From national innovation system to "public sphere for innovation":

Mission-oriented innovation policy and the changing institutional configuration[1]

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January, 2024

[1] Although the author is fully responsible for this study, he highly appreciates the helpful comments by Kari Lilja (Aalto University) and the participants of the workshop for this publication, as well as the interviewees for sharing their views and helping me understand the situations. This study is supported by JSPS KAKENHI grant number 19K01650.

Abstract

As one of the possible solutions to the current socio-economic problems, including secular stagnation and growing inequality, mainly due to neoliberal financialization, a number of novel approaches to innovation policy have been proposed and adopted by advanced countries that seek to foster innovation to stimulate productive investment and solve major societal challenges, such as health and environmental crises. This type of policy approach is often referred to as "mission-oriented innovation policy" (MOIP) because it encourages governments to play an active, "entrepreneurial" role by setting up various missions and investing resources to steer private sector innovation in particular directions. While MOIP may well be an appropriate approach for the current historical stage of techno-economic as well as capitalist development, as several neo-Schumpeterian and institutional economists have persuasively argued, proponents of MOIP overestimate the policy capacity of governments to steer innovation in particular directions. They also fail to consider how governments can influence the direction and depth of interactions among different actors because, as evolutionary economists have emphasized, innovation is inevitably the evolutionary process of interactive learning among actors. Moreover, they do not consider the risk of MOIP turning into an unproductive rent-seeking opportunity. While the National System of Innovation (NSI) is a relevant approach in that it shows how institutionalized interactive learning contributes to innovation, it has a theoretical flaw in that it does not specify the endogenous mechanisms that enable or limit interactive learning. In this context, this chapter explores the institutional underpinnings of MOIP through the cases of MOIP implementation in Finland, where innovations in specific fields that solve societal problems faced by cities are promoted by creating institutional conditions ("platforms") that enable private companies to develop and demonstrate their products in public facilities and infrastructure and to receive useful feedback on their innovations. Based on the analysis of the cases, it is argued that instead of the NSI concept, an alternative concept, "public sphere for innovation", is introduced as a more appropriate one to explicitly capture the institutional context of the evolutionary processes of MOIP, which includes dissonance, conflict, dialogue, and openness. Furthermore, it is argued that the public sphere for innovation is based on some of the core institutional features of the Nordic model.

1. Introduction

For developed countries as welfare states, in order to secure the financial resources to maintain social services - such as income tax, value-added tax, and corporate tax - it is necessary to maintain a high employment rate by increasing employment in some industries to compensate for the decline in employment in others, while also maintaining a certain number of high value-added industries. In addition, as emerging economies become more competitive with developed economies, it is increasingly necessary for products and industries in developed economies to be differentiated from those in emerging economies. Furthermore, developed countries generally face problems related to socio-economic sustainability, such as long-term economic stagnation and widening income inequality. Faced with these significant challenges, developed countries are trying to promote investment in innovation to address various social problems, such as high environmental impact and inadequate healthcare infrastructure - an issue on which it is easy to build social consensus about its importance - while pursuing industrial restructuring and job creation.

The novel innovation policies proposed by Perez (2016), Mazzucato (2021), and others aim to achieve an inclusive and resource-conserving economy by encouraging investment in innovation to solve social problems, on the one hand, and to transform the industrial structure and create jobs, on the other. These policies are often referred to as "mission-oriented innovation policies" (MOIP), in the sense of policies that encourage innovation to solve social problems (Mazzucato, 2018b). Others refer to the same type of policy as a “transformative innovation policy,” emphasizing the aspect of promoting innovations that enable transitions to socioeconomic systems that dramatically reduce environmental impacts (Boon *et al.*, 2022; Schot and Steinmueller, 2018). The MOIP is also embodied in the *European Green Deal* and the EU Research and Innovation Program *Horizon Europe*; it has also been implemented in Japan as the Cabinet Office's *Moonshot R&D Program*. Furthermore, the Interim Report issued in June 2022 by the Subcommittee for New Economic and Industrial Policy — as organized under the Industrial Structure Council of the Ministry of Economy, Trade and Industry (METI) — identified six “missions” that refer to “economic and social problems to be solved by the country and the world as a whole,” for which “large-scale, long-term and systematic support and other policies will be mobilized,” and where “mission-oriented industrial policy” was proposed as one of the pillars of the new industrial policy.[2]

A striking feature of the MOIP is that it envisages a more active role for the

[2] https://www.meti.go.jp/press/2022/06/20220613006/20220613006.html (accessed 15 May 2023)

government than is typically the case with conventional approaches to innovation policy, such as providing incentives to firms and investing public funds in research and development (R&D). For example, Mazzucato (2016) sees the government's role in MOIP as *creating markets* rather than merely correcting *market failures*,[3] since there is no market for the innovative products that MOIP seeks to create in the first place, and creating such a market is inevitably fraught with great uncertainty. Mazzucato (2013) introduces the concept of the "entrepreneurial state" and provides compelling evidence that governments, primarily the US government, have created large markets by investing public funds and taking risks, citing innovations like ICT and pharmaceuticals that have had significant social and economic impacts.

One problem with recent innovation policy arguments, including the MOIP is that they may overestimate the capacity of government to steer innovation. As such, active policy intervention — as in the case of MOIP — requires significant *policy capacity* (Mazzucato, 2013; Mazzucato, 2018a; Kattel and Mazzucato, 2018; Karo and Kattel, 2018; Kattel *et al*., 2022), making the risks of "government failure," a traditional criticism of industrial policy, unavoidable (Becker, 1985; Krueger, 1974; Krueger and Tuncer, 1982). In particular, since it is difficult to solve wicked social problems, such as those targeted by the MOIP, by technological means alone, the problem of overestimating the government's ability to manipulate the target is even greater. The fact that the MOIP concept was inspired by some of the major technological development projects of the postwar United States (Mazzucato, 2021), as suggested by the name "moonshot" given to an innovation policy in Japan, may also contribute to an overestimation of government capacity. However, because the Apollo program was primarily a technological endeavor, Storper *et al*. (2022) argue persuasively that it cannot serve as a model for MOIP aimed at solving complicated societal problems.

Based on Evans' (1995) argument that the capacity of governments also depends on how they are embedded in social relations, it is necessary to look beyond the "government or market" framework and focus on the institutional underpinnings of MOIP. Furthermore, in an environment where rationality cannot be overestimated, "(t)he design of a good policy is, to a considerable extent, the design of an

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[3] Because situations in which markets for such innovative products are not created solely through private sector efforts are considered a class of market failures (Foray 2019), it is not appropriate to think of "correcting market failures" and "creating markets" as different roles for government. Weber and Rohracher (2012), on the other hand, refer to the failure to innovate with transformative effects on society as a "transformational failure," which is distinct from a market failure, and argue that active policy intervention can be justified because of this distinct failure, as in the case of MOIP. However, since it is also possible to understand transformational failures as a class of market failures, this argument is not convincing enough to justify MOIP.

organizational structure capable of learning and of adjusting behavior in response to what is learned" (Nelson and Winter, 1982, p. 384). If we can interpret "organizational structure" here as including "institution," then it must be a central issue to focus on the institutional foundations of MOIP.

This study examines the institutional foundations of MOIP using the case of MOIP in Finland. Finland is an appropriate case to explore the institutional conditions necessary for MOIP because it was one of the first countries in the EU to apply policy instruments such as "demand-driven innovation policy" and "public procurement of innovation," which constitute MOIP (Tokumaru, 2022). In addition, the Nordic countries have activated organizations other than the central government and private firms, such as local governments and third sector organizations, which Myrdal (1960, p.47) referred to as "infrastructure," which may be advantageous in generating innovations to solve social problems. Furthermore, in questioning the sustainability of the 'Nordic model', which has been relatively successful in balancing economic outcomes and well-being, at least until the financial crisis (Thelen, 2014), it is important to examine how the Nordic model enables MOIP. The remainder of this study is organized as follows: Section 2 introduces MOIP in the context of industrial and innovation policy, long-term techno-economic development, and institutionalist innovation studies in neo-Schumpeterian research traditions. After narrowing the focus by examining the context of the case study, Section 3 presents the analytical framework. Section 4 analyzes the recent case of MOIP implementation in Finland and highlights its characteristics through a brief comparison with a Japanese case. Section 5 presents the concept of a “public sphere for innovation,” as distinct from innovation systems, as the institutional basis of MOIP. It then examines how the institutional features of the Nordic model can strengthen the public sphere for innovation.

