How to leverage the **digital transformation**'s potential for **innovation and research?**

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Paris, OECD Conference Centre

Summary of discussions

OECD
BETTER POLICIES FOR BETTER LIVES

Introduction to the workshop

Much is in flux with the digital transformation and innovation processes are no exception. Changes are driven by the wider availability of data and better ways to process and analyse them (e.g. software tools, AI), changes in the processes for developing innovations (often allowing for "scale without mass") and the emergence of new ways of bringing products to the market (e.g. through digital platforms).

These transformations apply to the research, development and commercialisation stages of innovation. The very innovation process is fundamentally different in the intangible economy compared to manufacturing, as illustrated by the case of software that entails little "production" but very frequent update and innovation cycles. The changes lead to tensions within companies and industries together with the emergence of new actors, in order to seize the opportunities of the digital transformation.

The changes to the very nature of innovation also affect the opportunities and risks different players (large companies, SMEs, research organisations, and start-ups) have with research and innovation.

- On the one hand, **a number of digital tools are accessible to all, and establish a level-playing field** between one-person start-ups with a laptop and Internet access and large companies. Indeed, it is no longer only large established players that dominate industries: new players are involved in the digital transformation of the automotive and pharmaceuticals sectors, in commercializing advances in genomics or offering on-demand transportation services, following the model introduced by Uber.
- On the other hand, **fully exploiting the potential of some of the new digital technologies may require large-scale investments** only affordable for large firms and certain research institutions. Processes may be computerised but require large data sources not accessible to all, and platforms may offer opportunities for entry to some but not all, and may disproportionally benefit the owners of those platforms. In the competition for scarce skills, large players are favoured as they can offer higher wages.

The **objective of the workshop** was to bring together experts and policy makers to discuss the effects of the digital transformation on the innovation performance and innovation practices of various types of actors. The workshop also aimed at identifying the implications of these transformations for innovation policies.

The **outcomes of the workshop** directly contributed to the OECD TIP Digital and Open Innovation project, which aims to identify innovation policy priorities in the context of the digital transformation. The workshop also contributed to the OECD-wide Going Digital initiative (http://www.oecd.org/going-digital/)

The agenda and all presentations from speakers are available at:
www.innovationpolicyplatform.org/digitalinnovation

More information on the OECD Digital and Open Innovation project can be found at: www.innovationpolicyplatform.org/TIPDigital

Main takeaways

Innovation in the digital age

1. **The nature of investments in our economies is changing, from predominantly tangible to intangible assets**. The characteristics of the latter, summarised in the four 'S' (scalability, sunkeness, spillovers, synergies) are leading to important changes in our economies. Consequently market dynamics are potentially changing notably as opportunities to scale allow firms to target global markets.
2. **The digital transformation is characterised by two diverging trends**. On the one hand, there are lower barriers to market entry and thus more opportunities for entrepreneurship across individuals, firms and regions, increasing competition pressures. On the other hand, economies of scale and scope deriving from data fluidity and network effects are leading to winner-take-all market dynamics and thus higher market concentration.
3. **Machine learning and advances in artificial intelligence allow extracting more value from data**. These general-purpose technologies offer opportunities for innovation across the economy, from the agriculture to the transportation and health sectors. For example, Evogene (a firm conducting R&D in plant genomics) uses a computational predictive biology platform that integrates various databases in order to identify genetic elements for improved seeds, significantly accelerating R&D process. The complexity of research in AI-related fields and the multiple areas of potential applications across all sectors requires research groups that combine strong data analytics capabilities and specific domain expertise. Advanced data analytics and AI-related skills however are in short supply, leading to high competition for this talent.
4. **Research collaborations –between industry and academia, large firms and start-ups, etc. – are key to innovation in the digital age for several reasons:**
   - *Diverse expertise is increasingly needed.* For example, innovation in the automotive industry increasingly requires strong capabilities in software engineering and AI, in addition to traditional core competences in mechanical and electronic engineering. Research collaborations allow firms to gain access and exposure to a richer pool of expertise and skills that are complementary to their own competences.
   - *Data access is critical for innovation.* Accessing the vast amounts of data collected by firms creates a new incentive for researchers to collaborate with firms.

5. **Knowledge intermediaries and a range of digital platforms facilitate collaborations for research and innovation**. Intermediaries, such as Digital Catapult in the UK, are central players in matching the capabilities and needs of different actors, and strengthening the connection of local, small and/or new players with global ones. Digital platforms also reduce the cost of searching for collaboration partners. Crowdsourcing platforms, such as Innocentive, are specific types of digital platforms increasingly used by firms to source ideas from outside their organisation to solve specific challenges. Such platforms facilitate collaborations and expand opportunities to participate in innovation activities by individuals, firms and research groups regardless of their location, potentially spurring inclusiveness in innovation activities.
6. **3D printing, virtual simulations and other digital technologies are transforming design, prototyping, testing and production processes in many sectors**. By facilitating the new product and process development phases, digital technologies are speeding up innovation cycles.
7. **The decline in information and exchange costs in the digital age have also enabled developing crowdsourced digital goods**, such as knowledge repositories (e.g. Wikipedia), user review sites (e.g. TripAdvisor), and open source software (e.g. Linux). These can become important production and innovation inputs.

