

Evolving innovation space

Analysing the changes in the innovation domain to support policy learning

Rapid change in innovation space

The innovation environment is undergoing rapid change. It is characterized by complexity and constant evolution. New innovation systems, ecosystems and consumer innovations have created a broad range of novel opportunities for spillovers. There is an increasing variety of innovations, not only relating to products, services and processes, but also to business models and wider social innovations that are utilized both commercially and non-commercially. Innovation occurs in all economic sectors and can support sustainable development, greater inclusion and green outcomes to limit climate change. In the current COVID-19 pandemic, crisis-driven innovation has been shown to be a powerful instrument of change in many areas.

Analysis of three viewpoints

This policy brief has analysed the change in innovation space from three viewpoints, 1) variety of innovations, 2) variety of actors and activities, as well as 3) innovation diffusion and spillovers. An evaluation of all three viewpoints has shown that the ongoing change is complex, and is caused by huge global and societal challenges. Moreover, the rapid technological development, particularly digitalization, drives this change.

The analysis reveals that the variety of innovations has extended from technological innovations to non-technological ventures, in which the free innovation activities of users and their communities play a remarkable role. The analysis also shows that innovation activities are shifting from the supply side of innovation and now also cover the demand side. This has brought a variety of new actors to the innovation field, such as non-profit organizations, cities and citizens. The free innovation activities of private users are not only a new and promising source of ideas and innovations, but also reveal areas in which the supply side does not meet the needs and expectations of the users. In relation to diffusion, non-commercial mechanisms have taken their position alongside traditional commercialization. From the perspective of policy development, novel approaches are needed to support non-commercial processes.

ELVIS - Evolving innovation space, RDI policies and impact evaluation

Leena Kunttu, Helka Kalliomäki, Johanna Kalliokoski, Jari Kuusisto

University of Vaasa

This research was conducted within the project, *ELVIS - Evolving innovation space, RDI policies and impact evaluation* at the University of Vaasa. The objective of the project is to explore new ways of evaluating the impact of innovation policies and to develop comprehensive approaches and indicators for this purpose. The need for novel evaluation concepts is obvious, due to the fact that the major evolution of policies has not been complemented by novel evaluation approaches. ELVIS produces knowledge, concepts and methods that can be used in the development of Finnish STI policy and in the evaluation of its effectiveness and impact. Certain methods of the project include international comparative research and rigorous case studies. The project will be conducted during the period 2020-2022 and is funded by Business Finland.

Further information:

Jari Kuusisto, Rector, University of Vaasa, tel. +358 29 449 8291, jari.kuusisto (at) univaasa.fi
Leena Kunttu, Project Manager, tel. +358 29 449 8562 leena.kunttu (at) univaasa.fi

Societal demands for innovation policy

Introduction

The world is changing rapidly, and the new innovation space is characterized by complexity and constant evolution (Kunttu *et al.*, 2021). A diverse range of societal challenges, including climate change, demographic pressures, urban congestion, social and economic inequality, conflicts and the current COVID-19 pandemic have set new demands for innovation policy. At the same time, huge global challenges have been associated with the UN's Sustainable Development Goals (SDGs), which aim to end poverty and other deprivations, and go hand-in-hand with strategies that improve health and education, reduce inequality and spur economic growth. In addition, topics related to green growth and eco-innovation in all economic sectors, as well as links between sectors and actors have brought new challenges to innovation policy work (Gault, 2020, p. 89). While the environment is changing in response to human activity, the economy is also changing as it becomes progressively more digital. The digital economy is changing the way innovation takes place and has also brought completely different types of innovations, activities and actors. For example, zero-priced products and services require new types of thinking for policy interventions.

Evolving innovation space in the Oslo Manual

To understand the challenges and changes that form the basis of the transformation of innovation policies, it is necessary to examine how the innovation space has evolved. One way to do so is to study the Oslo Manual published by the OECD. The Oslo Manual is based on the experience gained from collecting and analysing innovation data in both OECD and EU countries, as well as non-member economies (OECD and Eurostat, 2018). Thus, the purpose of the Oslo Manual is to support the collection of representative and internationally comparable data on innovation within the business sector. The manual also provides internationally-accepted definitions of innovation and its related concepts. The first edition of the Oslo Manual appeared in 1992, followed by editions in 1998, 2005 and most recently in 2018 (see Figure 1). During its three decades of development, the Oslo Manual has become an international standard, applicable worldwide (Gault, 2020).

