are taking shape in the context of the Covid-19 pandemic that have the potential to significantly impact innovation systems through to 2030. One trend which the Covid-19 pandemic has intensified in all business sectors and spheres of society is a more heightened awareness of sustainability issues. In this context, we should seize the crisis as an opportunity on the road towards the full integration of sustainability in innovation systems (Bodenheimer and Leidenberger 2020; wpn 2020). Another trend in the wake of the Covid-19 pandemic is our altered understanding of work and how it is appraised. A more results-oriented approach, stemming particularly from the need to work from home during the pandemic, can be observed (Bockstahler et al. 2020, S. 44–47). Furthermore, the pandemic has raised awareness at all levels of society for the topics of technological and innovation sovereignty, understood to be the ability to independently provide and develop the technologies or innovations that are considered critical for welfare, competitiveness and the capacity to act, or to be able to acquire such technologies/innovations without producing one-sided structural dependence (see Edler et al. 2020, P. 4).

Beyond these trends that are relevant for innovation systems, the pandemic has intensified uncertainty in markets and businesses. With regard to the development of innovations, past experience shows that such uncertainty can lead to a reduction in medium- and long-term innovation budgets. The repercussions for current and planned innovation activities can already be seen (EFI 2021, p. 20–26). In light of the permanent pressure to increase competitiveness, such cutbacks should be avoided as much as possible, however.

Updated theses on innovation in 2030 in the wake of the Covid-19 pandemic

Innovation beyond R&D departments

Thesis 1

Update

"The pandemic did not slow down the development of openness, the ability to learn and cooperation as the guiding principles of innovation."

Due to increased interdisciplinary linkages, innovation systems in 2030 will be shaped by continuous interaction in an open culture of innovation. Innovations in isolated disciplines will be the exception, and collaboration the rule. In the wake of the Covid-19 pandemic, there is less face-to-face, in-person interaction. Analog whiteboards and bulletin boards with sticky notes – once the birthplace of creative ideas – have largely given way to digital solutions.

This has made it easier to integrate large and internationally distributed communities into innovation systems. Complementing the digital media, innovation spaces continue to play an important role in the development and implementation of ideas (see Kasper and Pohl 2020).

In 2030, the participation of players from civil society will be firmly established (see Kaiser et al. 2019). Digitalization will have significantly reduced the barriers to international collaborations and enabled many more innovation partners to be part of the innovation process. Due to the increased number of innovation stakeholders, the tasks and responsibilities of innovation departments will have changed. On the one hand, they will have to play a more coordinating role to manage the deployment of the participating stakeholders; on the other hand, they will have to develop specialized skills and long-term resilient supply chains to maintain sovereignty and control over their proprietary technologies and innovations. This mix of caution and openness will lead to innovation departments playing a dual role, with the ongoing expansion of specialist expertise (see Longmuß et al. 2021) and a high degree of coordinating management. New forms of collaborative research in open innovation and experimentation spaces will be characteristic of interaction between the business sector, the scientific community and society in 2030 (see Stöffler et al. 2020).

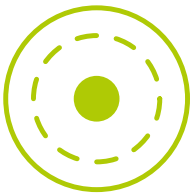
- What role will openness, the ability to learn and cooperation play in your innovation system in the future?
- In which areas should your business demonstrate a high degree of sovereignty (and where not)?
- In which areas does it make sense to open up innovation processes (and where not)?

Integrated solutions and value creation systems

Thesis 2

Update

"The pandemic has given digital business models such an enormous boost that user-centered integrated solutions will be the focus of innovation activities even more quickly."



More than ever before, economically successful innovations will require businesses in 2030 to combine transdisciplinary technical know-how with economic knowledge on their journey from the initial idea to final implementation, always with an eye to solution-independent user requirements and value-oriented business models. Covid-19 has accelerated the growing importance of user-centered solutions, and particularly integrated and digital-based solutions. In 2030, products and services will not only be simply integrated but also individually accessible on a data basis and tailored to the daily routines of the customers.

The Covid-19 pandemic and the resulting push towards digital adoption will also have boosted the importance of digital business models. In 2030, the central challenge for businesses will be to use platforms and unlock the value-adding potential of digital business models to complement traditional business models (see Lerch and Maloca 2020).

- Which solutions and platforms will your customers demand in the future?
- How would you describe the solution-independent customer benefit?
- Do the solutions currently available optimally deliver the customer benefit?

Fully digitalized innovation processes

Thesis 3

Update

"The introduction of fully digitalized innovation processes and their acceptance have been significantly accelerated by the pandemic."

In 2030, artificial intelligence will be a central enabler for innovations over the entire life cycle. This applies to the phases of the innovation process just as much as to the results. The best brains are no longer the exclusive determining factor for the further development of products, services, processes and business models, but rather the best machine integration of market requirements and of social and technological developments also plays a critical role. In 2030, machines will be able to develop incremental innovations entirely on their own. Automated data analysis, continuous simulation and virtual prototypes will facilitate breakthrough innovations in 2030.

