Ahead of G20: Artificial Intelligence and Innovation

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Conference Report and Policy Recommendations
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This extraordinarily insightful and timely conference brought together representatives from politics, academia, and businesses from Germany and Japan. The goal was no less than discussing one of the potentially biggest technological disruptions in human history and its significance for all areas of life – digitalization and artificial intelligence (AI). The symposium was organized by the Japanese-German Center Berlin (JDZB) in cooperation with the Fujitsū Research Institute in Tōkyō (FRI) and the German Economic Institute in Cologne (IW), and took place over two days at the JDZB from June 25 until June 26, 2019. Only a few days ahead of the G20 Ōsaka summit (June 28-29, 2019), the conference was filled with an atmosphere of urgency and relevance, as the G20 meeting had the future of technology at the top of its agenda. The structure of the symposium clearly reflected the various areas effected by advances in artificial intelligence research and digitalization: from opportunities in innovation for the industry sector and novel ethical questions for societies worldwide, to new challenges in international relations, labor markets, and the work environment. The various questions were profoundly discussed in constant awareness of their interwoven nature. Starting from a summary of the talks given, the last part of this report formulates policy recommendations drawn from the conference.

The scene of the symposium was set by honorary speakers all emphasizing similar challenges faced by Japan and Germany, such as stagnating or slow economic growth, decreasing global significance compared to the superpowers USA and China, and a rapidly ageing population. Subsequently, secretary general of the JDZB, Claudia SCHMITZ, as well as H. E. ambassador YAGI Takeshi[2], offered a shared wish for closer cooperation in the face of such challenges between Japan and Germany as well as the EU, which became an underlying theme of the whole conference.

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1. This report portrays the main line of argument of the Conference and it summarizes the presentations and discussions according to the understanding of the author. We therefore ask that individual remarks are not quoted as literal remarks of the speakers.

2. In general, Japanese names appear after the usual order "SURNAME first name". The transcription of Japanese names and words is based on the modified Hepburn transcription, in which long vowels receive a macron (long bar). No exception is made for well-known names and words.

Due to oft-cited shared values between Germany and Japan and similar opportunities for economic growth, both countries were repeatedly called upon to contribute to the promotion of principles and guidelines regarding the benefits and risks of AI. These foundational introductory remarks transitioned to the two keynote speeches.

Both keynote speakers, Prof. Dr. TAKEMORI Shumpei (Keiō University / Member of the Council on Economic and Fiscal Policy, Cabinet Office) and Prof. Dr. Prof. h. c. Andreas DENGEL (German Research Center for Artificial Intelligence, DFKI) introduced fascinating approaches to exploiting potentials in Japan and Germany and to creating frameworks, in which innovation and growth can occur and industries be strengthened. Exemplifying the novelty of current technological developments, both talks referenced the Japanese Fifth Generation Computer System (FGCS) built between 1982 and 1992. The FGCS illustrated why technological innovation alone does not necessarily lead to success. While it signified a big leap beyond previously existing machines in terms of computational capabilities due to its lack of data and, therefore, its marketability and applicability to real life problems, its utility was limited. With this vital need for data and real-life applicability of technological innovation in mind, both speakers uttered the common wish for stronger coordination and utilization of existing data. Economist and advisor to the Japanese government Prof. Dr. TAKEMORI, for instance, highlighted the need to finally build large datasets in Japan. For this purpose, he proposed pooling data stored by different government entities to achieve large datasets managed inside a single framework. Such standardized and pooled datasets could be huge drivers for innovation and growth in sectors like medical care – an increasingly important field in rapidly ageing societies like Japan. As both speakers emphatically agreed, without even creating new data, effective utilization of existing sources would open up tremendous opportunities for companies and researchers to innovate and create useful technical solutions to real-life problems in both countries.