Innovation policy implications

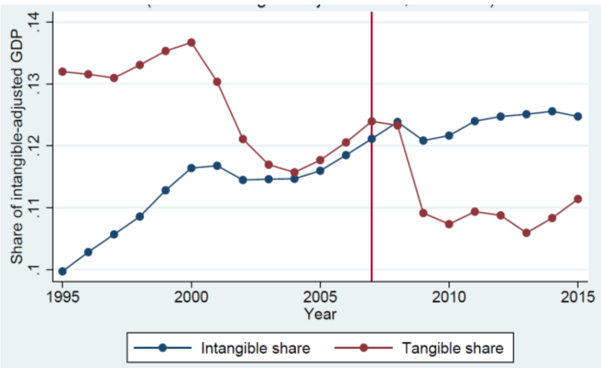
- **Access to data is a core input for research and innovation. Policy has an important role to play in supporting data-driven innovation** by:
  - setting out specific access conditions to different types of data (e.g. distinguishing between public, business and research data), users (e.g. citizens, researchers, public administration), and purposes;
  - stimulating data generation and processing, as well as integration of databases; and
  - ensuring data privacy and security protection.
- **Collaboration is becoming critical for innovation in the digital age and new policy approaches can be implemented to support it**. Smart industry field labs in the Netherlands are an example of public initiative that supports firms develop, test and implement new smart industry solutions in collaboration with research institutions. Governments can also support the creation of knowledge intermediaries (e.g. Digital Catapult in the UK), research and innovation centres that have among their key missions to work collaboratively with other actors in innovation ecosystems (e.g. Data 61 in Australia) and experiment with new approaches to open innovation practices, such as the creation of crowdsourcing platforms or open challenges.
- **Investments to facilitate testing and piloting of new technologies and services are needed**, given the complexity of certain areas of digital technology development and the uncertainty regarding potential wider impacts on society (e.g. in the case of self-driving cars). These can take several forms. In Korea, over 3000 vehicles have already participated in a pilot project on Cooperative Intelligent Transport Systems on a 7km span of a highway. In Finland, a number of testbeds are being established to foster innovation in the fields of automated driving, mobility-as-a-service and intelligent traffic infrastructures.
- **Crowdsourced digital goods are becoming important production and innovation inputs that governments could support**, for instance by sponsoring crowdsourcing programmes and favouring crowdsourcing in government procurement.

Keynote speech by Jonathan Haskel: the rise of the intangible economy

Jonathan Haskel, Professor of Economics at Imperial College London, presented his recent book (co-authored by Stian Westlake from Nesta) entitled ‘Capitalism without Capital: the Rise of the Intangible Economy’. The authors describe that the nature of investments in our economies is changing, from a predominance in the past of investments on tangible assets (e.g. buildings, machinery, vehicles, computers) to current higher investments in intangible assets (e.g. R&D, training, design, branding and marketing, software and data). However, this change remains largely hidden in official statistics, as GDP and company accounts do not include most intangibles.

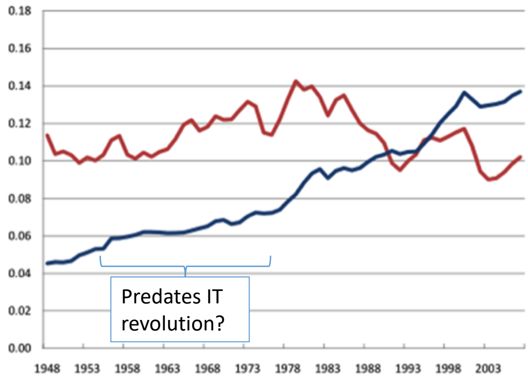
Figure 1. The rise of intangible investment is a long-term trend

Tangible and **intangible** investment share, US+EU11



From SPINTAN database

Tangible and **intangible** investment share, US



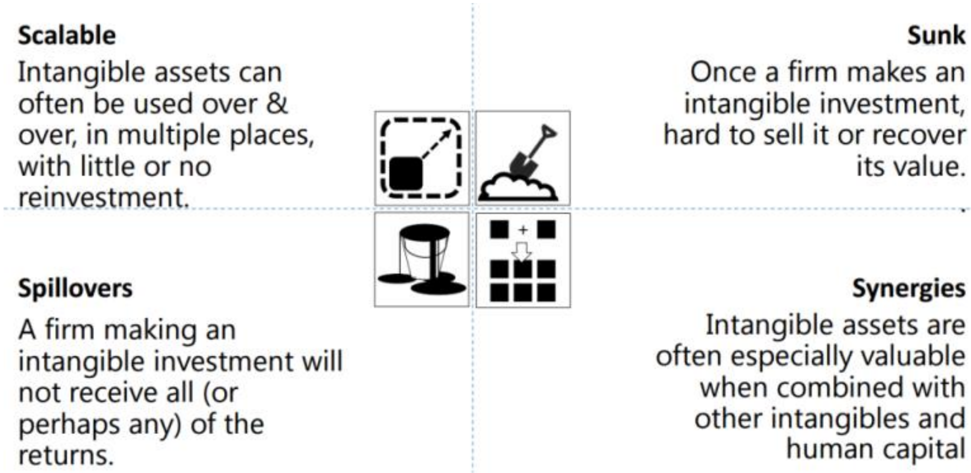
From Carol Corrado

Source: Presentation from Jonathan Haskel, available here.

Intangible investments have characteristics that distinguish them from tangible assets and that can be summarised in the ‘4S’ (Figure 2):

- **Scalability**: Intangible assets can often be used multiple times and in multiple places, with little or no investment. For example, if a taxi company wants to scale up it needs investments in new (tangible) vehicles, while for new on-demand mobility platforms mainly investing on intangible assets (e.g. Uber) it is easy to scale up at practically no cost, as new drivers are easily found online and these bear the costs of investments on tangible assets.
- **Sunkenness**: Once a firm makes an intangible investment, it tends to be hard to sell it to recover its value. For instance, software with no success cannot be sold anymore to pay back a bank loan. In contrast, loans to buy tangible assets (e.g. buildings) can be reimbursed at any time by selling them.
- **Spillovers**: Often, a firm making an intangible investment will not receive all of the returns (i.e. knowledge generated can be used by others). It is relatively easy to protect a tangible asset (e.g. having a security guard in front of a building) but it is much more difficult to protect software or its codes. This increases the power (and compensation packages) of people managing software and algorithms, as they could easily transfer those intangibles to competitors.
- **Synergies**: Intangible assets are often especially valuable when combined with other intangibles. Successful new inventions are often the result of combinations of innovation in a range of intangibles (e.g. innovations in marketing, branding, customisation to consumers’ preferences, business models, etc.).