As a digitalization accelerator, the Covid-19 pandemic has had a positive impact on the acceptance of digital and digitally supported innovation processes and fast-tracked the development towards fully digital innovation processes on a lasting basis. In 2030, innovation departments will see themselves as integrated control centers for the interaction of globally dispersed innovation stakeholders, specialized expertise and digitally supported processes (see Döbel et al. 2020).

- What is the potential of digitalization in your innovation process?
- What tasks can be supported or performed by artificial intelligence?
- How can the use of data make the innovation process more efficient and effective?
- What effect does the digital transformation have on reference solutions currently in use?

Application of knowledge across disciplines

Thesis 4

Update

"The trend towards Open Science has continued unabated. For successful innovations, the focus is on the beneficial application of knowledge."

By 2030, Open Science will be the established standard for scientific work. Both the production of scientific findings, and the knowledge generated itself, will have become more transparent and accessible. At the same time, however, the number of patents and copyrights around the world will have grown steadily (see Neuhäusler and Rothengatter 2019). In the development of user-centered innovations, the priority will be to draw on available knowledge and to strike the right balance between openness and the protection of intellectual property while remaining competitive. Standards and norms will play a central role in the sharing and collaborative use of knowledge and will have been stepped up internationally in the preceding years (see Herrmann et al. 2020).

With the increased availability of knowledge, knowledge management will have become considerably more complex by 2030. The convergence of disciplines and business sectors will have led to new specialist areas and fields of application. The involvement of new groups of stakeholders, such as private citizens who were not traditionally very receptive to science, will be routine in 2030. In many fields of application, the available knowledge – combined with modular development approaches – will allow these groups of stakeholders to quickly develop prototypes and beneficial solutions. In selected areas, this opening-up will have helped to significantly expedite development processes.

- Which groups of stakeholders will be included in your innovation activities in the future?
- In which areas is the priority on openness, and in which is the protection of knowledge at the forefront?
- Which disciplines and sectors should the business of tomorrow focus on?

European digital ecosystem

Thesis 5

Update

"The pandemic has highlighted the importance of data security and data sovereignty worldwide – this will be an established competitive advantage of Europe in 2030."

Due to major advances in digitalization, geographical distances will be easily overcome in 2030. Consequently, innovation ecosystems will continue to grow closer together around the world. Data will be a core component of all innovation activities. Europe will have seized the opportunity presented by the transformation of innovation systems and become a world leader with regard to data security and sovereignty, not to mention ethical aspects of digital value creation. Covid-19 will have raised awareness in politics and industry for a sovereign approach to the handling of data and the development of technologies and innovations (Edler et al. 2020).

By 2030, the diversity of the European innovation ecosystem combined with Europe's shared values will be one of the most important unique characteristics differentiating Europe from other regions. It is a competitive advantage in global digital value creation. Standards and standardization initiatives will form the basis for a European control and regulation system that takes account of this unique differentiator (see Herrmann et al. 2020).

- What benefits can you derive from the digital ecosystem in Europe in future?
- Which data security and ethics standards are a core focus for your customers?
- How can your company contribute towards data security and ethics?

BACK TO PRESENT

Opportunities for the future of innovation systems in the context of the Covid-19 pandemic

To understand and successfully design innovation systems, we need to anticipate future developments. This is what makes the preceding attempts to identify the medium-term implications of the Covid-19 pandemic for the development of innovation systems so important. Accordingly, Open Science, interdisciplinary, user-centered value-added systems and an open, cooperative culture of innovation that is learning-driven will continue to be valid points of reference in competitively shaping innovation systems. In the wake of the pandemic, industry, politics, science and society additionally have to face the following tasks:

Recalibrate innovation portfolios

Aside from the direct impacts, the current change being triggered by the Covid-19 pandemic presents the opportunity to rethink innovation portfolios and make them fit for the future. The priority here is to call into question traditional solutions and business models and benefit from the changes brought about by the Covid-19 pandemic. Within this framework, traditional patterns and paradigms can be broken and new fields of activity identified. With regard to resilience to future crises, it is imperative to strike a balance between sovereignty and openness and refocus skills and competencies.

Unlock digital potential

Of all the factors that have changed due to the Covid-19 pandemic, the digital transformation is among those to have had the greatest impact. With regard to the potential offered by the digital transformation, the priority is to examine current innovation processes for the potential provided for the application of digital solutions and artificial intelligence. It is also important to develop products, processes, services and solutions further and incorporate digital components and business models where applicable. After all, the digital transformation accelerated by the Covid-19 pandemic also has the potential to speed up or force the pace on more significant advances in innovation. Innovations that are radical, disruptive or breakthrough in nature, replacing current reference solutions and thereby devaluing the competencies of traditional market leaders, must be identified early on and implemented systematically.