Besides the question of data, economic structures, as well as business structures, were one common theme in the keynote speeches. The question of how to balance cooperation and competition between various actors to effectively innovate was discussed intensely. On the one hand, Prof. Dr. TAKEMORI called on Japanese small-and-medium-sized enterprises (SME) to become more independent from large corporations and through merging and cooperating turn into independent drivers for innovation on a global scale. To achieve this, he demanded greater courage and vision from Japanese SMEs and support by the government. As he added, traditional Japanese business practices such as seniority, rigid value chains, and vertical hierarchies also need to be questioned. On the other hand, computer scientist Prof. Dr. DENGEL introduced one already existing model for innovative, cooperative work: the German Research Center for Artificial Intelligence (DFKI). The DFKI acts as a non-profit research company with public and private shareholders. As a transferable best-practice model, Prof. Dr. DENGEL emphasized the DFKI's various strengths. Among those strengths, its international outlook, which offers a wide network of partner institutions, its long-term vision, as each research department articulates their own long-term research road map, its employee-development focus, and its principle of no dominance among shareholders, stood out. Furthermore, through its "Living Labs", the DFKI ensures the development of innovation that has real-world applicability. Additionally, Prof. DENGEL proposed establishing data consultancies and developing "model stores" for AI. In summation, cooperation was one central sentiment that both speakers highlighted, calling for active state participation and trust-building between various actors. It can be said that in ensuing proceedings, the question of how various stakeholders and groups can and must cooperate to face the challenges and opportunities brought about by technological shifts was *the* common theme.

The first discussion panel contributed to this major question, inquiring as to what even drives, or should drive, innovation. Objects of discussion were initiatives concerning the utilization of AI in the industry sector and wider society in Japan and Germany. With the "Society 5.0" approach by the Japanese

government, the main argument was that not technological curiosity but the wish to better the lives of people should be the main driver behind innovation. The "Society 5.0" approach has been widely praised as tackling important questions about the societal impact of AI and digital transformation by focusing on a "human-centered" approach to the future of technological development. Economist and former government advisor (Council for Science and Technology Policy) Dr. HARAYAMA Yūko explained this need to switch from a "technology-driven" to a "human-centered" approach in innovative research. As she stated, only clearly formulated core values such as openness, sustainability, and inclusiveness can assure the creation of a safe and fair society for all. To facilitate these values, she called for a switch from "planned" to "experimentation-driven" innovation, more strongly integrating the real-life experiences of people working, living, and experiencing areas where innovation is supposed to be implemented. Whereas in "Society 4.0" humans were passive producers of data, the novel 5.0 approach should focus on enabling as many people as possible to become active agents in utilizing data, using technology, and shaping underlying principles. This is especially crucial, as trust by all stakeholders is key to sustainable data creation and exchange. Accordingly, the state should follow a "bottom-up" policy approach, shifting the "entrepreneurial state" to a "learning-by-experimenting state" with strong participatory integration of all stakeholders. In conclusion, each innovation must originate in the desire to improve human well-being, and since, especially in the case of AI, failing at small things is less problematic, the scope of using novel technologies must be considered carefully.

Director and Fujitsu Distinguished Engineer at Fujitsu Technology Solutions GmbH Thomas WALLOSCHKE, who also collaborates with Plattform Industrie 4.0, tackled a similar question, speaking about whether AI could be generating innovation or should be viewed as a tool for humans to realize ideas. His answer landed clearly on the latter. As he stated, for the foreseeable future, AI can bring forth innovation-free optimization whereas innovation comes from people for people. AI's utility, nonetheless, should not be underestimated. To emphasize this point, he used the field of cybersecurity. Since cyberattacks become more and more flexible, machine learning makes it easier to respond to security risks through dynamic approaches of defense. While this example clearly showed the benefits of AI in optimizing solutions to problems without constant human intervention, caution is nonetheless appropriate as AI does not reveal the way certain results are reached ("explainability problem"). In the field of cybersecurity, where the outcome is especially crucial, merely trusting the AI to secure a network cannot be satisfying. In other words, ensuring transparency in AI will be important for creating trust and avoiding dangerous outcomes. It was fascinating to see how both speakers highlighted the crucial role for human beings as the focal point and driver of innovation, given the anxiety felt by many that AI could make humans obsolete.