Figure 2. Four economic properties of intangibles



Source: Presentation from Jonathan Haskel, available [here](#).

These features make an intangible-rich economy fundamentally different from one based on tangibles. They are also leading to increasing productivity gaps between urban and rural areas: Global cities are becoming increasingly attractive for most innovative firms and thus for talent, which is exacerbating regional inequalities. Raise in property prices in these cities is increasing wealth inequality.

In this changing context, Prof. Haskel argued that the spillovers of intangibles increases the case for public investment on publicly funded research and training, and other publicly funded intangibles such as procurement and public-run firms.

Panel 1. Opportunities and challenges for research collaboration in the digital age

Digital technologies provide unprecedented **opportunities for research**. These include the possibility to collect and exploit vast amounts of real-time data, or conduct large-scale computerised experiments, which allow for many more trials than could be realised by human researchers. **Investments needed to use digital technologies effectively** in research and to create and integrate different competences to fully exploit the digital potential **may, however, be too high** (both regarding infrastructure and skills) for all firms and research institutions to have access to them. Consequently, the relative cost of engaging in innovative research activities may lead to the exclusion of the firms and researchers that are not able to afford such costs, resulting in a concentration of R&D as is the case today.

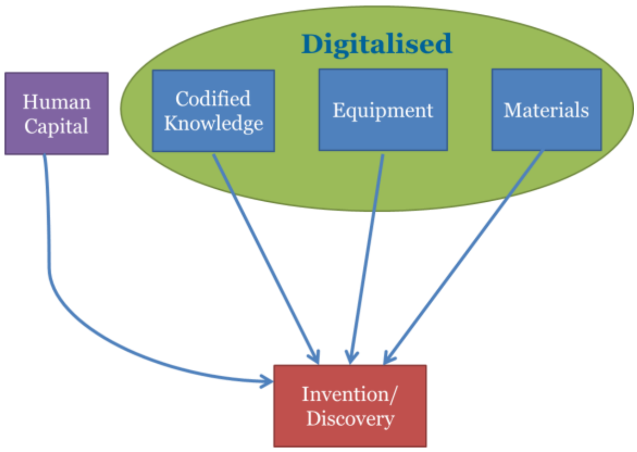
Key questions addressed by the panel were:

- To what extent has the digital transformation changed opportunities to engage in research activities related to innovation for different actors and places?
- Are changes similar across academic disciplines and industry sectors? Should policy intervene to ensure more widespread opportunities to innovate at the research stage? What are the organisational changes needed to facilitate a re-orientation of research organisations (and firms) in that regard?
- How does the digital transformation facilitate opportunities for extending research networks and collaborations with others (researchers, research organisations and firms)?

Conditions for digital innovation and entrepreneurship

Dominique Guellec, Head of the Science and Technology Policy Division at the OECD, discussed insights from the TIP project on Digital and Open Innovation. He explained that processes of **discovery and invention are becoming increasingly digitised**, but some firms are not able to adapt: Data is becoming the main input for research; investments in equipment have an increasingly intangible nature (e.g. investments in access to cloud services instead of purchasing new computers); and knowledge can be codified and transferred easily at practically no cost. Human capital on the contrary cannot be digitised and is becoming more important (Figure 3), as it is a key complement of AI and data analytics.

Figure 3. Processes of discovery and invention are digitalised



Source: Presentation of Dominique Guellec, available here.

Mr Guellec also pointed out that digital transformation is **lowering barriers to market entry**, as entry investments tend to be less costly than before (e.g. investment in computing power and data access is less capital intensive than investments in big production factories). This is likely to lead to higher numbers of small actors and increase competition pressures. However, economies of scale and scope deriving from **data fluidity and network effects favour winner-take-all market dynamics** and consequently market concentration. Policies have a key role to play in shaping those opposing forces.

Jean-Michel Dalle, Managing Director at Agoranov – a public incubator of innovative technology start-ups located in Paris – argued that the **conditions for research collaboration** are more difficult in Europe compared to the United States. One important reason being the lack of venture capital funding for startups. He echoed other speakers in pointing to the **high barriers to access data for start-ups**, particularly of certain types of data (e.g. patient data. In the case of academic datasets, much work is necessary to process data for it to be used for innovation. In view of these, Mr Dalle emphasised the need to soften the rules for accessing data, as well as increase investments in processing academic datasets in order to make them readily available for the wider academic community as well as businesses.

On the basis of his experience, he pointed out that younger generations of researchers are more willing to create their own start-ups and engage with industry than previous generations. This provides opportunities for enhanced knowledge transfer between industry and science provided policy provides the right support.

Steven Drew, from InnoCentive – a crowdsourcing platform – focused his presentation on the role and importance of **crowdsourcing as a new method to facilitate collaborations** and expand opportunities for participating in innovation activities. Innocentive (first called Molecule.com) was founded as part of big pharmaceutical company that felt many people around the world could help finding solutions to their research challenges. They came up with the idea of creating an online platform, where the firm would post their challenge and open it to potential solvers from all over the world (be it firms, research institutions or individual innovators), who would submit their solutions within a given deadline. Those proposals would then be privately reviewed and the winning solution would receive a monetary reward. Today, Innocentive runs challenges for clients (incl. businesses across all sectors, public institutions and NGOs) from all over the world, placing high importance on issues related to confidentiality (i.e. solvers identity and solution are kept private) and relevance/quality of challenges and solutions.

