

Co-design, Co-creation, and Co-production of Smart Mobility System

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Abstract. Smart Cities with their mobility system are assumed to be based on smart technology, smart people or smart collaboration, assigning citizens significant roles. While some argue that ICT will enhance democratic debate and empower citizens, others concern about the development of Smart Cities “without critical discussions and politics”. Japanese Ministry of Economy, Trade and Industry (METI) launched its Smart City project in 2010, setting specific criteria to ensure the “participation of all the stakeholders”; however, drawing on analysis of official documents as well as on interviews with each of the four Smart Communities’ stakeholders, the paper explains that very little input is expected from Japanese citizens. Instead, ICTs are used by municipalities and electric utilities to steer project participants and to change their behaviour. The objective of these experiments would not be to involve citizens in city governance, but rather to make them participate in the co-production of public services.

Keywords: Co-design · Co-creation · Co-production · Citizen participation · Pedestrian involvement · Mobility system

1 Introduction

Establishment and management of better mobility system has become an essential part of smart cities because of its importance for smarter environment. Participation of pedestrians and drivers is indispensable to design and deliver smart mobility system; however these co-creation processes are not yet theoretically developed and are difficult to implement in practice. The paper thus tries to understand these mechanisms from similar processes of Smart Cities and draw lessons from those cases.

Japan has been facing three main challenges concerning ecological issues as many other countries: reducing CO₂ emissions in order to mitigate climate change; ensuring its energy independence and security (renewable energy, energy conservation and efficiency improvements); revitalizing its economy by strengthening its competitiveness and becoming a leader in future “green” markets. To deal with these issues, the Japanese Government has been implementing various initiatives, among which regulations and subsidies, but also schemes such as a feed-in-tariff for renewable energy and eco-cities’ experimentations since the Eco-Town program launched in 1997.

More recently, in 2010, the Ministry of Economy, Trade and Industry (METI) selected four Smart Communities – Keihanna Science City, Kitakyushu Smart

Community, Toyota Smart Melit (Mobility & Energy Life in Toyota City), and Yokohama Smart City – within the “Demonstration of Next Generation Energy and Social Systems” project. Although only one of these is officially entitled “smart city”, the New Energy Promotion Council (NEPC), a METI agency, defines these projects as “smart cities [which] are a new style of city providing sustainable growth and designed to encourage healthy economic activities that reduce the burden on the environment while improving QoL (Quality of Life)”.

Smart Communities are based on smart grid technologies, which associate information flows to energy flows in order to optimizing the energy production and distribution, introducing safely as much renewable energy as possible and achieving peak shift through dynamic pricing or demand response schemes. However, Smart Communities aim at going further and beyond the mere smart grid, focusing not just on energy issues but also on the involvement of all the stakeholders. Another objective is to make “smart” not only the grid, but also industry, commerce, business and households’ behaviours, including mobility issues. According to METI’s call for projects and Smart Communities’ master plans, a very innovative feature of Smart Communities is the participation of all the stakeholder among which the citizens, and the behavioural change through lifestyle innovation.

The paper thus investigates the citizen participation system and effectiveness in Japanese Smart Communities, as it has been pointed out as a crucial factor of success for eco and smart cities [1], especially when energy infrastructure and natural resources management are involved [2, 3]. However, the “participation” quoted in the call for projects and Master Plans do not seem to have been implemented on a large scale. Although the time period for application was rather short (one year) and did not allow the citizens to participate in the process of building the project, documents and interviews with the four Smart Communities stakeholders revealed that few significant participatory systems such as deliberating workshops or civic forum were neither embedded into the master plan, nor organized since the beginning of the implementation.

Indeed while observing Japanese Smart Communities it appears that citizen participation does not really take place but also was not actually part of the objectives. Therefore, the research also seeks to explain this gap between claimed and actual citizen participation. Numerous social studies have highlighted serious acceptance problems encountered by energy infrastructure [3–5] and especially smart grid-based projects [6, 7]. These studies consider participation of citizen as well as their mere consultation or feedback request as key factors to their acceptance of the project. Furthermore, behaviour change policies in the field of energy consumption are considered to have resulted in a series of failures for many years [8–10], and recent studies in social psychology and behavioural economics have been promoting new tools in order to overcome behaviour change obstacles [11–14].

Interviews with local governments and private sector stakeholders revealed that each Smart Community focuses on changing participants’ behaviours rather than on promoting their participation as citizens. Thus, the paper intends to analyse the policy tools implemented in order to promote citizen acceptance and behaviour change in Japanese Smart Communities, and to understand what kinds of knowledge are mobilized. Furthermore, the issue of citizen participation as a policy instrument promoting

acceptance and behaviour change rather than participation in policy and decision making will be discussed. The paper examines the questions through document analysis and interviews with the stakeholders of the projects.