In the last speech of the panel, senior principle engineer at Siemens and representative of Plattform Industrie 4.0 Dr. Ulrich LÖWEN complemented previous insights by analyzing areas where digitalization can benefit industries. Focusing especially on how the Industrial Internet of Things (IoT) and AI enable the optimization of value networks in manufacturing industries, he demonstrated how new technological developments open possibilities for businesses to decrease costs and increase revenue and maybe even present new business models for struggling companies. His presentation showed convincingly how digitalization can increase product quality at every stage of the production process, from product design to service provision. The same holds true for all steps between various companies inside a value chain. Similarly, he also emphasized the benefits of individualizing solutions through increased flexibility in product design and execution that digitalization can bring. As the heterogeneity of needs in the industry or by consumers rises, IoT and AI enable companies to act accordingly and follow a use-case based approach. The Plattform Industrie 4.0 approaches these changes by offering a holistic process to address strategy, testing,

and standardization. With the Standardization Council Industrie 4.0 and the Labs Network Industrie 4.0, institutions have already been set up that support businesses in reaching out and trying new things. This concluded the first day of the symposium with the key message that human beings will remain central in a future world and AI and technological innovation have great potential as tools in bettering lives and rejuvenating businesses.

The focus shifted somewhat on the second day of the conference. From opportunities created by innovation, how to avoid negative outcomes for societies was put into the spotlight. Starting with how to create appropriate legal frameworks, considerations about the necessity of thinking about unintended side-effects and consequences for international relations followed. Prof. Oʜʏᴀ Takehiro (Keio University) tackled the avoidability of negative outcomes of AI from a legal standpoint, investigating the possibility and benefits of using architectural design (*ex ante* control) to achieve "soft, comfortable, and subtle regulation" towards AI instead of setting up laws (*ex post* control). His main goal was to argue for regulation capable of avoiding pitfalls without killing innovation. As he admitted, following such an *ex ante* approach of creating a not too rigid framework of architecture, aiming at maximizing avoidability through nudging development in the "right" direction, might be complicated, as AI is problematic in terms of predictability. This means, if it is not clear how an algorithm comes to a conclusion, building the right architecture to avoid unwanted outcomes is especially difficult. Nonetheless, he concluded that developing guiding principles which are not too rigid is desirable, as unexpected positive outcomes are also feasible.

Prof. Dr. em. Roland W. Sᴄʜᴏʟᴢ (ETH Zurich / Institute for Advanced Sustainability Studies, IASS Potsdam) widened the scope of the previous considerations by putting the spotlight on UNSEENS (Unintended Side Effects) of the digital transition. He proposed digital data as a viable subject of transdisciplinary analysis, cautioning that technological development must focus on unwanted side effects in all areas of life from the very beginning. While previous speakers saw AI and digitalization as contributors to the UN's Sustainable Development Goals, Prof. Sᴄʜᴏʟᴢ argued that the opposite could also turn out to be true. AI might become an accelerator of the global environmental crisis, because potentially it could rapidly increase resource usage. Expert round tables focused on discussing and collecting UNSEENS, organized in both Europe and Japan, showed similarities and differences in themes discussed. Observing such differences and similarities across countries highlights the possibilities for deliberation in risk assessments through expanding perspectives. Prof. Sᴄʜᴏʟᴢ emphasized that transdisciplinarity and input from various stakeholders (citizens, consumer organizations, ICT-scientists, economists, …) is also crucial to creating sustainable digital data management in the future. In a similar fashion to previous speakers, he highlighted experiential wisdom as equally important to academic rigor and a bottom-up approach, bringing together experts and practitioners from all areas identified as vulnerable, as key.