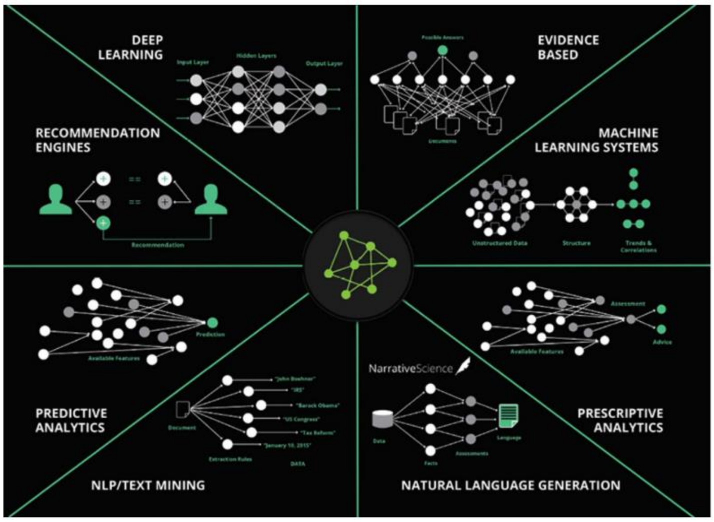
He argued that crowdsourcing, enabled by digitalisation, **expands opportunities for participating in innovation activities** of companies, academic teams and individual researchers, including those in more remote areas. Crowdsourcing thus reduces the importance of distance for innovation and promotes inclusiveness in innovation.

Policy approaches in support of digital innovation

Peter Leihn, Commercial Director of CSIRO's Data61 –Australia's data-driven research and innovation centre– talked about the **role of data for innovation**. Over past years there has been more data generated than over all history. Such expansion, coupled with the development of methods for advanced data analysis (which are critical to extract value from data), are bringing fundamental shifts to our economies. **Machine learning and artificial intelligence (AI) are at the heart of transformations** as they allow exploiting such data to perform tasks that would otherwise require human intelligence. For example, predictive analytics allows identifying the best line of action based on information contained on large amounts of historical data; prescriptive analytics allow optimising processes; and machine learning allows for transforming unstructured to structured data so as to identify trends and gain insights (Figure 4).

Such technologies can be **applied for multiple purposes across sectors**, from geological research to the health sector. Yet exploiting the full potential of such complex technologies for specific sectors requires the combination of both digital/data analytics skills and well as domain expertise. Moreover, the complexity of research on machine learning and AI **requires collaborations across actors** with different capabilities, as no single organisation by its own can have all necessary skills to be at the frontier of different ongoing developments.

Figure 4. Areas of development of machine learning and artificial intelligence



Source: Presentation of Peter Leihn, available here.

Peter Leihn also discussed how his own institution, Data 61, was collaborating with industry and academia to better leverage the potential of digital tools for innovations. Examples include:

- Collaboration with GE to develop a data analytics solution that will give the Royal Australian Navy greater insights into their fleet engine performance and enhance operational efficiency.
- Partnership with Boeing to provide an R&D pipeline of emerging data-driven technologies in areas such as autonomous systems, on-board health monitoring analytics and machine learning techniques for improved efficiency of manufacturing.
- Collaboration with academia to monitor the biodiversity in the Amazon rainforests through new methods, that consist in creating a distributed, wireless sensor network throughout the jungle with autonomous nodes that continuously monitor wildlife.

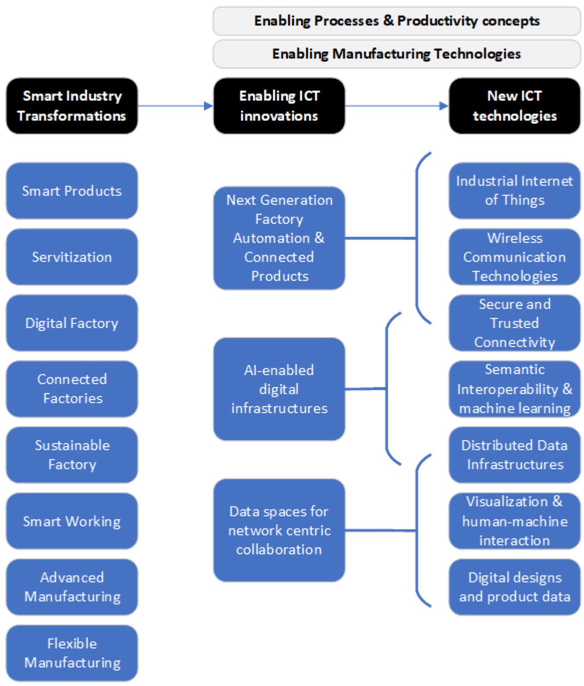
Michaela Muruianu, Lead of the Artificial Intelligence Programme at UK's Digital Catapult – a digital technology innovation centre that promotes the development and early adoption of advanced digital technology–, presented an overview of the **industry needs in the field of AI** and how Digital Catapult is addressing them. She pointed out that start-ups in this field face a number of barriers, this including limited **access to computational power and to the right talent**. Insufficient industry adoption of advanced technologies and regulatory constraints also affected their business opportunities.

The **Machine Intelligence Garage**, created in January 2018, helps start-ups access to computing power for early stage AI companies, essential for developing new AI products and receive private investments and facilitates their access to expertise and a place where companies of all sizes experiment and collaborate. After the first months of operation, several hundred companies had participated in workshops and experimentation days organised to help companies of all sizes get to grips with systems for machine intelligence.