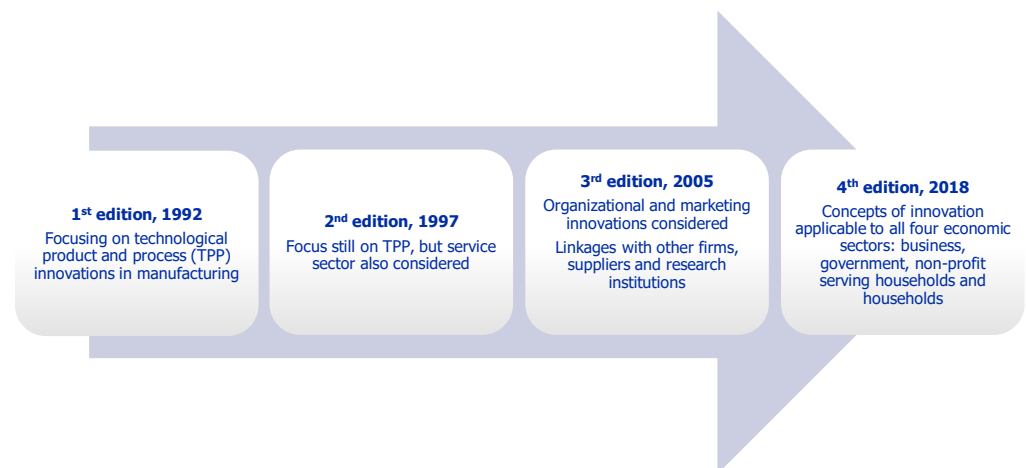


Figure 1. Key characteristics of the four editions of the Oslo Manual.

A general definition of innovation, applicable to all sectors of the economy, is introduced in the fourth edition of the Oslo Manual (2018), which aims to expand the domain innovations to all economic sectors, not just industry and business (Gault, 2019). Consequently, a variety of innovations have evolved from the domain of

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technology, covering a wide range of innovation types across a number of sectors, including business, government, non-profit and households. In the same way, a variety of actors and activities have evolved, which are not only related to the supply side, but also the demand side of innovation, where customer organizations and private consumers play a central role. Digitalization enables collaborative learning and the co-creation of new, innovative solutions in users' informal communities. The activity on the demand side may also indicate that there are areas on the supply side that cannot meet users' needs. This means that non-commercial mechanisms have taken on an increasing role in parallel with the traditional commercial approaches in innovation diffusion, which is also important from a sustainability point of view.

Alongside the Oslo Manual, there are several ongoing processes which measure innovation worldwide. For example, the *Maastricht Manual* measures eco-innovation and supports international analyses and comparisons, as countries rapidly move towards green economies. In the context of public sector innovation, the same kind of work has been started in the *Copenhagen Manual*.

Research approach

When improving our understanding of the evolution of innovation space, we used a framework consisting of three separate but somewhat overlapping dimensions:

1. to monitor the increase in the **variety of innovations** in subfields including products, services, processes and marketing
2. to consider the increase in the **variety of innovation actors and activities**, including government, industry, academia and non-profit organizations
3. to evaluate **innovation diffusion and spillovers** taking place in various ways: commercial, entrepreneurial, sharing and others

Table 1 Summary of the key observations in three dimensions

	<i>Narrow understanding</i>	<i>Broad understanding</i>
<i>Variety of innovations</i>	TPP innovations that have been gradually extended to the innovation categories and are related to, e.g., services and marketing	In addition to TPP, non-technological innovations are also considered, including social, institutional, open and user innovation
<i>Innovation actors and activities</i>	Focus on the <i>supply side</i> of the innovation process, driven by scientific and industrial advances. Key actors in the process belong to the "triple helix" consisting of academia, industry and government	The focus is extended to the <i>demand side</i> , consisting of a variety of actors ranging from entrepreneurs and non-profit organizations to cities and users
<i>Innovation diffusion and spillovers</i>	Commercialization process for the supply side innovations	On the demand-side, commercial and non-commercial mechanisms are based on users' desire to learn, share and support one other