2. Contextualizing MOIP

In the aftermath of the global financial crisis, many socio-economic reform proposals have been discussed that aim to promote innovation while achieving a stable, sustainable and equitable economy. In particular, there is a renewed interest in industrial policy in this context, given the strong criticisms that have been raised since the 1970s on the grounds that such policies can be a breeding ground for rent-seeking and that the government has no ability to select specific industries or firms for preferential treatment, making "government failure" inevitable (Becker, 1985; Krueger, 1985; Krueger and Tuncer, 1982). As will be discussed in more detail below, this growing interest in industrial policy has been extended in two directions, the first concerning

policy proposals leaning towards a "learning society" or a "learning economy", while the second concerns MOIP.

2.1 The "revival" of industrial policy and the *learning economy* thesis

In response to the critique of industrial policy, developed countries have eschewed "vertical" policies that promote specific industries through subsidies and other means in favor of ostensibly "horizontal" policies that aim to strengthen the general industrial base through regulatory reform, entrepreneurship promotion, and R&D infrastructure development (Aghion et al., 2021; Criscuolo et al., 2022; Warwick, 2013). In the case of the United States in particular, the term "industrial policy" itself has been thoroughly avoided, often replaced by the term "R&D policy" (Wade, 2012; Wade, 2017), which is often strongly associated with specific sectors such as defense and health care. Apart from the above superficial tendency to avoid industrial policy, especially vertical policy, there has been a consistent and strong pursuit of de facto industrial policy, which increasingly takes the form of environmental policy (e.g., Aigenger and Rodrik, 2020; Rodrik, 2014; Szalavetz, 2015). A typical example of the former is the case of the United States, where ICT-related industries have been promoted as part of its defense policy (Block and Keller, 2009; Keller et al., 2022; Mazzucato, 2013; Schrank and Whitford, 2009; Wade, 2012; Wade, 2017; Weiss, 2014). The European Green Deal, launched in 2019, also aims to leverage responses to environmental problems to promote environment-related industries, and is a prime example of the latter (Pianta and Lucchese, 2020; Pianta et al., 2020; Pichler et al., 2021). Moreover, as Stiglitz and Greenwald (2014) emphasize, all rules and regulations have specific impacts on different industries, so governments can always be seen to be involved in industrial policy, despite their intentions.[4] From this perspective, the question is *not* whether industrial policy should be implemented, *but* how it should be implemented[5] (Chang and Andreoni, 2020; Rodrik, 2009; Stiglitz and Greenwald, 2014).

It is in this context that policy proposals for a "learning society" or "learning economy" have been actively argued. These arguments, which emphasize the

[4] Here, Stiglitz and Greenwald (2014) cite an example in which a law giving derivative financial instruments (derivatives) preferential residual property rights in the event of corporate bankruptcy is, in effect, an industrial policy which encourages the use of derivatives.

[5] Agency theory is not a relevant framework for designing industrial policy as long as governments do not know the *optimal* incentives for firms (Rodrik 2004; 2014). In this context, governments need to communicate intensively with actors such as firms and industry associations in order to design sound policies (Evans 1995). The question is how to build such deep relationships while maintaining administrative independence.

importance of building a social infrastructure that enables organizations and individuals to learn to adapt to changes in the environment, follow the "horizontal policies" mentioned above in the sense that they do not intend to promote *specific* industries or technological fields; instead, the scope of the policy measures covered is much broader than that of traditional industrial policies. Stiglitz and Greenwald (2014), for example, argue for industrial, trade, monetary, macroeconomic, financial, and intellectual property policies as enablers of learning. In particular, they emphasize the productive role of social policies in promoting learning and risk-taking by reducing the risks associated with economic change. Similarly, Lundvall (2002; 2016), who characterizes the modern economy as a "learning economy" in which it is more important to constantly update outdated knowledge through learning in order to adapt quickly to new situations and create innovations than to simply possess certain knowledge, as emphasized by the "knowledge-based economy" thesis, argues that investments in areas other than R&D, such as the labor market, education, and training systems, are also important for enhancing society's capacity to learn.

Thus, Lundvall's thesis on the learning economy is unique in that it incorporates the concept of *social investment*, which seeks to improve social and economic outcomes through social spending that gives individuals the capacity to respond to social risks (Crouch, 2013, Chapter 5; Hemerijck, 2017; Morel et al., 2012), as an institutional basis for enhancing the capacity to learn through workplace and inter-organizational interactions, which are important sources of learning (Lundvall and Lorenz, 2012). Indeed, Lundvall and Lorenz (2012) empirically demonstrate that Nordic countries with high levels of social investment have been successful in maintaining a high capacity for learning at the workplace level, and that the Nordic welfare state is highly valued in this context as a socio-economic system that supports a learning economy.[6]

2.2 The historical background of MOIP

MOIP is another policy proposal that has been actively introduced and argued in this context, and is the focus of this study. As discussed in the previous section, MOIP proposals have argued for policies to steer innovation and investment in certain directions in order to achieve inclusive and resource-efficient economic growth. One of the main perceptions underlying these policy arguments is that, in modern industrialized countries,

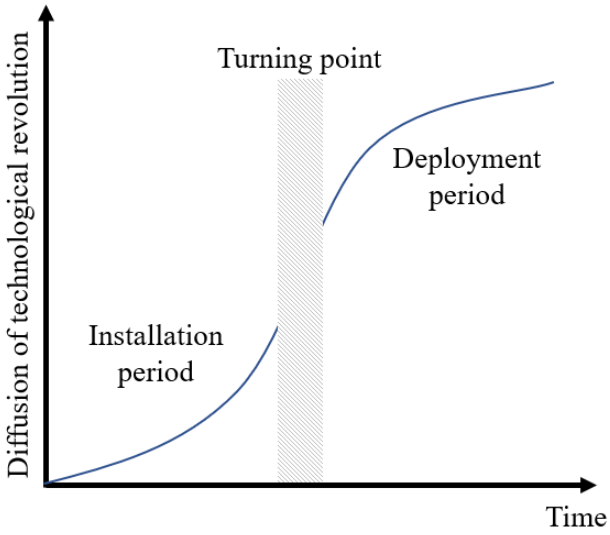
[6] However, it should also be noted that there are deep-rooted criticisms of social investment strategies (e.g., Hemerijck, 2017), including the criticism that social investment strategies may increase rather than decrease the opportunity gap that exists between individuals.

unproductive rent-seeking is becoming more widespread without investment being directed in productive directions. Economic instability and significant income inequality are serious consequences of this (Christophers, 2020; Lazonick and Shin, 2020; Mazzucato, 2018). In this context, it is hoped that the solution of social problems can be combined with the transformation of industrial structures and job creation, as proposed by Perez (2016), Mazzucato (2021), and others, by encouraging investment in innovation to solve various social problems, such as high environmental burdens and inadequate healthcare infrastructure, where it tends to be relatively easy to build social consensus on the importance of the problem.[7]

Drawing on Kondratiev's and Schumpeter's long-wave theory of the business cycle, several neo-Schumpeterian arguments highlight the constructive role that governments can play at certain turning points in the long-term dynamics resulting from the creation and diffusion of breakthrough technologies (Hirooka, 2006; Freeman and Perez, 1988; Freeman and Louça, 2001; Perez, 1983; Perez, 2002; Tylecote, 1992). For example, Perez (2002) argued that the social and economic effects of a breakthrough technology diffuse very slowly and take a long time to manifest. The diffusion curve is S-shaped with discontinuities (Figure 1), a pattern that has been observed four times since the 18th century.

Figure 1: Diffusion trajectory of technological revolution

[7] Although not necessarily explicitly linked, these new industrial policies can be seen precisely as a contemporary version of Keynes's "socialization of investment" (Crotty, 2019), as they focus on inducing private firms to innovate and invest, partly through strategic investments by governments in specific directions. Indeed, Mazzucato (2018), one of the main proponents of MOIP, explores the critical implications of the concept of rent in classical political economy and positions MOIP as a contemporary measure to curb rent-seeking activities and revive productive investment.