Lastly, Kaan Sᴀʜɪɴ from the German Council on Foreign Relations (DGAP) put the spotlight on "The Recent Emergence of AI Ethics Guidelines in Light of the US-China AI Competition". He compared the guidelines produced by the OECD, the EU, and the Beijing Academy of AI. In them, he observed similar principles, which is significant since the OECD document is supported by the United States and the Beijing Academy of AI is a state-backed Chinese institution. Therefore, one could conclude that ethical concerns are apparently backed by all major nations. Sᴀʜɪɴ commended that Chinese institutions show concern with ethical questions, and thereafter observed a general openness for global discussion. While multilateral cooperation on AI is not yet visible and formulated principles are very vague, the goal seems to be opening a thematic discussion and all major actors appear willing to join in. He further concluded that, as AI is too complicated for one set of principles, ethic guidelines must reflect cultural and social preferences for various areas. Finally, he cautioned that AI could change power dynamics in many bilateral relationships, and most likely increase power imbalances.

To offset these dynamics, cooperation of "the weak" could be crucial. To sum up the first panel of day two, careful consideration of possible pitfalls, inclusion of diverse voices, and intense cooperation between actors will become increasingly important in the future.

The last session of the conference was focused on the future of work and gave insights from politics as well as businesses. Dr. Markus DICKS of the Federal Ministry of Labor and Social Affairs' (BMAS) new "Policy Lab Digital, Work and Society" introduced listeners to the German government's AI strategy and new approaches inside the government to cope with future challenges brought on by technological developments. While the German government expects more job creations than losses until 2030, the Labor Ministry's Policy Lab was introduced as an innovative way to approach accelerating changes in the labor market. Through horizontal, less bureaucratic processes, the aim is for more flexibility and faster reaction-times to disruptions in the labor market by technological developments. The creation of a German AI Observatory, starting from October 2019, further aims at monitoring and analyzing the impact of AI on places of work. In general, the German government intends to make Germany and Europe a leading center for AI research and put a focus on responsible development and use of new technologies. Dr. DICKS further described the favored society-related approach in technological innovation, aiming at a third way besides the heavily state-driven approach in China, or the strongly market-dominated approach in the United States. As he concluded, to successfully find a middle ground between these two dominating approaches, international dialogue and cooperation will be ever more important for countries like Germany and Japan.

From an intra-business perspective, Michiko ACHILLES (SAP Japan) described how digitalization and AI changes the work of human resource departments. Since in a globalized and fast-changing world the "war for talent" will get more intense, effective human resource work will become more crucial, especially as previously unheard job descriptions and requirements will develop at a rapid pace. One way of approaching these changes is turning companies into cloud companies, offering human resource departments greater information on the wants and needs of employees and departments. Technological innovation will become crucial for HR departments to identify potentials and challenges and identify new roles and job descriptions in each company. Further, introducing new leadership styles, empowering employees, emphasizing a company's purpose, and following through on set principles by introducing agile organizational structures will be key for companies to attract talent. HR work will partly rely on emphasizing to managers the need to have conversations with employees on performance and develop fitting evaluation strategies for data creation. As, for instance, surveying employees through extensive questions on trust and engagement by leaders and management has shown motivational outcomes for the former, such efforts must increase. On a wider scope, diversifying and increasing talent will be crucial. To facilitate this, companies must be flexible, implement previous goals, and help their employees develop. In short, using intra-company data in innovative ways will decide the future prospects of companies and employees alike.

From a business perspective, Dr. Martin SCHULZ of the FRI connected to the previous talk by going into more detail on the role of AI in the approaching economic system. He described the imminent "learning economy" as the next step after Industry 4.0. As the main input factor is now data, learning becomes the major step towards value creation. It is no longer knowledge, in other words, storing and selling data, which drives economic growth, but learning how to use the data one has in creative ways. As complexities increase, because innovation now also comes from the consumer side, AI is needed to a greatly increased extent to organize and understand this huge amount of information. To implement learning in this new economy, corporations should utilize "Corporate Learning Platforms", "Learning Factories", or "Knowledge Exchange Networks", which act in a problem-

focused, cooperative fashion. These insights, again, connect to previous emphasis on flexibility and bottom-up innovation.