The paper begins by exploring theories of participation to see how it has been transformed under New Public Management (NPM) and later with the introduction of New Public Governance (NPG). As Smart Communities use information and communication technology (ICT), the potential impact of ICT on participation will also be investigated. The paper then introduces Japanese Smart Communities and the research methodology. It then examines the questions through document analysis and interviews with the stakeholders of the projects. Although the authors conducted interviews within each of the four initiatives, the paper focuses on Kitakyushu's case as an illustration of Smart Communities' rationale. Kitakyushu has the advantage of exhibiting the same participatory mechanisms but with a more pro-active approach. While the other cases give very little additional insights about public participation in smart cities, Kitakyushu's case allows us for more substantial investigation and analysis.

The paper tries to identify the importance of participation in co-designing and co-production of Smart City through literature review as well as a Japanese case study and understand the role of the citizen.

2 Literature Review

2.1 New Public Management (NPM) and ICT

New Public Management (NPM) was introduced into the traditional form of public administration and changed its managerial style through a series of techniques imported from business management [15]. Besides efficiency, effectiveness, and accountability, customer-oriented and/or outcome-oriented thinking has been introduced in policy making and implementation processes [16]. Reform in public service delivery, influenced by these orientations, forced public sector organisations to outsource some functions, privatize enterprises, and revise the role of government in accordance with the role of private sector and civil society. Public and Private Partnership (PPP), the Private Finance Initiative (PFI), and other forms of collaborations became alternatives to traditional government restructuring. This trend has evolved into the public governance model, with greater emphasis on integrating politics and management rather than relying merely on the introduction of new management techniques.

With the introduction of NPM, markets, managers and measurement were introduced [17]. Some of the characteristics of NPM were represented as decentralisation, management by objectives, contracting out, competition within government, and customer orientation [18]. NPM also brought ICT into public administration and promoted e-Government. Renewal of public management and public service delivery has then become an important trend in recent public sector reform.

Introduction and use of ICT to improve managerial processes and to enhance communication to and with the citizens is a key factor for a successful e-Government policy. It first developed as a tool for better governance in terms of efficiency in office work/administrative systems/tasks, data processing and dissemination. However, it is

now recognized as an important tool of communication between government and its stakeholders, providing an interface between them. E-Government has become one of the most important elements in public sector reform, as it offers transparency, accountability, interface with citizens, access to information, and good governance, including prevention of corruption. When there is high demand for accountability and transparency, introduction of e-Government is a common strategy [19].

2.2 Public Service Delivery Under NPM and Public Governance

Many authors have focused their research efforts on the analysis of decentralisation processes, following the public governance approach. Following the implementation of public sector reform based on NPM, the dimension of public administrations, especially at the local level, has prompted renewed both practical and academic interest. The dimension of local governments has become very important for two main reasons: regional competitiveness and capacity to provide public services.

In terms of public services, it is important to highlight the impact of the decentralisation process especially on public administrations at the local level [20]. First, the number of public services provided by local governments has increased. Secondly, the decentralisation process has influenced local governments funding system, which has changed from an indirect to a direct system, that is to say, local governments are increasingly financed by their citizens. As a consequence, many local governments do not have sufficient financial resources to fund the provision of the services needed. These changes are also accompanied by demands for increasingly complex public services, which are difficult for a single local government to provide. These administrations therefore need new strategies to exploit their financial, material and human resources more efficiently, with the aim of satisfying citizens' demand for increasingly complex services.

The decentralisation process has confirmed new interests in institutional models of governance among public administrations operating at different levels and at the same level. All this interest has grown within a theoretical framework known as "Public Governance" [16, 17]. At citizen-related level, the most important objective stemming from decentralisation is to have public services, which reflect different needs and requirements of the citizens, of a higher quality at lower cost [18]. These interests have led to the network governance approach as well as participatory discourse.

2.3 Citizen as Stakeholder Under New Public Governance

Attentions on public service delivery and the role of citizens and social sector in its process lead to New Public Governance (NPG). It was also proposed as critiques to NPM, which merely stressed efficiency, effectiveness and managerial techniques.

Some authors, in particular Osborne, ironically defined NPM as "a transitory stage in the evolution towards New Public Governance" [12]. Not only public service delivery, but also the policy making process became key features of NPG. Bovaird pointed out that "radical reinterpretation of policy making and service delivery in the public domain resulting in Public Governance" [21].