Results

Increasing the variety of innovations

Extending the variety of innovations to the non-technological side

In the traditional, narrow view, innovations have been viewed as technological product and process (TPP) innovations. In the early editions of the Oslo Manual, the concept of TPP was closely linked to the manufacturing industry. Over the last few decades, the variety of technological innovations has been gradually extended within the innovation categories related to services and marketing. In addition to these extensions, a broader understanding of innovation, also favoured by the fourth edition of the Oslo Manual, considers the non-technological innovation modes that do not necessarily have direct links to technology. The variety of non-technological innovations include *social innovations* (Moulaert *et al.*, 2005), *institutional innovations* (Hargrave and Van de Ven, 2006), *open innovations* (Chesbrough, 2003) and *user innovations* (Von Hippel, 2017).

Open networks of developers and users

The social innovation concept has been used in topics that include collaborative innovation in public and business services, social entrepreneurship, open-source innovation and stakeholder involvement in many different contexts (Moulaert *et al.*, 2005). A central element in social innovation is the interaction between people and their organization in communities. Open and innovative networks of developers and users are informal communities in which new types of innovations are born (Von Hippel, 2017). Internet-based platforms provide a focus for online communities of users, which increasingly co-produce products and services, either independently of or in collaboration with firms. Their motivation and aims not only include financial gains (as in the case of firms), but the desire to learn and contribute, often freely, to a certain community or cause. An example of this kind of online community is Github, in which individual developers of open-source software freely share their code with other developers.

Innovation in the digital economy

The digital economy has implications for both innovation measurement and innovation policy. Within the digital economy, innovation is increasingly data-based and it mainly focuses on services (Planes-Satorra and Paunov, 2019). Innovation cycles are also accelerating and are more collaborative, which reflects the complexity and multidisciplinary nature of the innovation activities (Gault, 2020, p. 62, 96). With the growth of the digital economy, users are being offered new or improved products such as apps, software, cloud storage, hubs or social media, typically at a low price or free of charge. These products establish a link between the producer and the user, which allows the use of the product to be monitored and the data collected to be used for various purposes. This is enabled by artificial intelligence (AI). The zero-priced innovations have policy implications related to the way in which producers and users interact. On the other hand, while the zero-priced products are increasingly shaping the way people think, work and interact with society, they are also raising questions relating to the privacy, confidentiality and security of the data being used. Moreover, the products and services that are provided to users at zero cost do not appear in official innovation statistics, rendering them difficult to measure (Gault 2020, p. 62). This should be considered in policy learning.

Increasing the variety of innovation activities and actors

Narrow and broad understanding of

The variety of innovation actors and activities can be understood in a narrow or broad manner (see table 1). The narrow understanding relates to the mainstream of the earlier editions of the Oslo Manual, whereas the development has gradually proceeded towards a wider understanding in the newer editions. The narrow understanding considers innovation as the “commercialization of science” in which

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innovation actors and activities

academia and industry are the key players (Diercks, Larsen and Steward, 2019, p. 890). Within the narrow understanding, innovation activities clearly focus on the supply side of the innovation process.

Demand side actors as innovators

In contrast to the narrow view, the broad understanding considers not only the supply side of innovation, but also the demand side of the innovation process. The broad understanding involves the consumers, users and other target groups of collaborative networks (Diercks, Larsen and Steward, 2019). This is emphasized in the fourth edition of Oslo Manual. The innovation networks may include a wide variety of actors, such as entrepreneurs, non-profit organizations, cities, users and private citizens. The linkages between the actors can constitute feedback loops that interact with one another, as well as the actors, meaning that innovation takes place within multi-connected complex systems, which may be a challenge from a policy perspective (Gault, 2020, p. 4).

In the process of democratizing innovation (Von Hippel, 2005), non-traditional actors, such as dispersed individual users and online communities, play an increasing role. These users often operate at grassroots level in a bottom-up manner and may share their innovative products free of charge, without any intellectual property rights or financial procedures (Von Hippel, 2017). This challenges the traditional producer-centred innovation and opens up new avenues for widespread innovation. The key drivers for user-centred innovation are curiosity and the willingness to learn and share, rather than financial gain, making individual efforts and products difficult to measure in financial terms. This may be problematic from the viewpoint of statistics serving innovation policy learning (Gault, 2020). Moreover, activities on the demand side may also indicate that there are areas on the supply side that cannot meet users' needs. This is a potential topic for further research.