(Source: Created by the author based on Perez, 2002)

This neo-Schumpeterian line of reasoning is useful for placing the MOIP in the current historical context. Five major technological revolutions have occurred, as shown in Table 1, with a related set of technologies diffusing and impacting society in each prolonged wave (Freeman and Perez, 1988; Perez, 1983; Perez, 2002).[8] According to Perez (2002), as shown in Figure 2 below, the past five technological revolutions have produced explosive technological developments during the "installation period" by attracting huge amounts of money, resulting in asset bubbles with high expectations for canals and railroads in the past and the Internet in the recent past. There comes a " turning point " when the bubble bursts, ending the installation period, and substantial institutional reforms become necessary to address the problems of inequality and instability created by the finance-driven economy of the time, which encouraged investment by private firms and benefited society as a whole. A typical example is the New Deal that followed the Great Depression of 1929. Such institutional renewal brought about the "deployment period" that followed the turning point. Governments play a major role in moving societies into the deployment phase by leading major institutional reforms by "tilting the playing field" in favor of investment in certain directions for firms and individuals (Perez 2016). This also means that it is not enough for a government to simply implement

[8] The idea that some technologies have particularly large economic and social impacts is not unique to neo-Schumpeterians, as it is also well known in economic growth theory, along with the concept of "general purpose technologies" (GPTs). Lipsey, Carlaw, and Bekar (2005), for example, identify 24 GPTs in their comprehensive analysis that have many applications and significant spillover effects. Three categories are used to categorize GPTs: organizational, process, and product technologies.

conventional policies to promote R&D and human resource development during the turning point and deployment period.

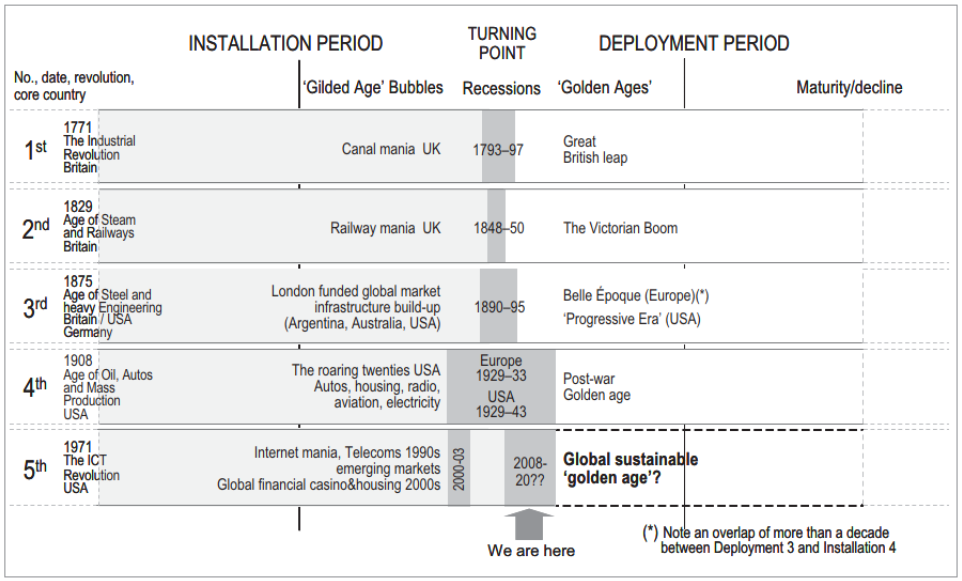
In light of this, MOIP can be considered an appropriate measure to the extent that the current period can be understood as a turning point. In fact, Perez (2016) recognizes that the IT bubble and the global financial crisis of the early 21st century are typical crises that characterize the end of the installation period of breakthrough technologies, that is, ICT in the current case. Thus, the task at hand is to fundamentally reform the relevant institutions to adapt to the deployment period and set the direction for the deployment of breakthrough technologies. In this context, MOIP has recently been proposed as a policy measure with significant societal impacts, along with financial regulation, corporate governance reforms to correct the shareholder value orientation, and measures to correct income inequality (Perez, 2009; Mazzucato and Perez, 2015; Perez, 2016). Perez and Leach (2022) proposed relevant policies very similar to the MOIP, which aim to deploy a set of breakthrough technologies, such as ICT and materials, in an environmentally friendly direction to achieve inclusive and sustainable growth. This concept is also very akin to the German "Green Industrial Revolution" thesis in that they also aim to achieve both economic outcomes, such as job creation, and social benefits, such as the creation of better governance methods through resource- and energy-saving economic growth (Jänicke *et al*., 2012).

Table 1: Five Technological Revolutions

	Year	Name for the period	Initial point of revolutions	Core country
First	1771	The “Industrial Revolution”	Arcwritht’s mill	Britain
Second	1829	Age of steam and railways	Steam engine for the Liverpool-Manchester railway	Britain
Third	1875	Age of steel, electricity, and heavy engineering	The Carnegie Bessemer steel plant	USA and Germany
Fourth	1908	Age of oil, automobile, and mass production	Ford Model T	USA
Fifth	1971	Age of ICT	Intel microprocessor	USA

(Source: Created by the author based on Perez, 2002)

Figure 2: Recurrent patterns of technological revolutions



(Source: Perez, 2016)

How, then, can policies such as MOIP be justified that target *specific* areas such as the environment and health care? According to Boyer (2004), a new model of economic growth is now emerging, called the *anthropogenic* model, in the sense that "modern economies are [...] governed by the production of humans by humans in the general sense that education, health, and culture represent crucial components in the production, and especially in the shaping, of lives and lifestyles" (p. 137). Indeed, Boyer found that in the post-war period in the United States, the share of spending on health has consistently and continuously increased, while the share of spending on durable goods has remained almost constant, suggesting the emergence of an anthropogenic model.

If Boyer's argument is correct, and assuming that ICT-related breakthrough technologies are already well prepared (Perez, 2002), innovation is expected to be more active in areas such as health care where social demand is increasing. Since a large proportion of services in these areas are provided by the public sector, and the influence of regulations and other institutions is also significant (Cohen 2014), the scope and impact of public policy on innovation in these areas can also be expected to be significant. Since the sectors that represent the anthropogenic model are none other than the sector that is largely involved in solving the social problems that the MOIP assumes, the emergence of the anthropogenic model creates favorable conditions for the MOIP.

In fact, we can discern an increase in investment in innovations such as environment- and healthcare-related fields. According to BloombergNEF (2023), the

global investment in energy transition[9] has steadily increased from 32 billion dollar in 2004 to 1,110 billion dollar in 2022 despite the financial and economic crisis around 2010. Table 2 also shows the share of ICT, environment-related, and medical technologies in patents among the OECD countries. Although it should be noted that there are some problems with using patent data as an indicator of innovation (Patel and Pavitt, 1995),[10] it can be seen that the pace of innovation in ICT, which has been the driving force of innovation since the 1980s, is slowing down, while the pace of innovation in environmental technologies and medical technologies is steadily increasing.

Table 2: Proportion of patents by technological fields in OECD countries (%)

	1985-89	1990-94	1995-99	2000-04	2005-09	2010-14	2015-19
ICT	17.4	21.9	27.3	32.8	36.4	32.8	31.2
Environmental Technology	7.1	7.9	7.7	8.5	10.8	13.7	12.9
medical technology	4.9	5.3	5.8	6.6	7.0	7.5	7.8

Notes: (1) Filing date in the first country; (2) Number of patents filed in at least two countries, in which one of the countries is Europe, the U.S., Japan, Korea, or China.

(Source: Authors' calculations from *OECD Patents Statistics*)

The arguments in this subsection can be summarized as follows: First, MOIP, which attempt to socially steer the direction of innovation, are appropriate for the current stage of techno-economic development - that is, the turning point, as neo-Schumpeterian economists call it. Second, MOIP is consistent with the long-term transformation of capitalism into the anthropogenic model. Third, the implication of these two points is that the concept of a knowledge-based economy, as well as the concept of a learning society and a learning economy, remains too general in examining innovation policies relevant to the current socio-economic situation. As the economic historian Mokyr (2004) convincingly argues, information, knowledge and learning have always been important for a very long time since the industrial revolution, which means that concepts such as a

[9] Investment in energy transition includes the following items: renewable energy, nuclear, energy storage, CCS, hydrogen, electrified transport, electrified heat and sustainable materials. While renewable energy was nearly dominant in the earlier period, electrified transport has rapidly risen to about just under half of all investments by 2022.