Indeed, NPG has adopted citizen-centric approach and tries to guarantee participation of stakeholders, including social sector. It is based on network governance and focuses on joined-up governance and co-production. Since the public service delivery was the critical issue, which made NPM shift to NPG, it is considered as synonym of New Public Service (NPS). NPG stresses the importance of democratic decision-making and has evolved on changing characteristics of accountability.

Pestoff pointed out that under NPG, “central role attributed to citizen co-production and third sector provision of public services” [22], while Osborne defined NPG as “it posits both a plural state where multiple interdependent actors contribute to the delivery of public services and a pluralist state, where multiple processes inform the public policy making system” [12].

Stakeholder in network is a crucial element in NPG. Bovaird pointed out that governance provides a set of balancing mechanisms in a network society and defined NPG as the ways in which stakeholders interact with each other in order to influence the outcomes of public policies. NPG “seriously questions the relevance of the basic assumptions of NPM that service delivery can be separated from service design, since service users now play key roles in both service design and delivery”. And “service users and professionals develop a mutual and interdependent relationship in which both parties take risks and need to trust each other” [21]. Trust has thus become an important issue under NPG.

Another keyword that many authors pointed out to describe the characteristics of NPG has been negotiation. Bovaird wrote that “policy making is no longer seen as a purely top-down process but rather as negotiation among many interacting policy systems” and that “services are no longer simply delivered by professional and managerial staff in public agencies, but they are co-produced by users and communities” [21]. He pointed out “emerging role of user and community co-production.

It is clear, at least from the literatures, that NPM and then NPG both pointed out the importance of participation, among others, while promoted e-Government. Smart City projects are locally promoted ICT strategy, focusing mostly on the better use of energy in the community, through incentives as well as disincentives and thus trying to change the behaviour of the residents. Thus they could be good case to examine the NPG model.

2.4 ICT Potential for Participation

Some scholars consider ICT to be a powerful means to promote and improve public participation [23, 24]. ICT may reduce participation costs by enabling citizens to participate through their mobile devices at any time and place [25]. The modes of expression and communication provided by ICT also allow new publics to have interest and legitimacy in participating in public affairs [26]. Not only would ICT widen the public of participation; it also has the potential to enrich the content of citizens’ input that would no longer be solely in a discursive form [24]. Collaborative tools such as citizen sensing and other interactive applications [27] have the potential to enhance democratic debates, while information aggregators may facilitate citizen engagement [28].

E-participation, which mobilises ICT for participatory process, aims to increase citizens’ abilities to participate in the political process [29]. This can go beyond by not only

supplying citizens with information on public policies, but also giving them an opportunity to co-create them. Interactions between governments and citizens consist of provision of information, consultation and active participation of citizens on political decision-making [30]. ICT supports these interactions [31], and is believed to renew the trust in government [32]. In the electronic environment, citizens can interact with public officials in a more informal way and the nature of interactions would therefore become more horizontal and egalitarian [33].

Furthermore, it is worth noting that given the peculiarities of Japanese society, scholars argue that more than elsewhere, ICT could greatly boost citizen participation in Japan: for Ishikawa, “Internet is an ideal tool for jump-starting deliberative democracy in Japan” [23]. Moreover, reflected by Sabouret who qualifies Japanese as “homo technophilus” [24], many scholars consider that Japanese people are keen to use new technology. However, the possibility of ICT to stimulate public participation is subject to criticisms. First, the promises of increased social inclusion may be counterbalanced by new forms of exclusion, regarding the elderly in particular [34]. This caution is especially relevant with regard to Japanese society since in 2014, 26 % of the population is over 65 years of age. Second, although ICT allows for new forms of expression and creativity, it also favours individualised patterns of participation at the expense of collective patterns based on open discussion [35].

The paper takes Smart Community Projects as an example to examine the citizen participation in Japanese NPM as well as NPG, which could reflect on the co-design, co-creation, and co-production of mobility system.

3 Case Study

3.1 Methodology

This research is based on qualitative analysis and uses the following analytical tools: research on primary documents, semi-directive interviews and field observation. It first examined documents of METI and Smart Community cases, including their Master Plans as well as press release and communication materials. Other related documents were received directly from the institutions during the field survey. This first step aimed to understand the extent of public participation, and to identify the nature of its mechanisms.

Second, semi-structured interviews were conducted with METI, the local governments and private actors involved in each project, as well as with Smart Communities’ inhabitants, from February to July 2014. In total, thirty-four interviews were carried out with the main stakeholders.