Claire Stolwijk, Researcher at TNO –the Netherlands organisation for applied scientific research– described the role **Dutch Smart Industry Field labs** play in accelerating the digitalisation of industry. Smart industry field labs are shared facilities in which companies and knowledge institutions **develop, test and implement smart industry solutions**, and where people can learn to apply them. Each field lab (of a total of 34) acts as an innovation hub and contributes to one or more Smart industry transformations, such as smart products (e.g. for smart farming, digital health), servitisation, and digital factories. Such solutions are developed following a bottom-up approach (i.e. in response to the industry needs) and therefore solutions are difficult to predict (Figure 5). She also stressed the importance of **collaborations across sectors and across borders** in order to find new solutions, which is facilitated by digital technologies.

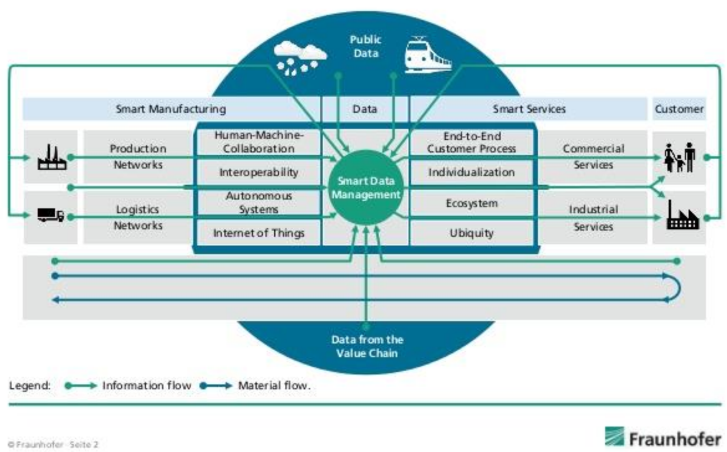
In a context where data have become a strategic resource for developing smart manufacturing and smart services, the Netherlands has adopted field labs as an attractive instrument for executing its innovation policy to create data spaces for collaboration (Figure 6).

Figure 5. ICT innovations for Smart Industry



Source: Presentation of Claire Stolwijk, available here.

Figure 6. Data as a key resource for smart manufacturing and smart services



Source: Presentation of Claire Stolwijk, available here.

Open discussion

During the **open discussion** that followed, three main issues were addressed:

- **The impacts of digital transformation on regional disparities:** Despite the expectations that digital technologies would reduce the importance of distance for innovation, innovation activities remain mostly located in specific cities, where talent is concentrated. Research and innovation centres such as Australia's Data61 and UK's Digital Catapult try to integrate a regional dimension in their activities, by establishing partnerships with regional actors. In the case of Digital Catapult, regional centres have been established to address local challenges. Crowdsourcing platforms may help reduce current barriers by encouraging as many people as possible to participate in innovation activities, regardless of their location. Nonetheless, an important barrier for peripheral regions to catch up in innovation performance is the lack of sufficient capabilities.

- **Differences in data access regulations across countries:** The conditions for accessing and sharing data are often constraining and quite heterogeneous across countries. There are also important differences in the difficulty to access data depending on the source (e.g. geospatial data is easier to access than health data). The EU General Data Protection Regulation (GDPR), designed to harmonise data privacy laws for all companies operating in the EU, and ensure that people have more control over their personal data and businesses benefit from a level playing field, was considered an important first step to ensure that business are more considerate with their use of private data. A final remark regarding data access was that accessing the vast amounts of data generated by businesses has become a key incentive for research collaborations.

- **The role of social sciences in the digital age:** In a context of rapid technology changes, social sciences have an important role to play in identifying what are ethical concerns and potential impacts of developments on future wellbeing, in order to ensure such developments are socially desirable. In addition, the contributions of social scientists may be critical for developing new technologies that have an important component of human-machine interaction or require a deep understanding of human behaviour and decision-making processes.

Panel 2. Opportunities and challenges for developing and commercialising innovation in the digital age

The **development and commercialisation stages of innovation** have also been affected by the digital transformation. For instance, once developed, new software is fundamentally different from physical products such as cars - the latter requiring production before they are taken to the market, while the former can be quickly disseminated at little cost. This has been referred to as "scale without mass." As intangible product components are increasingly important, the development process of innovation is gradually shifting towards this new model. Commercialisation is also changing in this context, with new ways of launching products and services, nearly instantaneously and at global scale, and benefitting from networks. This offers **more opportunities for small actors** to compete with larger ones compared to the past. However, **platform dynamics and network effects may disproportionately compensate larger players**, with an opposite effect on the actual opportunities for other to innovate.

This panel focused on **opportunities and challenges across different sectors**, with a focus on the agri-food, automotive/transportation and retail sectors - representatives of primary, manufacturing and services sectors, respectively. These sectors (and their own boundaries) are changing with the digital transformation, and constitute excellent examples to illustrate the pervasiveness of digital transformation across the whole spectrum of economic activities, at the same time that allow distinguishing different sectoral dynamics.

Key questions addressed by the panel were:

- To what extent has the digital transformation changed opportunities for different actors to develop and commercialise innovations across different value chains?
- Are changes similar across actors and industries and in particular across agro-food, automotive/transportation and retail sectors?
- What can policy do to ensure more widespread opportunities?