[10] It does not make sense to compare the figures of the three technology fields in Table 1 since the propensity to patent varies by technology fields. See Cohen *et al*. (2000) and Hall and Ziedonis (2001) on the reasons why some fields have particularly high propensity to patent.

knowledge-based economy and a learning economy reflect too general an understanding of the current trend to specify relevant policies suitable for the current, specific period, i.e. the turning point of the ICT revolution and the transformation to the anthropogenic growth model.

2.3 The concept of *foundational innovation* and the institutional foundation of MOIP: Missing links

Environmental, health, and education innovations have something in common in that they all contribute to the foundation of human well-being. Unlike consumer goods, the environment, health care, and education should be guaranteed to all citizens at a certain level of quality and quantity (Uzawa, 2005). While it is technically possible to provide many services as private goods, it is difficult to guarantee a certain level of quality and quantity when services are provided entirely as private goods (Cohen, 2014). Therefore, the quantity and quality of services must be socially determined, as is the case with environmental regulations, medical practices, and educational programs, with the provision of services often entrusted to the public sector.

In this study, we refer to such innovations, large and small, as *foundational innovations,*[11], because all of the innovations listed above are foundational to human well-being and have a commonality in that they constitute the public infrastructure to be collectively consumed. Foundational innovations include changes that can be directly perceived by individuals, such as innovations in health and education services and the creation of more sustainable environments. They also include innovations at different scales in goods, services, technologies, methods, and processes that make these innovations possible (Foundational Economy Collective, 2018, p. 54). The latter aspect is particularly important for what Perez (2002) calls the "deployment period," when a set of breakthrough technologies (such as ICT-related technologies) is deployed in a particular direction, because it points to a path by which foundational innovations create new industries and jobs that apply the new breakthrough technologies, of which digitized

[11] Obviously, the term "foundational" is closely related to Uzawa's (2005) concept of *social common capital*. The term "foundational" is chosen in this paper to avoid making the concept too long and to make it more intuitive, which is taken from the concept of *foundational economy* originally proposed by political economists at the University of Manchester. They use this concept in the sense of an economy that produces "welfare-critical goods and services such as housing, education, childcare, healthcare and utility supply" (Foundational Economy Collective 2018, p. 19). They take a critical look at the situation in developed countries, where industrial policies focus almost exclusively on knowledge-intensive business services (KIBS) and high-tech industries, and justify focusing on the foundational economy instead because the foundational part of the overall economy accounts for a larger share of job creation and household spending than is usually assumed.

health care is a typical example.

A major problem with the policy proposals to promote foundational innovations, such as MOIP, is that they fail to consider the institutional foundations of these innovations. First, proponents of MOIP seem to overestimate the *policy capacity* of governments (Mazzucato, 2013; Mazzucato, 2018a; Kattel and Mazzucato, 2018; Karo and Kattel, 2018; Kattel *et al*., 2022) to steer foundational innovations because their capacity to do so is inevitably bounded under uncertainty. Specifically, governments can at best specify a very general vision, such as "CO_2 reduction," but it is difficult to specify the specifics of innovation in advance because a general vision can be realized in different forms depending on the context (Foray, 2019; Frenken, 2017). The fact that it is often difficult to solve social issues, such as those targeted by foundational innovation, simply by technological means[12] also makes it difficult to steer innovation solely through the efforts of governments. However, it is also exceedingly unlikely that foundational innovations with a significant societal influence will be created by merely offering a key direction and completely letting a bottom-up search handle its fulfillment because the search for innovations tends to be path-dependent, and myopic, risk-averse search paths are likely to dominate under conditions of high uncertainty. Thus, some relevant forms of governance are required to steer a bottom-up search and for influencing the size and "innovativeness" of the outcomes. It is in this context that the question of the institutional basis required for such relevant forms of governance should be addressed.

Second, while Mazzucato (2018) and Perez (2016) emphasize productive cooperation between the government and the private sector as a key enabler of foundational innovation, they do not examine how cooperation can escape falling into a kind of collusion that traditional critics of industrial policy have emphasized. An important clue to this issue, as noted above, is Evans' (1995) view, based on his careful study of the East Asian developmental state, that only a government that has established a relationship of "embedded autonomy" with the private sector can effectively implement industrial policy. In other words, governments that are fully autonomous from the private sector and fully embedded in the private sector cannot effectively implement industrial policies. Another suggestive case is the example of the "industrial strategy" in the United Kingdom (Berry and Barker, 2021). Although this is certainly an ambitious industrial policy aimed at influencing the direction of each sector, the

[12] As suggested by the name "moonshot" attached to the policy in Japan, the MOIP draws inspiration from a major postwar U.S. technology development project (Mazzucato, 2021). However, as Foray, Mowery, and Nelson (2012) and Storper *et al*. (2022) argue, because the postwar moonshot projects in the United States were for technologically solvable problems, they cannot be the model for MOIP, which targets solutions to much more complex social problems.

direction is determined under the strong influence of the "leaders" chosen from the existing leading companies of each sector, which ends up reinforcing current paths, technologies and products rather than forging new ones. For example, in the "life sciences" sector, measures have been taken to protect large pharmaceutical companies. This case shows that even when ambitious rhetoric is used, the reality may only provide huge rent-seeking opportunities for existing firms. Given this reality, it is extremely important to carefully examine how the government interacts with and intervenes in the private sector to steer foundational innovation. Otherwise, policy proposals such as MOIP may become mere rhetoric to justify rent-seeking activities that stifle foundational innovation.

2.4 Exploring the institutional foundation of MOIP beyond national system of innovation (NSI) approach

From the Neo-Schumpeterian perspective, *National System of Innovation* (NSI) approach seems to be a natural starting point for examining MOIP's institutional basis. Miettinen (2012) critically examines this concept and elucidates that Finland was the first country to systematically introduce it into its innovation policy.[13] The NSI approach assumes that knowledge generated through interactive learning between actors is crucial for innovation (Lundvall, 1992) and that ensuring interactions between actors is an important policy issue. From this perspective, industry-academia cooperation can be seen as a typical policy to be pursued.

However, the NSI approach has several theoretical flaws; one of the most important is that the NSI does not embody the endogenous mechanisms that enable or limit interactive learning. Bateson (1972) and Engestrom (2014) both argue that people learn because they are confronted with contradictions and conflicts. Their views are in sharp contrast to those that understand learning as independent of the particular contexts of the parties, as the concept of interactive learning assumes, or as a mere transfer of information. In fact, the idea that conflicts and bottlenecks are important drivers of learning is key to understanding economic development (Hirschman, 1958), technological innovation (Rosenberg, 1976), urban development (Jacobs, 1969), and the development of technological capabilities in modern Japan (Nakaoka, 1990, Chapter 1). Considering these views, it is necessary to specify how contradictions and conflicts are

[13] Since the NSI concept was originally developed by Freeman (1987) through the study of Japanese industrial policy and various systems (e.g., trade and employment practices), it is incorrect to assume that it originated in Finland. See Abiko (2012) for a work that positions this concept at the intersection of neo-Schumpeterian economics and institutional economics, and examines its implications in detail.

endogenously generated within the system and how they are linked to the learning of the parties involved. At the same time, if the search for partners for interactive learning is left entirely to the actors, the breadth and depth of learning are likely to be limited due to cognitive and geographic constraints on the scope of the search for partners. This means that the NSI approach does not incorporate mechanisms for expanding the breadth and depth of learning for innovation (Frenken, 2017), which is essential for MOIP.

Moreover, while the NSI approach has focused mainly on science and technology (S&T) organizations, such as universities, research institutions, firms, and government agencies responsible for science, technology, and industrial policy, as well as the military and public health institutions that influence technological development (Freeman, 1987; Nelson, 1993), focusing only on these S&T organizations can be a narrow view of the institutional foundations of MOIP. As Frenken (2017) points out, it is important to focus on institutions and organizations in local contexts because the search for solutions to social problems begins in the specific places where the problems actually arise. In this sense, following Lundvall (2002; 2016), who in his analysis of the Danish NSI as a "learning economy" extended the object of analysis to the institutions surrounding the labor market, the employment system, and social security, including education and training, it will be necessary to analyze and consider the impact of institutional foundations beyond the narrowly defined science and technology-related institutions.