Innovation diffusion and spillovers

Commercial and non-commercial mechanisms for innovation diffusion

The diffusion of individual consumers' "free innovations" is often a bottleneck. Individual users often lack the incentive or the means to commercialize their products and services, which reduces their value. Establishing ways of collaborating with producers and firms can address these challenges and has the potential to lead to both increased producer profits and a higher social value (Von Hippel, 2017). Gault (2020, p. 66) lists three potential channels by which to bring a user-based innovation to market: 1) providing a prototype or the necessary knowledge to a producing firm; 2) starting a business, so as to provide the product or 3) making the product freely available for potential users as a peer group or community. The first two can be found in official innovation statistics, but not the third. Support for these channels should be given careful consideration by policy makers.

Crisis-driven innovation can lead to accelerated diffusion

Innovation can also support governments in terms of addressing societal challenges, using tools such as co-creation or citizen engagement (Arundel, Bloch and Ferguson, 2019; Dan, 2021). An unfortunate event can lead to new discoveries and new ways of behaviour or organization when responding to new, challenging situations. For example, the trend of "working from anywhere" during the COVID-19 pandemic changed the innovation processes. The opportunity for stakeholders to participate equally in innovation processes, irrespective of their geographic location has boosted networked innovation and also introduced new ways of collaboration. In a crisis, the diffusion and adoption of innovation occurs out of necessity. To the extent that regulatory, legal and ethical challenges are addressed, crises can lead to an accelerated diffusion of solutions to various societal challenges (Bessant, Rush and Trifilova, 2015).

Challenges for innovation policy

Evolving innovation space and the challenges addressed by the three viewpoints used in this policy brief (variety of innovations, variety of innovation actors and activities, as well as innovation diffusion and spillovers) pose many kinds of difficulties for innovation policy development. To generate debate and reflection, we discuss the following challenges:

Challenge 1 – The rapid change in innovation space, caused by new global and societal challenges. Currently, innovation occurs across all economic sectors and can support sustainable development, greater inclusion and green outcomes to limit climate change. Sustainable development goals and increasing pressure to foster eco-innovation and inclusive green growth have necessitated a re-consideration of the instruments of policy working and learning.

Challenge 2 – Increasing variety of innovations. The variety of innovations has been extended from technological innovations to non-technological innovations, including social, institutional, open and user innovations. The role of users as active innovation players is increasing, and linkages between them and the service providers in the digital economy are taking new forms. These new innovation models are difficult to measure and are analysed using traditional economic measures. From a policy perspective, it is essential to understand the meaning of new innovation models in relation to the economy and to develop valid instruments to support it.

Challenge 3 – Increasing variety of innovation actors and activities. Innovation has shifted from the supply side and now also covers the demand side, where diffusion and the end use of innovation are considered. The demand side consists of a variety of actors, ranging from entrepreneurs and non-profit organizations to cities and private consumers. A central challenge is to develop policy tools that involve the demand side actors and understand the linkages between producers and users. In addition, the activity of the demand side may also indicate that there are areas on the supply side that cannot meet users' needs. Thus, there are challenges in terms of fostering a closer interaction between the supply and demand sides.

Challenge 4 - Innovation diffusion and spillovers. The evolving innovation space, consisting of a variety of innovations, actors and activities, facilitates new ways of diffusing innovation, which includes both commercial and non-commercial avenues. Individual users or users' communities often lack the incentive or the means to commercialize their products and services, thereby reducing their value. Therefore, policy development should consider how policies can support the non-commercial diffusion of new innovations.