Third, in the case of Kitakyushu, besides the interviews with two dozen of residents, a field observation was carried out. The author attended to one of the regularly scheduled meetings of all stakeholders, including a representative of the citizens, and participated in the Higashida Share Festival, held on 17–18 May, 2014, during which the author talked with the residents on an informal basis.

3.2 Kitakyushu Smart Community

This project was proposed by Kitakyushu City Government, Nippon Steel, IBM Japan, and Fuji Electric Systems.

Kitakyushu City is located in an historical industry area and an historical company town. It has hosted since 1901 the very first Japanese steel works (Yawata Steel Works was a public company, then became Nippon Steel), on which the city relies its development. After the successful overcome of the territory from typical pollution and issues related to coal mining, fossil-fuel power station, and steel works, the territory launched eco-friendly, eco-driven, eco-related, and ecological industries. It became one of the first cities to host landfill sites as well as factories for the recycling of consumer electronics. The city used to rely on heavy industry, however has been successfully converting into green economy. In the Higashida area of Yahata-Higashi ward, the site of the operational experiments and of the Yawata Steel Works, the city is proceeding with the development of a new city district on unused land. In the new district, the City is pushing ahead with the establishment of a variety of new energy distribution infrastructure, for example, for the supply of energy produced by natural gas cogeneration by means of the steelworks' transmission network, and the supply of hydrogen produced by the steelworks by pipeline to areas within the district.

Sketching a vision of the optimum form for community energy management, the project seeks to create the appropriate social structures for a low-carbon society by innovating lifestyles, business styles, and urban planning. By means of the establishment and operation of a customer energy management system called Smart Community Centre, the project aims to establish mechanisms for citizens and companies to think about and participate in the process of energy distribution. The city believes that making energy use visible can encourage change in lifestyles and business. In addition, other initiatives include preparation for the large-scale introduction of next-generation vehicles and their linkage with public transport.

Due to factors including the establishment of environmental facilities and the introduction of a range of new energy sources, the Higashida area in Yahata-Higashi ward of the City already emits 30 % less CO₂ than other areas in the city. This trial aims, by means of initiatives including further introduction of new energies, the use of community energy management, and the establishment of new transport systems, to achieve a further 20 % reduction, reducing CO₂ emissions to more than 50 % less than other areas in the city. In order to achieve these goals, a Smart Community, which provides advanced energy control and optimizes total energy distribution, encompassing electric vehicles (EV) is established and in parallel with the establishment of charging infrastructure to facilitate large-scale introduction of EV, the construction of next-generation traffic systems linking bicycles and public transport.

It is clear that the city had concentrated its attention on energy, not necessary on ICT driven services, although the very first intention of METI was the smart grid, the smart community, and the smart city in terms of ICT use. This is not because the city has strong interests in environmental industry, but can be observed in other projects as well. It is, however, not clear, if the city had really considered the project in terms of creating smart city using ICT as major driver. From the official materials of the municipality and

interviews conducted among the public servants in the municipality, it emerges that the main focus of the municipality has been the energy issue, and not the community planning and/or citizen services.

The residents were rather passive during these events, letting the local authorities and the industrial actors decide for them and following their decisions. This tendency can be observed in cities and territories, where there used to be dominant economic actor. The citizen participation looks weak in both areas, not because residents are not interested in their cities, but because they have strong trust in established institutions and let them decide on their behalf.

3.3 Analysis: Co-design, Co-creation, and Co-production?

The private companies involved in the project had collaborated with the municipality from a very early stage of the project, prior to the official call of METI. They created a secretariat for the project within the municipality, dispatching their staff to it. They agree that in this way, they were able to gain trust from the residents in the planned area. This is confirmed from the citizens as well. They agree to the fact that the major industrial actors have been “the authority” together with the municipality in the territory.

The citizen participation is guaranteed in two processes; one is residents briefing before initiating the project involving residents and the other is feedback meetings during the project implementation. During the first, consensus building, especially for privacy issue, was achieved. Since some experiments, including Dynamic Pricing, required data gathering of private households, consensus of residents were needed. Most of the residents in the area participated actively in the area, although there was no direct “participation” during the designing process of the project. This sounds a bit contradictory; indeed, most residents agreed to participate in the project and gave consensus of gathering and using their household energy consumption data by the smart community consortium, without strong concern and/or specific request to the project. During the feedback meetings, the project team gathered information, opinions, and suggestions of the residents. In these meetings, residents were asked to answer the questioner and express their opinions. Besides some suggestions regarding the tariff differences, few opinions were gathered. This is not an isolated case in Japan; it is rather common that these town meetings and feedback meetings get few feedbacks.

Many private companies actively participated in the project, since they have various interests of their own; however there had been a clear hierarchy among them. They say that it has been not a trouble, since the organization has functioned well. This view is confirmed by the municipality, which explained this tendency as trust to “the authority”.