3. Research context and analytical framework

3.1 Context: innovation policy in Finland

As background to the following analysis, we briefly mention the historical context of innovation policy in Finland (Tokumaru 2017). As an external evaluation report commissioned by Finnish Innovation Fund (Sabel and Saxenian 2008), the limitations of technology-push innovation policies were recognized, even within the government. It was in this context that the “broad-based innovation policy” (BBIP) was adopted in the “national innovation strategy” prepared by the Ministry of Employment and the Economy in 2008 (Halme et al. 2014). The BBIP is a new type of innovation policy oriented toward extending the scope and instruments of innovation policy in terms of (1) incorporating policy instruments to stimulate innovation from the demand side as well as the supply side, (2) emphasizing non-technological innovation, and (3) considering social issues as well as direct economic benefits (Laasonen et al. 2020), clearly anticipating the later MOIP.

While Finnish innovation policies have undergone a major shift in the direction of the BBIP, a suitable institutional and organizational framework for their implementation continues to be explored. For example, the cluster policy implemented from 2007 to 2012, the Centre of Excellence Program (*SHOK* in Finnish), was positioned as part of the BBIP. The aim was to link excellent research with ground-breaking innovation and the creation of new industries; however, the result was only to strengthen the business and knowledge bases of existing large companies. One reason for this is that the development plans for each cluster were effectively drawn up by the participating large companies (Miettinen 2012; Laasonen et al. 2020).

This was followed by *INKA*, an innovation program that has given local authorities a much larger role through public procurement of innovations and infrastructure formation, and *6Aika*, which will be discussed later as a case study. New institutional and organizational frameworks for policy practice are expected to be created in these new programs that focus on actors at the local level. This study identifies this emerging framework and examines its compatibility with the Nordic model. The study focuses on whether an emerging framework can be neatly conceived in terms of the NSI concept.

3.2 Innovation-enabling role of the Nordic model

The Nordic model's institutional characteristics are considered to contribute to innovation in two ways (Tokumaru 2022). The first is the "enabling welfare state" (EWS) thesis by Kristensen and Lilja (2011) and Miettinen (2012), according to which the welfare state encourages capacity building through social investment, subsequently contributing to innovation, based on the concept of EWS. Although this approach can explain the formation of new technologies, knowledge, and human capacities, it cannot explain how they can be redirected to new purposes and realized as new industries and innovations, as assumed in the MOIP. Second, if we consider corporatism in a broad sense as a mechanism for consensus-building through consultation among organizations with different interests, corporatism has been applied to science and technology policy and industrial policy in Nordic countries, enabling them to rapidly change the fields in which they invest resources. Ornston (2012), who coined the concept of "creative corporatism," argues that corporatism has enabled rapid changes in industrial structure. However, this study does not explain why corporatism can be "creative," that is, why it can find new directions to channel technology, knowledge, and human capital. Considering the purpose of MOIP, the other objective of this study is to clarify how new directions for allocating technology, knowledge, and human resources are found in society and how the institutional characteristics of the Nordic model contribute to this

new direction.

3.3 Analytical framework

The analysis and discussion are based on the following framework based on the evolutionary theory of the firm (Tokumaru 2005). Goods are produced by combining both tangible and intangible *resources*. Resources include routines, rules, and regulations, including technology, skills, know-how, and resources held by individuals and organizations. The individual resources are defined as r_i $(1 \leq i \leq m)$, where m is the number of resources. If there are m types of resources and n units of individuals and organizations, the resource endowment of society as a whole is represented by matrix R with n rows and m columns. Each element is either 0 or 1. Information and communication technology is used for various purposes; therefore, various functions can be extracted from a given resource. These functions are referred to as *services*. In other words, resources are not simply useful to humans and society, but specific services need to be extracted for them to be useful (Penrose 1959; Richardson 1972). The individual services are called s_j $(1 \leq j \leq k)$, where k is the number of services. Given that there are k services, the services provided to the society in question are represented by a k-dimensional vector S where each element is either 0 or 1.

In many cases, new services are extracted by combining multiple resources in novel ways. For example, digital healthcare combines information and communication technology with knowledge and technology related to medicine and health. New services are added to society by replacing old resources with new ones or combining several existing resources (Arthur 2009; Frenken 2017; Jacobs 1969). As a whole, society can be considered as doing three things.

(1) Renewal of matrix R: Introducing new r_i and discarding old r_i.
(2) Conversion $R \Rightarrow$ S: Extract new services (S) by combining resources (R) in unknown ways, called "R-S transformation."
(3) Orientation of new service extraction (S).

Based on this framework, there are three possible measures for creating new industries and innovations: (1) resource expansion, (2) new combinations of resources, and (3) promotion and direction of search for extracting new services. According to the abovementioned studies, while the Nordic model works in favor of (1) resource expansion, as the EWS thesis emphasizes, the implications for (2) new combinations of resources are unclear. Furthermore, although the Nordic model is considered to be

favorable for (3) orienting service extraction, as the creative corporatism thesis supposes, the explanation is insufficient.

4. Case studies of MOIP implementation in Finland

Although Finland is a pioneer in MOIP, how is it implemented in practice? Which actors are involved and what roles do they play? These are not questions that can be addressed by examining policy documents alone; therefore, in this section, the most recent policy practices that embody the MOIP concept are taken as case studies and analyzed by applying the analytical framework presented in Section 2. The characteristics of Finland's most recent policy practice are identified through a brief comparison with Japan's policy practice.

Finland has apparently no innovation policy that advocates a "mission-oriented" approach. Therefore, regarding innovation policies that aim to generate innovation by solving social problems, a review of the websites of the Ministry of Economic Affairs and Employment, Business Finland and Sitra (Finnish Innovation Fund), which are government agencies involved in innovation policy, identifies the following two specific policy approaches that are relevant to MOIP. The first is the "public procurement of innovation" (PPI), in which the public sector procures goods and services that have not yet been commercialized to solve social problems while encouraging innovation by firms from the demand side. The second approach aims to solve social problems faced by cities by creating institutional conditions ("platforms") that enable private companies to develop and demonstrate their products in public facilities and infrastructure and obtain useful feedback on their innovations.

The institutional and organizational conditions of the former approach have already been analyzed (Tokumaru 2018; 2022) and are not addressed in this paper. Instead, this study focuses on the latter policy approach because it is newer. Moreover, while public procurement basically consists of a "one-to-one" relationship between public authorities and private companies, the latter is trying to create a "one-to-many" relationship in the sense that it is trying to build a "space" that can attract many companies, and the impact of innovation policy is considered larger. Specifically, we take as a case study the *6Aika* (Six City Strategy), which was a large-scale policy aimed at organizing cities as "platforms for experimentation."

4.1 Organizing cities as "development and demonstration platforms:" *6Aika*[14]

[14] This section relies on publicly available documents as well as (1) interviews with the City of Oulu in November 2018, March 2019 and September 2022 (Business Oulu and City of Oulu), (2)

4.1.1 Overview of 6Aika

6Aika is the name of the joint urban development strategy implemented by the six largest cities in Finland (Helsinki, Espoo, Vantaa, Tampere, Turku, and Oulu) for the period 2014-2020. Sixty projects were implemented to not only increase the international competitiveness of companies and public sector productivity but also create new service innovations and new industries and jobs. The Finnish Government, with funding from the European Union Regional Development Fund (ERDF) and the European Social Fund (ESF)[15], has launched the "Sustainable growth and employment 2014-20: structural funds Sustainable growth and jobs 2014-20: Finland's structural funds program." As part of this program, the government organized a competitive tender for an "integrated territorial investment" strategy in 2013, in which six major cities submitted proposals for 6Aika, which were selected. The total budget was approximately EUR 95 million, with the ERDF and ESF contributing EUR 80 million and EUR 15 million, respectively.