In the last talk of the conference, Dr. rer. pol. Hubertus BARDT of the IW Cologne talked about how companies and workers are to prepare for the looming digital economy. As already mentioned by previous speakers, he highlighted the need for "Work 4.0" to be flexible in terms of external and internal factors. Regarding the former, companies should enable freelance work or utilize external crowdsourcing. Internal flexibility regards such strategies as responding to employees wishes for flexible working hours or spatial decentralization, i.e. mobile work. He further talked about the need to understand changes in the nature of work more holistically, as additional competences are expected for every existing job profile. Therein, advanced IT skills might not necessarily be the most demanded, but creativity, empathy, and innovative thinking will be central across all professions. As communication, diversity, and cooperation will increase in importance, fostering soft skills will be crucial. To prepare for this new work environment, public education systems will need to adapt to these new challenges to facilitate a society able to take up opportunities presented by technological developments. With these final thoughts, a highly stimulating conference came to an end. The ensuing part of the report summarizes key findings and formulates policy recommendations stemming from the previously described proceedings.

Key findings and summary

1) On a state level, both the German and the Japanese government should work hard on pooling their respective data resources and enable scholars as well as companies to utilize these datasets for cutting-edge research through easily accessible platforms. Upholding clearly defined, shared principles such as privacy, non-harm against individuals, anti-discrimination, and transparency, i.e. who uses government data for what purposes, should be one central pillar of such platforms. Easy access with the possibility of tracking concrete usage of data will help avoid the emergence of a data oligarchy, foster trust between actors, and prevent data misuse. Setting up a corresponding state data consultancy could accelerate the usage of existing data and bring revenue to the respective states. Large companies wanting to benefit could be made to contribute by sharing data. In general, states must perceive themselves as investors in research and development and pay attention to return-on-investment.

2) Globally, countries and international organizations like the OECD should ideally come to an agreement on a unified standard for data accumulation, enabling closer cooperation in problem solving. Since the contents are similar, it should be attempted to combine and harmonize the different proposed guidelines for AI from Japan, the EU, the US, China, and the OECD. Germany and Japan, as countries who perceive themselves as close with regards to values and goals, should act as a prototype on how to facilitate cooperation in a digital age and how to ensure "data free flow with trust". A corresponding design guideline is needed that clearly articulates and follows certain ethic rules. In response to the current climate crisis, contributing to the Sustainable Development Goals and being part of a global governance framework for digital transformation is crucial for the sustainability of human life. Multilingual access to previously described platforms and data consultancies will be crucial in the necessarily accompanying trust-building efforts and data exchange.

3) Public education systems need to be strengthened and the approach to education must change. Students must be engaged as agents of innovation and offered the circumstances under which they can effectively engage with existing problems. As social skills are highly important in the future, cooperative learning and project-based cooperation between schools and external actors could

prove effective. Educators need to have sufficient digital skills to teach their students and accompany them in their creative processes. Wide accessibility of information should turn educators and experts from their respective fields into consultants and not teachers following a classical top-down approach. The education sector on all levels must be better funded and prepared for the "digital world". Attracting talent to the education sector will be hard without attractive payment and working conditions. As curricula need to be focused on digital skills, the necessary equipment, hardware, and software, must be provided on a large scale. Lastly, equal education opportunities for acquiring AI literacy at all levels of education must be present to prevent inequalities in the future.

4) Large companies must play a part in educating their workforce to face new challenges and respond to changing job profiles. They should cooperate with other actors such as labor unions, state entities, or NGOs to facilitate these efforts. Human resource departments must actively push for a diversification of talent, actively engaging women, minorities, or people from outside their own company's area of expertise to follow innovation and flexibility in problem-solving. Public-Private-Partnership-Models should be pursued by private companies as well, in order to ensure the trustworthy exchange, storage, and utilization of data. Ensuring transparency and avoiding unwanted outcomes and developments in a society must be the primary goal of all actors in that society.