Conditions for digital innovation across sectors and actors

Sandra Planes-Satorra, from the OECD's Directorate for Science, Technology and Innovation, presented preliminary findings from the TIP Digital and Open Innovation project, that explores how the **digital transformation is impacting innovation across sectors**. She first identified some general tends across countries, which include:

- **Digital technologies are increasingly integrated into new products**. For instance, smart and connected products are present in agriculture (e.g. drones, tractors equipped with a range of sensors) and the automotive sector (e.g. connected cars).
- **Data are a key input for innovation**. Data are used, among others, to (1) explore and expand into new areas of business (e.g. smart farming, car-sharing services); (2) improve and tailor services to consumers (e.g. retailers collect and exploit consumers and sales data to predict consumer preferences and personalise advertisements); and (3) optimise the development, production and distribution processes (e.g. development of predictive maintenance systems).
- **Digital technologies offer new opportunities for innovation in services**. Manufacturers are investing in the development of digitally-enabled services to complement their products (a trend known as 'servitisation of manufacturing').

- **Innovation cycles are speeding up.** Digital technologies (e.g. 3D printing, virtual simulations) increase speed and reduce costs of design, prototyping and testing processes. There are also higher possibilities to release pilot versions to the market, facilitating the integration of consumer feedback to products.

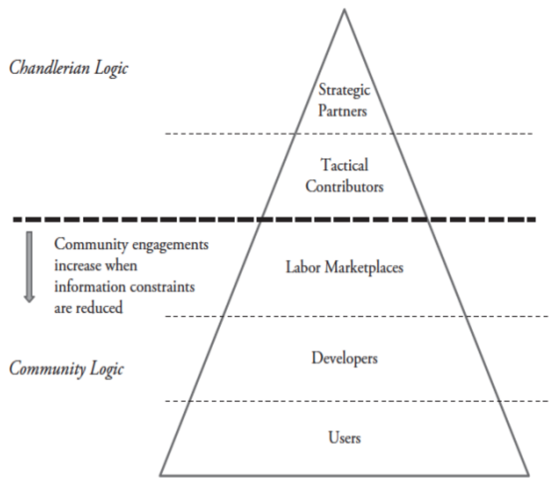
She then explained that **specific impacts of digital transformation differ across sectors** due to three main factors. First, the scope of opportunities for innovation in products, processes and business models that digital technologies offer differ across sectors. Second, sectors need different types of data for innovation and thus the challenges faced for their exploitation differ. Third, the conditions for digital technology adoption also vary, for instance due to differences in capabilities to uptake those technologies, the pressure from market disruptors, or the level of maturity of sector-specific digital technologies. She also stressed the need to consider the differences among actors within sectors, as not all are equally prepared to reap the benefits offered digital technologies and address the challenges linked to them.

Zoltán Cséfalvay, Ambassador and Permanent Representative of Hungary to the OECD, and author of TECHtonic Shifts, echoed the observations of the fundamental cross-sectoral implications of the digital transformation. From the era of globalisation the world has moved to the digital era, that is bringing **new economic models, new consumption patterns and new employment practices**. He pointed out that the digital age also has allowed innovation to become more widespread, by expanding opportunities for different groups in society to be involved in innovation activities (e.g. enabled by crowdsourcing platforms).

New opportunities for innovation

Frank Nagle, Assistant Professor at the Harvard Business School, pointed to another important new phenomenon of the digital age that foster innovation: **free crowdsourced digital goods** such as knowledge repositories (e.g. Wikipedia), user review sites (e.g. TripAdvisor, Yelp) as well as open source software (OSS) (e.g. Linux). These are enabled by the decline of information and exchange costs, which allow companies to more cheaply engage with external communities (decentralising innovation) and to contribute to crowdsourced digital goods (Figure 7).

Figure 7. Typology of communities



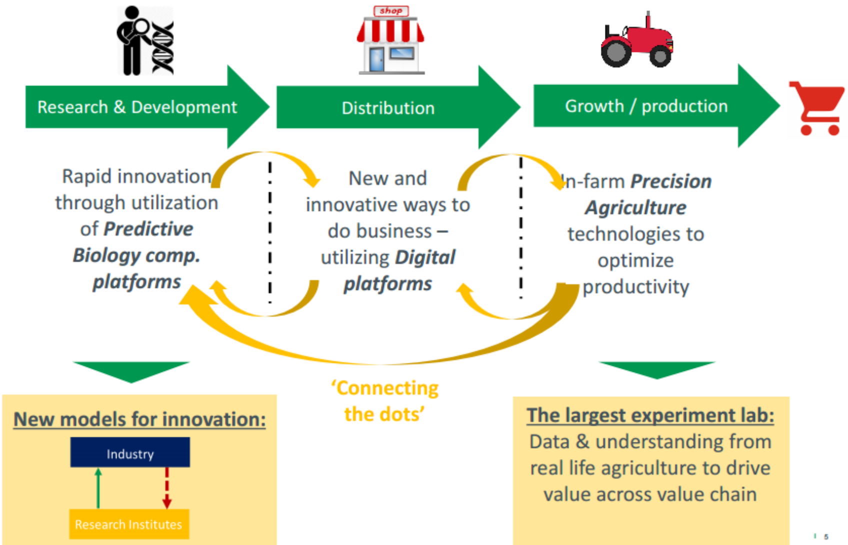
Source: Presentation of Frank Nagle, available here.

He pointed out that **governments can support more of this type of innovation**, providing incentives for firms and individuals who contribute to it and by favouring crowdsourcing in government procurement. This was done by France by implementing procurement policy changes favouring OSS to save money, which also led to other positive outcomes such as an increase in the share of firms using OSS, in IT employment and in the number of IT-related start-ups. The US has also sponsored open source software, which has led to over USD 12 billion of value and 20% of websides using open source codes. Despite these benefits, it is important that governments set regulatory frameworks in order to avoid data monopolies and ensure consumer privacy is preserved.