6Aika's budget was allocated through 13 calls for projects, with six cities deciding on the themes of the calls and submitting them to the funders, ERDF and ESF. The applications were evaluated by the 6Aika steering group, both in terms of "impact on the country as a whole" and "impact on the six largest cities as a whole." The largest number of projects are in "Training and Employment" (19), "Circular Economy and Energy" (12), "Smart Cities and Urban Data" (7), "Mobility," (5) and "Health and Well-being" (5). Applicants are usually public authorities such as cities, universities, or municipal industrial promotion agencies. Although companies are not allowed to apply, they can participate as partners in the project and develop and demonstrate their products. A total of 3,300 companies participated in the project and 806 product and service innovations were produced. In addition, 102 new "platforms," meaning institutional and organizational bases for the creation of new products and services, were created in the six largest cities. For example, the opening up of educational institutions and health centers as demonstration sites, described as "turning cities into platforms for development and demonstration," is listed as a major achievement of 6Aika. After 6Aika ended, each city maintained its own platform and developed new ones.

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interviews with 6Aika Strategy Secretariat in September 2019 and (3) interviews with the City of Helsinki in September 2022 (Testbed Helsinki).

[15] The ERDF aims to reduce regional imbalances and helps the least developed regions. The ESF, on the other hand, is aimed at inward investment in order to support employment and employment (Delegation of the European Union to Japan, *EU MAG*, no. 61).

4.1.2 Platform formation in 6Aika

Two examples are given to depict how platforms are constituted in practice.

(1) Oulu Health

Oulu Health is an institutional and organizational structure established by the city of Oulu to promote collaboration between private companies, citizens, medical and health institutions, research institutes, and public administration with the aim of creating new products and services that solve problems arising in hospitals, health centers, and people's lives at home. Platforms focusing on healthcare also exist in Helsinki and Kuopio. However, Oulu is unique in that it focuses on the use of digital technology and healthcare data, drawing on the strengths of its existing technology clusters.

It was established in 2012 and has been developed with funding from the government and the EU. The main participating organizations were the city-owned industrial development corporation Business Oulu, the City of Oulu, Oulu University of Applied Sciences, National Technical Research Centre (VTT), Oulu Medical Research Centre, and the University of Oulu and Oulu University Hospital. Business Oulu is a key organization in terms of promoting Oulu Health, developing new services, and facilitating inter-organizational collaboration. Business Oulu's budget contribution to Oulu Health is entirely used for personnel costs. Oulu Health has several projects; half of the budget for maintaining and developing these projects comes from the City of Oulu, while the other half comes from the central government and the EU as external funding. In recent years, funding from municipalities has decreased and the weight of external funding has increased.

Two typical examples of such projects are provided below. First, the Oulu Health Lab is an institutional and organizational environment that aims to test products and services developed and produced by private companies in the digital healthcare sector in medical and health institutions where they will be used and to obtain feedback from users, healthcare professionals, and patients. This was a collaboration between Oulu University Hospital, Oulu University of Applied Sciences, and the Oulu City Social Services Department. As of 2019, more than 70 companies have conducted demonstrations. An example of the results of collaboration among hospitals, community health centers, and private companies in the Oulu Health Lab is the body data measurement IoT sensor developed by *Kipuwex*. This is a tool for diagnosing and monitoring pain using digital data acquired from sensors and is particularly useful for people with communication difficulties. This is expected to improve care efficiency.

Second, the Future Hospital 2030 project aims to transform the University Hospital of

Oulu into the “smartest” hospital in the world by 2030. “Smart” refers to the intensive use of digital technology to provide user-friendly healthcare. One billion euros will be invested in this huge project, which will also provide opportunities for private companies in digital healthcare to develop their products and services. It will also provide a significant opportunity for private companies in the digital healthcare sector to develop their products and services. In this sense, the project is also meant to promote industry, and the city's industrial development corporation, Business Oulu, is supposed to act as a link between companies and university hospitals.

(2) Testbed Helsinki

Testbed Helsinki is an institutional and organizational environment that promotes innovation, mainly through start-ups, by opening schools and health and medical institutions, providing opportunities for demonstration and testing, and inviting start-ups to provide solutions to the problems and challenges faced by professionals who work there. The former participated in the study at Helsinki University Hospital and Metropolia University of Applied Sciences, which educates nurses. The latter is called the “Innovation Challenge,” in which proposals are invited for solutions to problems and issues such as “what can be done to encourage young people who tend to be shut-ins to go out.” It was run by the Economic Development Department of the City of Helsinki, which applied for and received funding from EU funds and the City of Helsinki Innovation Fund. The focus areas are ed-tech, smart mobility, built environment, circular economy, health, and well-being.

The city's economic development department is staffed by 14 “innovation agents,” who act as links between the relevant departments within the city and the private sector. City departments, such as healthcare and education, are usually reluctant to become involved in industrial promotion measures, such as test beds, as they do not usually consider the economic effects of measures and services. One of the major roles of innovation agents is to convince and involve departments that participating in the testbed will bring benefits such as improved quality and efficiency of the public services provided by the departments. In the case of an Innovation Challenge, the innovation agent organizes dialogue and consultation between the departments of the city that have raised the problem or issue and the start-up company that has proposed the solution and selects the products and services that will actually be tested. In the healthcare sector, many public regulations take time to clear, and start-up companies tend to pursue quick decision-making. Translating and bridging these discrepancies are important for innovation agents.

In relation to the above, not all private companies wanting to carry out demonstrations are able to do so, and only those products and services that are of real interest to City departments are tested. The proportion of projects that could proceed to demonstration testing is 50% for the Testbed and 15% for the Innovation Challenge. Discussions are held with the applicant companies before they apply, advice is provided, and the questions are answered. In this sense, innovation agents can influence the content of proposals and reflect the wishes of education and healthcare fields. Moreover, in addition to not testing company proposals as they are, innovation agents may counter-propose to combine the proposals of several companies into a single new product or service. Consequently, beacons and intelligent lighting systems have been developed for blind citizens, for instance. Although the successful implementation of demonstrations does not mean that the city will buy new products and services from these companies, small companies, such as start-ups, are subsidized for the cost of the demonstrations as an incentive.

4.2 Development and demonstration on the platform

Although we have described how cities are organized as platforms above, to clearly understand the practices of development that actually take place there, we discuss two cases below.

(1) Additional development of the Oulu Selfcare system

The City of Oulu began operating a platform for digitalized healthcare services called the “Selfcare System” (*Oulun Omahoito*) as early as 2010. Residents of Oulu and neighboring municipalities use this system, but for the moment, it is up to them to decide whether to use it. In practice, more than half of Oulu's citizens are registered with the system, with the most active user group being people aged 65 years and older. The system allows users to make appointments for hospital visits, communicate with specialists, self-check their health status, record and retrieve test results, and receive health guidance via the internet. The system also enables nurses to judge whether a patient needs a hospital visit and to control unnecessary visits. The system was designed to be flexible, allowing new services to be added sequentially as subsystems, and these services were extended. In the future, the system will be connected to the national health information data (*KanTa*) and past personal medical data to further improve efficiency. It was expected that the introduction of this system would, for example, replace hospital visits with home-based measures and prevention as much as possible, and replace telephone calls with online responses as much as possible, allowing specialists to

concentrate on the most necessary tasks. In fact, the city of Oulu estimates that the introduction of this system resulted in savings of approximately EUR 2.7 million over the five-year period from 2012 to 2017.

The information system is developed and owned by local IT companies, and the city purchases the services they provide. The history of the development is as follows: In 2004, the then Deputy Mayor of Oulu asked several local IT companies to propose the digitalization of the healthcare system. In addition to improving the efficiency of the healthcare system, the city intended to promote the industry by creating new demands. In response, they proposed the concept of a "citizen portal." In response, a team consisting of the City of Oulu, three local IT companies - Coronaria, Mawell (now CSAM), and ProWellness–the University of Oulu, Oulu University of Applied Sciences, and the National Institute of Health and Welfare–developed and tested the system from 2005 to 2009, when the foundation of the system was completed[16]. Although there were no previous links between these three companies, the development of the Self-Care System triggered business collaboration and provided an opportunity for the digitalized healthcare industry to develop in Oulu, because many healthcare products and services were developed jointly in partnership with several companies. The development was led by the city's healthcare system department, which persuaded and consulted the city's healthcare professionals (doctors, nurses, etc.), who were originally critical of digitalization, and coordinated with the City's industrial development corporation, Business Oulu. The Selfcare System itself is owned by a private company from which the city purchases services, while the city owns the user data.