Proposals for action

Based on the challenges identified, which innovation policies are facing, the following proposals for action have been identified:

Proposed action 1 – Active information collection and knowledge assimilation from the global innovation space to be used in Finnish policy development. OECD activities in the development of innovation measurement, statistics and analysis are an important source of information, and the OECD Oslo Manual development provides an essential opportunity for participation, however, this is not the only study. For example, the *Maastricht Manual* project measures eco-innovation to support international analyses and comparisons, as countries rapidly

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move towards green economies. In the context of public sector innovation, the same kind of work has been started in the *Copenhagen Manual* project. From the viewpoint of global inclusion, the processes supporting the achievement of UN Sustainable Development Goals by 2030 are essential. New information from the manuals needs to be processed, in order that this can be utilized and distributed to relevant policy areas. However, to enable real-time analysis and forecasting, the newest research-based knowledge should be analysed closely by both policy makers and researchers. In this respect, different scientific and practical forums, including conferences, are essential.

Proposed action 2 – Policy work supporting new innovation models. The traditional policy instruments focus mainly on technological innovations. Whereas they still play a significant role in the innovation environment, their field is also undergoing change. Digitalization and the digital economy have brought about new, mainly service-oriented innovation models, in which producers and users (or customer firms in a B2B context) form links and networks and data are essential assets. Understanding the value and logic of these, the number of digitalization-based innovation models should be increased, so as to develop new kinds of supporting policy instruments, specifically for the Finnish context. In the same manner, policy learning should target the expanding field of non-technological innovations, including social, institutional and user innovations. For example, social entrepreneurship and communities of users, which develop new innovations on a voluntary basis, are areas of great societal value, but are still much ignored in terms of policy work. Consideration should be given as to how policy actions can cover fields of innovations that cannot be measured by traditional economic measures.

Proposed action 3 – Policy implications related to new innovation actors and activities. Whereas the majority of the innovation policy work has traditionally focused on the supply side of innovation, the need to understand the demand side is becoming increasingly significant. From a policy perspective, this may mean moving away from the traditional triple helix model, and involving new kinds of demand side actors, such as entrepreneurs, non-profit organizations, cities and citizens, as well as users of innovation networks. Besides these new kinds of innovation networks, it is essential to recognize the financial potential of users' and communities' free innovation work and to find ways of fostering entrepreneurship among them. Policy work should recognize these new actors and should find instruments to support their activities at the policy interfaces of various sectors.

Proposed action 4 – Supporting the non-commercial diffusion of new innovations. As the current policy instruments focus on the commercialization of new inventions and innovations, they do not directly adapt to non-commercial diffusion. Policy work should, therefore, consider which kinds of policy activities could support the diffusion of the results of free innovation activities, developed by individual users and user communities. For example, supporting the micro-entrepreneurship of users, providing support for prototype development and making company contacts or facilitating the development of shared digital platforms for companies and users could be potential policy tools in this context. Furthermore, questions of diffusion increasingly relate to systemic changes in societal structures, that necessitate the rethinking of policies for innovation diffusion to achieve a comprehensive societal transformation.

Conclusion

To understand the challenges and changes that form the basis of the transformation of innovation policies, it is necessary to examine the way in which the innovation space is changing. This policy brief has analysed the change in innovation space from three viewpoints: the variety of innovations, the variety of actors and activities, as well as innovation diffusion and spillovers. An evaluation of all three viewpoints revealed that a remarkable change is occurring, which is rapid and complex in nature. This change is caused by huge global and societal challenges, as well as rapid technological development, particularly digitalization. For this reason, it is necessary to form an up-to-date understanding of the development. The variety of innovations has been extended from technological innovations to non-technological innovations, in which the users' and their communities' free innovation activities play a remarkable role. Developing the new ways of diffusion is essential from both a commercial and a non-commercial perspective.

The users' free innovation activities are a new and promising source of ideas and innovations. In the case of companies, it would be beneficial to get closer to the users, e.g., by actively taking part in the communities' interaction. The companies can also establish their own communities for the users of their products, which lowers the barrier between producers and users and fosters new, innovative ideas that can be commercialized by the companies. This enables more sustainable innovation processes, whereby new products and services are developed to meet the real needs of users. On the other hand, it is usual that users and their communities lack the incentive or the means to commercialize their products and services. Companies could help in this regard by providing avenues for easy commercialization of user innovations. Moreover, governments and public sector policy makers should recognize these new actors and find instruments to support their activities, so as to foster entrepreneurship among them.

Contact information:

Leena Kunttu, leena.kunttu@uwasa.fi

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