Take advantage of Europe's competitive strengths

Europe's innovation ecosystem provides a unique framework to ensure we are competitively positioned in the user-centered, digital value creation process, a framework which has become increasingly important in the context of the Covid-19 pandemic due to the sharper focus on data security and sovereignty. With respect to the competitiveness of their innovation systems, businesses should therefore take advantage of this ecosystem and build on it.

During and after the crisis triggered by the Covid-19 pandemic, it is imperative to preserve the advantages of globalization while also ensuring we do not return to outdated patterns and paradigms. Innovation budget cutbacks should be avoided with a view to medium- and long-term competitiveness and the future-proofing of business this involves.

DEFINITION OF TERMS

“Innovations“ and “innovation systems“

The landscape surrounding the definitions of the terms “innovations” and “innovation systems” is already quite broad and is constantly evolving. In the Fraunhofer Group for Innovation Research, these two terms are understood as follows in the context of the paper entitled “Understanding Change, Shaping the Future. Impulses for the Future of Innovation”:

Innovations comprise both technical, organizational and social innovations. An innovation is understood to be the successful implementation of an idea. This implementation can be in the form of new technologies, products, services, business models or integrated solutions in fields of implementation, such as markets, organizations or society.

Innovation systems are understood to be a combination of all stakeholders and factors that influence innovations throughout their life cycle.

THE FRAUNHOFER GROUP FOR INNOVATION RESEARCH

Six institutes of the Fraunhofer-Gesellschaft

With its clear orientation and distinct focus on key enabling technologies, the Fraunhofer-Gesellschaft is the leading organization for applied research in Europe. Its research activities are conducted by 75 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of more than 29,000, who work with an annual research budget totaling €2.8 billion. International collaborations with excellent research partners and innovative companies ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.

The member institutes of the Fraunhofer Group for Innovation Research have pledged their commitment to the following mission: "We provide guidance to stakeholders from industry, politics and society, support them in determining how to position themselves, and assist in shaping the future of the innovation system."

The following tasks and fields of activity are at the forefront of the Group's common strategic direction under the guiding principle of "Understanding Change, Shaping the Future":

Understanding change
Understanding innovation systems is key to shaping them in a targeted manner. This specifically includes:

- Identification, analysis and development of innovation systems
- Futures research and technology foresight
- Socio-economic and socio-technical research

Shaping the future
Accompanying support to shape innovation systems specifically comprises:

- Strategic innovation, R&D and technology planning
- Monitoring of production, service and solution development
- Business, industry and organization development
- Monitoring of transformation processes

For almost 50 years, the Fraunhofer-Gesellschaft has explored the topic of innovation research through scientific and application-oriented work – currently conducted by a total of 1500 employees at six Fraunhofer Institutes. The following institutes form part of the Fraunhofer Group for Innovation Research:

- Fraunhofer Institute for Industrial Engineering IAO, Stuttgart
- Fraunhofer Institute for Systems and Innovation Research ISI, Karlsruhe
- Fraunhofer Center for International Management and Knowledge Economy IMW, Leipzig
- Fraunhofer Institute for Technological Trend Analysis INT, Euskirchen
- Fraunhofer Information Center for Planning and Building IRB, Stuttgart
- Fraunhofer Institute for Integrated Circuits IIS, Supply Chain Services (SCS) Working Group, Nuremberg[1]

Additional information

Paper "Understanding Change, Shaping the Future. Impulses for the Future of Innovation"
http://s.fhg.de/innovation2030-en

Publications of the institutes of the Fraunhofer Group for Innovation Research:
https://www.innovationsforschung.fraunhofer.de/en/publikationen.html

[1] *Guest institute*

BIBLIOGRAPHY

Bauer, Wilhelm; Schimpf, Sven (2020): Back to the future. Scoping dynamics in industrial innovation. In: IEEE Engineering Management Review 48 (2), S. 72–82. Preprint available online at http://publica.fraunhofer.de/documents/N-593125.html.

Bockstahler, Milena; Jurecic, Mitja; Rief, Stefan (2020): Working from home experience. An empirical study from the user perspective during the Corona pandemic. Published by Wilhelm Bauer, Oliver Riedel and Anette Weisbecker. Stuttgart. Available online at http://publica.fraunhofer.de/documents/N-605596.html.

Bodenheimer, Miriam; Leidenberger, Jacob (2020): COVID-19 as a window of opportunity for sustainability transitions? Narratives and communication strategies beyond the pandemic. In: Sustainability: Science, Practice and Policy 16 (1), S. 61–66.