As mentioned above, the Selfcare System is an extensible platform to which new services can be added. Examples of new services that can be added include image chat systems and infant hearing testing devices. Therefore, the city created a new welfare system development department to promote the development of new services. The typical role of this department is to invite companies to submit specific proposals for new services, organize a half-day session in which several companies respond to requests and present their proposals, and then select companies from among them to form partnerships and develop new products. The following quote is an example of this, emphasizing that the department also helps these companies by encouraging them to collaborate with each other:

[16] For the latter part of the project (2007-09), the development costs totaled EUR 1.85 million, of which 39% was borne by the National Institute of Health and Welfare, 43% by the City of Oulu and 18% by Tekes (the former Finnish Technical Agency) (Hirvasniemi and Kanto 2010; Kanto 2010).

> We [in the City of Oulu] also take care of patients with diabetes and there are many technologies and solutions. Therefore, we invited several companies to half-day meetings to present their systems to the diabetes professionals in our department. We found that there are systems that are very useful for Self-Care System by patients themselves, and systems that are also very useful for professionals who are involved in their care. We asked them to work together, rather than compete, to develop improved systems. This helped both companies as well as professionals, citizens, and patients. Often, one company's solution is only one part of the whole, and the same applies to another company's solution. We [the welfare system development department] help combine these partial solutions and make them into a better whole solution. (Interview with the City of Oulu, February 27, 2019).

In addition, the department exchanges views with approximately 100 companies annually. In other words, the city of Oulu can be seen to play a leading role in five important phases: forming a platform to which new products and services can be added; persuading doctors, nurses, and other professionals; developing concepts for individual new services; identifying and attracting private companies; and forming continuous dialogue and inter-company collaboration. The contribution of Business Oulu and the city of Oulu in the eyes of start-ups is well described by the following quotes from interviews with start-ups in the digital healthcare sector:

> A number of events organized by them (Business Oulu and the City of Oulu) helped a lot, especially in the early stages. They were events where start-ups, large established companies and SMEs could meet, have a dialogue and network with people. They didn't fund us, but they organised a lot of events and gave us a lot of good tips on who to meet. [...] they gradually became more aware of our products and services, and they were able to promote start-ups (like ours) better to big companies. (Interview with NearReal, March 1, 2019)

(2) Redevelopment of the Kalasatama area of Helsinki (Smart Kalasatama).[17]
The Kalasatama area of Helsinki, a former power station and factory site, has undergone redevelopment since 2010. Notably, the area is being redeveloped to ensure an affluent

[17] This section is based on interviews at Forum VIrium Helsinki (Veera Mustonen: 24/11/2014), publicly available documents, and Matchoss and Heiskanen (2017), Matchoss and Heiskanen (2018), and Heiskanen, Apajalahti, Matchoss and Lovio (2018).

lifestyle, while reducing energy consumption through the introduction of digital and renewable energy technologies. This redevelopment project is called *Smart Kalasatama*. The City of Helsinki owns the district's land. From the outset, the Helsinki City Council decided to issue building permits only for projects that used "smart energy" technologies, such as "smart meters" to monitor and control electricity usage. To provide a venue for smart-grid-related developments and solutions, the existing large companies ABB, Helsinki Energy (Helen), Nokia Siemens Network, and Mitox joined forces to launch a demonstration in Kalasatama. Of these, Helen, the energy company of the city of Helsinki that supplies electricity and heat, was immediately asked to demonstrate a smart energy system in a residential block; however, as the system was developed entirely in-house, no data on energy use were made publicly available and no new products based on the open data could be introduced by other companies, including start-ups. In other words, Helen positioned Kalasatama as a place for demonstration tests of its own products and services, and did not understand it as a place to develop and test more innovative products and services in collaboration with other companies.

The City of Helsinki's ambition to enhance the development of digital services in Kalasatama has led to the project being managed by Forum Virium (FV) since 2013, which is a nonprofit company funded by the City of Helsinki and several other companies. Its primary tasks include developing new services using digital technology, networking among the companies involved, networking within municipal authorities, building a vision, and managing demonstrations. At the city's request, FV sought to move away from the traditional approach of entrusting the development of energy-related services to large companies such as Helen, which owns the grid. The city of Helsinki wanted a low-cost, general-purpose smart energy management system to be developed in Kalasatama, which could then be commercialized and transferred to other locations.

In particular, it is necessary to collaborate with IoT start-ups to develop a system that wirelessly monitors and controls the energy consumption of individual products without relying on the wired system owned by Helen and others. Although Helen usually co-developed with existing large companies, FV organized a new regular forum called the Innovator's Club, which aimed to bring together companies, research institutions, the government, and residents and attracted many start-ups that were developing innovative products and services. In doing so, it has established links with start-ups, which Helen would not have been able to connect with, and encourages joint development. Collaboration among start-ups is encouraged. For Helen, of course, this meant that it was faced with the challenge of having to develop in a new way with new collaborators.

FV also launched a service called Agile Piloting, a system that enables companies to quickly test the products and services they have developed, and has encouraged the development of start-ups.

As a result, it can be said that FV has disrupted the existing development method of developing products and services through joint development between large companies, and has enabled the development of various new products and services by forcing new entrants, start-ups and Helen to collaborate with each other.

4.3 A Japanese case

To highlight the characteristics of these cases, a brief comparison with the MOIP in Japan is relevant. Specifically, we describe the case of Toyota City where a "smart city" demonstration was conducted.[18]

Toyota City was selected as an "Environmental Model City" by the Cabinet Office in 2009 and as a "Next Generation Energy and Social System Demonstration Area" by the METI in 2010. Demonstration experiments include human- and environment-friendly shared small vehicles and the demonstration of "smart houses" equipped with smart meters and storage batteries to measure and control energy use. While Toyota City took the initiative in planning the former model city, large companies such as Toyota Motor Corporation and Denso drew up proposals for the latter. Denso itself was involved in the in-house development of technology to share and utilize electricity stored in cars at home. In fact, the concepts for small cars and smart house demonstrations were developed by Toyota and Denso, while technologies such as HEMS, solar power generation, lithium batteries, small cars, and electric cars were all introduced by these companies. Toyota City and the Chubu Electric Power Company were positioned only as providers of the "location" for demonstration experiments in these technologies. However, the involvement of Toyota City is said to have been essential because local residents' cooperation is necessary.

4.4 Summary

Based on the analytical framework presented in Section 2, each case can be organized into three categories: (1) resource expansion, (2) new resource combinations, and (3) orientation toward new service extraction.

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[18] This section is based on interviews at Toyota City Hall (14/5/2014, 5/6/2014), Denso (10/6/2014) and public documents conducted in collaboration with Ville Valovirta (VTT, Finnish National Technical Research Centre).

(1) Expansion of resources

In both the 6Aika and Toyota City case studies, the knowledge gained from the demonstration tests can be used as material for future new linkages. Therefore, both cases involved measures corresponding to the expansion of resources have been taken.

(2) New resource combination

In the case of Toyota City, the fact that a demonstration test is conducted means that the findings from users are obtained as feedback, which may be interpreted as a measure to encourage a new combination of resources.

However, compared with Toyota City, the main difference in the case of 6Aika is that it attempts to promote a new combination of resources in a multifaceted way. First, it attempts to link companies with university hospitals (in the case of Oulu Health), city planning departments (in the case of Smart Kalasatama), schools, and health centers (in the case of Testbed Helsinki), but also with other companies, as in joint development (Oulu Selfcare system and Smart Kalasatama). Second, the persuasion of university hospitals, universities, municipal health centers, schools, and other departments of the city to cooperate in the promotion of industry was also common in the 6Aika cases. Third, attempts to attract new companies, especially start-ups, are common. Efforts to invite and connect relevant new actors can be attributed to the promotion of new resource combinations. In each case, specific actors, such as the city innovation agent or industrial promotion corporation, are actively responsible for inviting and connecting relevant actors, and never expect them to occur spontaneously. In the case of Toyota City, on the other hand, it is fair to say that there are almost no measures to create new links between actors and to promote new combinations of the resources they possess.