Ido Dor, from Evogene –an Israeli firm conducting R&D for improving crop quality and productivity through the application of plant genomics– highlighted the **potential of digital technologies at different stages of the agriculture value chain**. His company, for instance, develops novel products for life-science markets through the use of a Computational Predictive Biology (CPB) platform, which integrates various databases (e.g. on plant genes, bacterial genes, chemical compounds) to identify genetic elements for improved seeds, chemical compounds for innovative Ag-chemicals and microbes for novel Ag- Biologicals. Such platform allows for more **rapid R&D and innovation processes**. In addition to benefits at the R&D stage, agriculture is also benefitting from digital transformation at the distribution stage, with innovative ways to do business through digital platforms, and at the production stage, with the development of in-farm precision agriculture that allows optimising productivity. There is potential for innovations also because in the production stage, large volumes of data are being collected (to provide precision agriculture technologies and services), which could then be used along the value chain to drive innovations (Figure 8).

Mr Dor then argued that further efforts are needed in order to “connect the dots”, i.e. **build links between parts of the value chain and innovation cycle**. Three main challenges exist: first, ensuring the integration of different types of data collected; second, having a critical mass of data in order to be able to extract valuable knowledge; and third, addressing the risk of centralised hubs for data that may restrict access and thus limit the potential development of new solutions.

Figure 8. Potential of digital transformation at different stages of the agriculture value chain



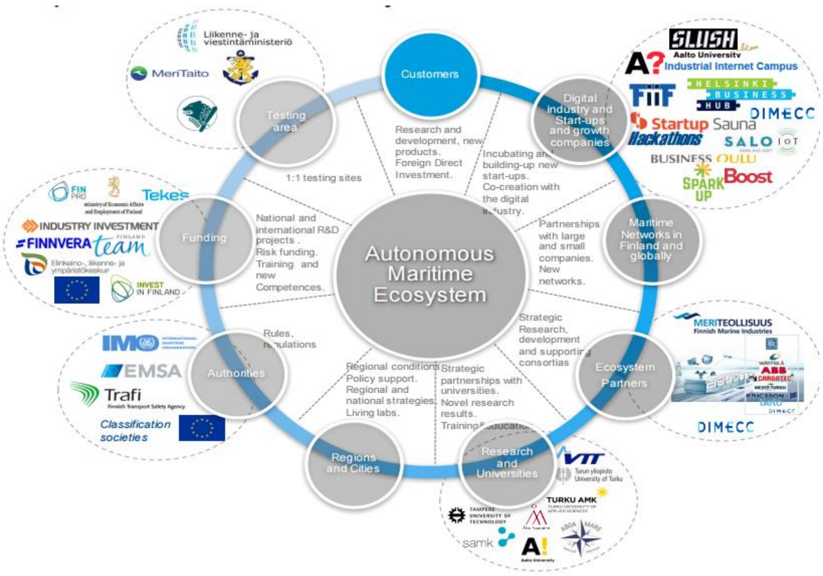
Source: Presentation of Ido Dor, available here.

Sectoral policy approaches in support of digital innovation

Eija Laineenoja, Senior Adviser at Finland's Ministry of Economic Affairs and Employment, focused on governments' role in enhancing opportunities for innovation in specific sectors, building on the National Growth Programme for the Transport Sector recently developed in Finland, which is part of a broader cross-sectoral approach to favour digital innovation. After mentioning the trends and drivers of change in the country (e.g. emergence of disruptive technologies, servitisation, automation, sustainability needs), she referred to **several recent government initiatives** that aim to foster digital innovation in the country, including: the spearhead project on growth environment for digital businesses; the Artificial Intelligence programme; the Platform Economy Roadmap; the Growth Agenda, which identifies actions for economy renewal and high value added business. Taking a sectoral approach, the New Act on Transport Services focuses on generating and disseminating public data (through open APIs), increasing competition and removing barriers for new market entrants.

Disruptive changes are expected in the transport sector, particularly in the areas of software, electric buses, shared services and transport management. To achieve a transport sector that is emissions-free, safe, highly automated, smooth and seamlessly organised, and customer driven, the Finish Transport sector vision 2030 sets a range of areas of action and objectives, such as the need to source and use broad-based high-quality research and innovations, **facilitate testing and piloting of new technologies and services**, and establish a dynamic operating environment for transport sector start-ups. The National Growth Programme for the Transport Sector (2018-2022) identifies 9 themes and more than 30 measures to achieve these objectives, including the **promotion of cities as platforms for pioneer markets** and the **effective use of digital data for transportation**. The development of the strategy followed a systemic approach, involving the different actors in the transport sector innovation ecosystems (e.g. Figure 9).

Figure 9. Autonomous maritime ecosystem

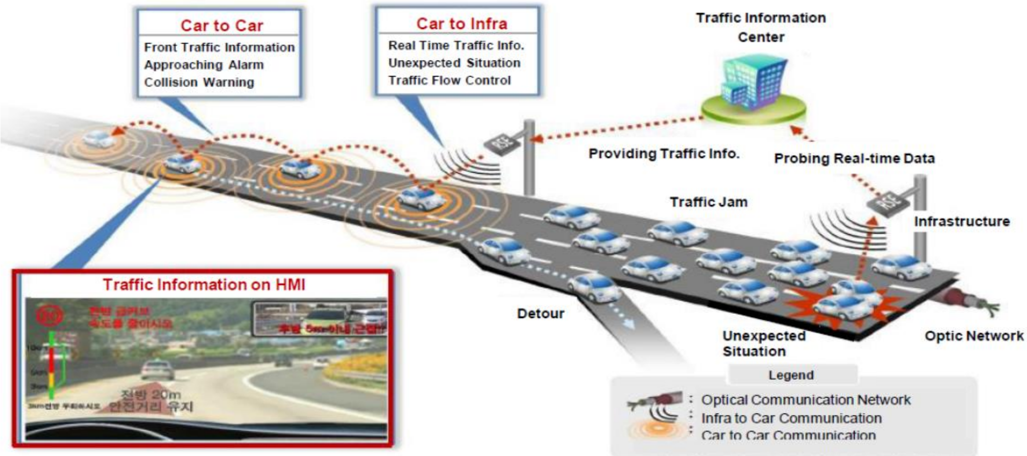


Source: Presentation of Eija Laineenoja, available [here]

Continuing the discussion on the need to take sectoral policy approaches to innovation in some areas, **Young-Jun Moon**, from the Korea Transport Institute (KOTI), presented the characteristics and **trends of digital innovation in Korean transport systems**. Innovations are mainly driven by developments in the field of Artificial Intelligence (AI), vehicle-to-vehicle communication and mobile data.