Danzinger, Frank; Hossbach, Nadja (2020): Coronakrise und die digitale Transformation. Ergebnisse einer Kurzumfrage. Published by Alexander Pflaum and Roland Fischer. Fraunhofer IIS, Working Group for Supply Chain Services SCS. Nuremberg. Available online at www.scs.fraunhofer.de.

Döbel, Inga; Knitsch, Valentin; Riemer, Annamaria (2020): 2030 Datenbasierte Wertschöpfung in Deutschland. Drei Zukunftsszenarien. Published by Till Kallert and Nick Carlo Dühr. Leipzig. Available online at http://publica.fraunhofer.de/documents/N-593266.html.

Edler, Jakob; Blind, Knut; Frietsch, Rainer; Kimpeler, Simone; Kroll, Henning; Lerch, Christian et al. (2020): Technology sovereignty. From demand to concept. Karlsruhe. Available online at http://publica.fraunhofer.de/dokumente/N-599757.html.

EFI (2021): Gutachten zu Forschung, Innovation und technologischer Leistungsfähigkeit Deutschlands 2021. Berlin: EFI - Expertenkommission Forschung und Innovation. Available online at https://www.e-fi.de/fileadmin/Assets/Gutachten/2021/EFI_Gutachten_2021.pdf

Fraunhofer Group for Innovation Research (publ.) (2018): Understanding Change, Shaping the Future.Impulses for the Future of Innovation. With the collaboration of Wilhelm Bauer, Michael Lauster, Thomas H. Morszeck, Thorsten Posselt, Marion A. Weissenberger-Eibl, Sven Schimpf et al. Published by Fraunhofer Group for Innovation Research. Stuttgart. Available online at http://publica.fraunhofer.de/dokumente/N-509887.html

Herrmann, Philipp; Blind, Knut; Abdelkafi, Nizar; Gruber, Sonia; Hoffmann, Walburga; Neuhäusler, Peter et al. (2020): Relevanz der Normung und Standardisierung für den Wissens- und Technologietransfer. Kurzstudie. Munich. Available online at http://publica.fraunhofer.de/documents/N-615857.html.

Hofmann, Josephine; Piele, Alexander; Piele, Christian (2020): Arbeiten in der Corona-Pandemie Auf dem Weg zum New Normal: Studie des Fraunhofer IAO in Kooperation mit der Deutschen Gesellschaft für Personalführung DGFP e.V. Published by Wilhelm Bauer, Oliver Riedel and Stefan Rief. Stuttgart. Available online at http://publica.fraunhofer.de/dokumente/N-593445.html.

Kaiser, Urban; Möbius, Karin Tina; Klages, Tina (2019): Chancen und Herausforderungen von Kooperationen zwischen Forschungseinrichtungen und bürgerwissenschaftlichen Initiativen am Beispiel des Forschungsprojektes »CitizenSensor«. In: 20. GMA/ITG-Fachtagung Sensoren und Messsysteme 2019. Wunstorf: AMA Service, S. 469–475.

Kasper, Harriet; Pohl, Verena (2020): Future Innovation Labs. Die Zukunft der Innovationsarbeit. Published by Wilhelm Bauer, Oliver Riedel, Anette Weisbecker and Thomas Renner. Stuttgart. Available online at http://publica.fraunhofer.de/documents/N-597069.html.

Lerch, Christian; Maloca, Spomenka (2020): Digitale Geschäftsmodelle - Modethema oder Wettbewerbsfaktor: Wie Produkthersteller die digitalen Wertschöpfungsmöglichkeiten nutzen können. Karlsruhe (Bulletins from the ISI "German Manufacturing Survey"). Available online at http://publica.fraunhofer.de/documents/N-578704.html.

Longmuß, Jörg; Korge, Gabriele; Bauer, Agnes; Höhne, Benjamin (Hg.) (2021): Agiles Lernen im Unternehmen. Wiesbaden: Springer Vieweg. Available online at http://publica.fraunhofer.de/documents/N-603315.html.

Neuhäusler, Peter; Rothengatter, Oliver (2019): Patent applications - Structures, trends and recent developments 2019. Berlin (Studien zum deutschen Innovationssystem). Available online at http://publica.fraunhofer.de/documents/N-589565.html.

Stöffler, Sonja; Spitzley, Anne; Ravlic, Irena; Nawroth, Georg; Albert, Florian (2020): Gemeinsam erfolgreich forschen: Multilaterale Forschungskooperationen im digitalen Zeitalter. Published by Wilhelm Bauer. Stuttgart. Available online at http://publica.fraunhofer.de/documents/N-566068.html.

wpn (2020): Nachhaltig aus der Corona-Krise! Impulse aus der Arbeit der Wissenschaftsplattform Nachhaltigkeit 2030 zur Stärkung deutscher Nachhaltigkeitspolitik. Available online at https://www.wpn2030.de/wp-content/uploads/2020/08/Nachhaltig-aus-der-Coronakrise.pdf.

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