(3) Exploratory promotion and service extraction orientation

In the case of Toyota City, no measures were taken to encourage or orient the search for service extraction. In both 6Aika cases, measures have been taken to influence the orientation of development, and these measures have encouraged development to bring about a greater societal impact. In the case of Smart Kalasatama, for example, the FV took measures that significantly changed the direction of development by limiting the role of Helen, an existing large company, and actively seeking links with startups. In the case of the Oulu Selfcare System, it was also possible to develop services with a greater impact by continuously exchanging ideas with companies and linking several companies together for development. The development of services with a greater impact was made possible by the continuous exchange of ideas with companies and bringing

several companies together for development. This is clearly different from Toyota City, where the services and concepts proposed by large companies were accepted.

5. Discussion and conclusion

The analysis in section 4 shows that the practice of MOIP in Finland is characterized by active practices in two aspects: the new combination of resources and the exploration and steering of new service extraction. The implications of these findings are discussed below.

5.1 The concept of catalysis and manifestations of dissonance

The analysis in section 4 shows that the MOIP approach is not to increase technological knowledge, as in the traditional R&D support policies that flourished in the past in Finland when the country adopted the NSI concept, but to influence the direction and impact of innovation by linking actors in new combinations and encouraging interactions between them. In other words, policies have a significant influence on the perceptions and communication of actors. It should also be noted that these are not just policies that aim to link actors, such as policies that promote industry-academia cooperation.

The policy approaches that emerge here can be called *catalytic policy*, in analogy to the role of catalytic substances in facilitating chemical reactions by reducing the energy of the reaction. The people and organizations that play a catalytic role can be called *catalysts*. Catalytic policy is distinct from the two traditional policy approaches: those that seek to change the behavior of targeted actors through financial incentives, and those that seek to change the behavior of actors through monitoring and regulation.

Notably, catalysts do not simply act as a nexus between parties. For example, in the case of Smart Kalasatama, the prominent role of the catalyst is most evident: FV as a catalyst actively invited start-ups and civil society organizations to work with Helen, a large existing company, thereby disrupting Helen's development process, network, and initiative. Moreover, the scope of FV's catalytic action includes disrupting the development processes, networks, and thus the initiative of the existing large company, Helen. Although *intermediation* is often understood as bridging differences in values and cognitive frameworks between the parties involved, in this case catalysis can be understood as revealing invisible dissonances in values and cognitive frameworks, which also reveals bottlenecks as opportunities for innovation (Rosenberg 1976; Tokumaru 2022). Conversely, if the dissonance had not been revealed, development would have continued along the conventional path-dependent trajectory of Helen, as in

the case of Toyota City, and Kalasatama would have been significant only as a demonstration site for large corporations. As a result, the scale and impact of innovation would have remained small.

5.2 The concept of *public sphere for innovation* and the "Nordic model" as an enabling societal foundation

In the case of 6Aika, the links between actors as sources of innovation - for example, the links between private companies and university hospitals, cities, health centers, and schools - cannot be understood as the continuous relationship of interactive learning assumed in the NSI or other related approaches. Because the above connections are not composed of actors with shared values and are only temporary relationships, it is not appropriate to describe them with concepts such as "community" or "commons," which suggest continuous relationships with shared values, as in the concept of "innovation commons" (Potts 2019). Moreover, the dissonance that arises from discussion and dialogue among actors forces a renewal of the cognitive frameworks of the actors involved and the search for new perspectives. This cognitive transformation goes far beyond the two-way flow of information assumed in the NSI approach (Lundvall 1992). The links between actors found in the case studies can be understood as a space for open discussion and dialogue between parties with different values and containing dissonances, in the sense that questions and conclusions are not predetermined. From this point of view, it is appropriate to call this space where open discussion and dialogue between actors takes place a public sphere for innovation. The public sphere for innovation can be a space where innovation is fostered by daring to connect actors with different values and interests, by revealing dissonances between actors, and by focusing discussion and dialogue in the direction of resolving dissonances. In other words, the public sphere for innovation is a space where social demands are created and discovered.

As the case of Toyota City suggests, it is not self-evident that a public sphere for innovation can emerge. For example, if the capacity for open discussion and dialogue is concentrated only among existing large private firms, it is difficult to reflect the public interests of the region for innovation. The 6Aika cases suggest that catalysts can help to disrupt this situation, putting issues arising from the discrepancy between the values of private companies and local authorities on the agenda for dialogue and negotiation, and creating a public sphere for innovation.

The entrepreneurial state thesis on which MOIP is based suggests that it is important for governments to be entrepreneurial in the sense of taking risks and making bold

initial investments. However, the case study in this paper shows that for a public sphere for innovation to emerge successfully on a platform, it is necessary to establish a collaborative relationship between the various organizations that make up the platform, such as university hospitals, health centers, schools, and city departments. Again, the role of catalysts to persuade each organization to cooperate is important, and corporatism at the local level is considered to be of great importance (Tokumaru 2022).

In this sense, the ability of government to be "entrepreneurial" also depends on institutional foundations, such as the existence of a layer of catalysts with competencies and corporatist institutions and practices at the local level. As some authors have already argued, in the Nordic countries decentralization is highly advanced, the competencies of local authorities are considerable (Anami 2010; Yabunaga 2012; Tsuchida 2013), and financial subsidies to third sector organizations are relatively large, making the existence of catalytic organizations relatively easy (Tokumaru 2020). In addition, generous unemployment benefits, relatively small wage differentials, low education costs, and reduced income inequality due to massive income redistribution lower the barriers to changing jobs and make it easier to attract competent catalytic personnel to catalytic organizations, even if their salaries are reduced due to changing jobs.[19] Corporatism is deeply rooted at the regional level in terms of cooperation and collaboration between different sectors (Tokumaru 2022). Thus, it can be argued that the institutional features that constitute the so-called Nordic model serve to facilitate the formation of catalysts and platforms, thus enabling the formation of a public sphere for innovation.

It should be emphasized that public sphere for innovation and platform are the concepts that should be clearly distinguished from innovation systems. First, they are clearly different from the situation envisioned by the innovation system concept in that (1) the public sphere for innovation consists of *temporary* relationships between parties, (2) interactive learning is only possible after discussion and dialogue in the public sphere for innovation, and (3) the inclusion of parties with different values and conflicting interests is important for endogenous learning to take place. Second, the actors that make up the platform cannot be captured by the innovation system concept because they do not innovate through interactive learning. In this sense, it becomes less appropriate to characterize Finland's institutional mechanisms for foundational innovation using the NSI concept, unless the concept is significantly expanded.

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[19] The author's interviews with eight catalysts (September 2022) confirm that these institutional factors facilitating labor mobility are in fact encouraging the mobility of catalysts, but a full analysis of this issue will be left for another paper.

As mentioned in section 1, previous studies have shown how the Nordic model enables innovation. However, this study shows that the implications of the Nordic model for innovation go beyond the understanding of these previous studies. The institutional features of the Nordic model contribute to the creation of a public sphere for innovation and facilitate the implementation of MOIP by enabling the formation of catalysts and platforms. In addition, as discussed in Section 1, while MOIP emphasizes government capacity but largely ignores the implications of the institutional context in which governments are embedded, this paper argues that the institutional context is central to the implementation of MOIP.

Many of the institutional conditions mentioned above that constitute the public sphere for innovation are lacking in Japan. Although it may sound very circuitous, it is important to increase the competence of catalysts and create the conditions that enable the public sphere for innovation to emerge at the regional level, for example, by expanding career paths in local governments to develop the expertise of personnel in charge of promoting local industries, and by strengthening the authority and financial resources to make them more independent.

5.3 Future research

The remaining issues in this study include the following ones: First, we have not yet sufficiently explored the foundations of the catalysts by examining the financial resources and strategies of these catalytic organizations, as well as the motives, reasons, and actual conditions of the mobility of catalytic personnel. Second, there are important but unknown issues concerning the financial resources, resource allocation, and functions of organizations that constitute platforms, the characteristics and roles of key individuals, and the ways in which collaborative relationships are formed and maintained. In the current situation in Japan, while concepts such as “platforms” and “ecosystems” abound, infrastructure development continues to dominate policy efforts, making questions about these *soft* issues critical.

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