A recent development has been in the area of **Cooperative Intelligent Transport Systems** (C-ITS) for vehicle-to-everything connectivity (i.e. vehicle-to-vehicle, vehicle-to-infrastructure, vehicle-to-pedestrian, vehicle-to-device) (Figure 10). Over 3000 vehicles have already participated in a pilot project in Korea on a 7km span of a highway. The objective of this project is to reduce congestion, increase safety and promoting sustainability, and their main challenge is making the best use of big data and AI to achieve these objectives.

Figure 10. Cooperative Intelligent Transport Systems pilot project in Korea



Source: Presentation of Young-Jun Moon, available here.

Integrated Smart Mobility is another key area of development, and is based on connected and digitalised travellers: smartphone data are used to optimise on-demand transport services, enabling real time, door-to-door and multimodal transport services that enhance convenience for the user, as well as time and cost savings (Figure 11). Challenges ahead are in the field of big data management, and key questions arise: Who owns the data collected through these systems? How much should users pay to get these services to be affordable?

Figure 11. Integrated smart mobility services based on connected travellers

Source: Presentation of Young-Jun Moon, available here.

Open discussion

During the **open discussion** that followed, three main issues were addressed:

- **The implications of public ownership of data:** there is uncertainty regarding the desirability of public ownership of some types of data. Public ownership would have implications in terms of competition and inclusiveness. Benefits would particularly stem from centralising and integrating large amounts of data, as well in terms of levelling the playing field for different actors using such data for innovation purposes. However, a balance between public and private ownership of data was deemed desirable in order to keep the right incentives for innovation. A question was also raised regarding the potential use of platform economy models for the provision of public services.

- **The ubiquitous nature of digital transformation:** Digitalisation is not only transforming specific sectors that see their end-consumer products being (totally or partly) digitised (e.g. media, music, automotive) but also having effects on innovation in sectors producing physical products (e.g. materials, agriculture, energy). For instance, computer simulations allow modelling and experimenting across all sectors, significantly speeding up innovation cycles.

- **Diverging trends characterising the digital economy:** One the one hand there is trend towards the 'democratization' of innovation, with lower barriers to entry and thus more opportunities for entrepreneurship across individuals, firms and regions; on the other hand, there is a trend towards concentration of innovation, with a few large global leaders driving major innovation. Policies may determine their respective strength.

List of speakers

Zoltán Cséfalvay, Ambassador, Permanent Representative of Hungary to the OECD, and author of TECHtonic Shifts

Jean-Michel Dalle, Managing Director, Agoranov, France

Ido Dor, Executive Vice President and General Manager Ag-Biologicals, Evogene, Israel

Steven Drew, Vice President of Business Development in Europe, InnoCentive

Dominique Guellec, Head of Division, Directorate for Science, Technology and Innovation, OECD

Jonathan Haskel, Professor of Economics at Imperial College Business School, Imperial College London

Eija Laineenoja, Senior Adviser, Ministry of Economic Affairs and Employment, Finland

Peter Leihn, Commercial Director, CSIRO's Data61, Australia

Göran Marklund, Deputy Director General for External Matters, VINNOVA, Sweden, and Chair of the OECD TIP Working Party

Young-Jun Moon, Senior Research Fellow and Chief Director, Department of National Transport Technology R&D, Korea Transport Institute (KOTI)

Michaela Muruianu, Programme Lead – Artificial Intelligence, Digital Catapult, UK

Frank Nagle, Assistant Professor of Strategy, Harvard Business School

Caroline Paunov, Senior Economist, Directorate for Science, Technology and Innovation, OECD

Dirk Pilat, Deputy Director, Directorate for Science, Technology and Innovation, OECD

Sandra Planes-Satorra, Junior Policy Analyst, Directorate for Science, Technology and Innovation, OECD

Claire Stolwijk, Researcher, Strategy and Policy for Innovation, TNO, the Netherlands

The organising team

The workshop was organised and coordinated by Caroline Paunov, Sandra Planes-Satorra, Martin Borowiecki, Diogo Machado, Teru Koide and Ryo Fujishiro.

OECD Digital and Open Innovation project

The digital transformation has changed the way economies work and how innovation is organised. **The OECD project 'Digital and Open Innovation' investigates whether and, if so, how digital transformation changes the rationales for innovation policy and identifies the most appropriate instruments to foster innovation and inclusive and sustainable growth** in the new context. To identify practical policy implications, the project reviews changing business models and new forms of innovation across sectors and different actors, including SMEs, start-ups and research institutions. It also analyses new forms of collaboration in innovation at local, national and global levels.

Find more information about the project at:

www.innovationpolicyplatform.org/TIPDigital

Workshop website:
www.innovationpolicyplatform.org/digitalinnovation

OECD Digital and Open Innovation project:
www.innovationpolicyplatform.org/TIPdigital

OECD Working Party on Innovation and Technology Policy:
www.innovationpolicyplatform.org/cstp/tip

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