The municipality has been the major actor together with a small number of private companies. The city actively invested in the project in advance, following its environmental as well as industrial strategies. It has promoted Eco-town projects among others. Their strategies have enjoyed strong support by the citizen and thus the smart city project has also enjoyed strong support.

The project team, however, pointed out one interesting feature; changing behaviours of the residents in terms of their energy consumption. Since the households get information about the details of their energy consumption, they now try to “save” energy in

peak times, rationalising their consumption. This means that the dynamic pricing made the residents aware of their consumption patterns, made them consume rationally, and thus made them “save” energy at the same time.

Like in other Smart Communities Projects, also in Kitakyushu case, it appears that citizen participation does not really take place but also was not actually part of the objectives. Citizen participation was formally designed in the process, but it has never actively implemented.

The results of interview also reminds us to consider the trust factor in this case, since trust has been noted by various actors as well as trust is one of the new key elements under NPG.

4 Findings and Implications

NPM had introduced collaborative government and co-production in public service delivery. NPG concepts explain the conditions of the stakeholders involved in these processes.

From the description above mentioned of projects under Smart City and Smart Community, and of the Japanese e-Government policy and strategy, it is possible to draw various observations.

First, the current Smart City and Smart Community projects are still in a too early stage to understand the very intention of the government as well as municipalities. However, from the materials of METI, it is rather clear that the original policy of Smart City and Smart Community is the economic stimuli, considering that the investment related to the projects might boost industrial activities in the territories. The fact, that the private companies in the territories, and major energy, telecom, and IT companies are involved from the very early stage of the projects, means that the Ministry was mostly keen on the creation of new industry through the projects. This process has been typical to the Ministry; it is well known that the high-tech industry had benefited mostly from these policies [36].

Second, the major part of the current projects regards on energy, especially on energy saving and creation of new energy sources. City planning and building management are part of this energy saving strategy. The latter was launched before these projects, mostly by local governments. Building energy management was sought to save urban energy consumption, at least to rationalise it. At territorial level, energy saving strategy was introduced by private companies, including developers and building companies. However these projects remained isolated ones, without broader strategy for the community. Then the Smart City and Smart Community projects included these experiences into its policy and have been successfully applied in many foreign projects. After the Earthquake, this tendency became more evident, although projects in the area of earthquake have little to do with energy saving.

Third, in terms of ICT use in the territory, the Smart City and Smart Community projects have realised little until now. They included intelligent traffic management system and EVs in the original projects; however these are only on a very early stage.

Forth, it is interesting to note that the various projects related to ICT have initiated by different ministries and have been poorly coordinated. Major ICT projects in central and local governments have been promoted by MIC (Ministry of Internal Affairs and Communications); meanwhile ICT industry related projects have been promoted by METI. They were independently initiated and although many projects had similar characteristics, they are not coordinated among themselves. It is possible to observe typical sectionalism among ministries, which is one of the obstacles for integrated ICT policy development in Japan.

Lastly, the Smart Community in Kitakyushu, in particular, has revealed interesting features: behaviour change of the residents in energy consumption, while they show little participation. The case, given the historical peculiarity of the territory, could be an interesting case to study trust among institutions and its impact on participation and behaviour change.

The pattern of participation can be explained by the focus of Japanese smart cities on energy issues, and by Japanese society's traditional characteristics that seem to be favourable to co-production of public services. However, since the experimentation only started in 2012, it is still unclear whether these practices will be maintained in the long term. Furthermore, the limitation of the area, the number of residents involved and the peculiarity of Kitakyushu city do not enable to contend that citizens would be that much cooperative in other contexts. Nevertheless, although this article does not aim at providing generalisable conclusions about participation in smart cities, the fact that citizen involvement shows similar characteristics in other Smart Communities as well support the idea that Kitakyushu's case is far from being unique. Accordingly, other smart city projects may draw lessons from Kitakyushu Smart Community. Especially, it underlines the importance of the trust factor, which is precisely one of the new key elements under NPG, for the participation of citizens to the energy management co-production.

Furthermore, another ambition of this article is to highlight that it is better to be cautious with "citizen participation" claims when it comes to smart cities. The smart grid technologies Smart Communities rely on are at the core of smart city projects throughout the world. Therefore, the fact that smart cities may mobilise ICT to steer citizens rather than to catalyse public participation calls for further research. Indeed, the Japanese case suggests an interlocking between the rise of smartness and the emergence of a "behaviour change agenda" based on the use of behavioural sciences and big data. In this regard, citizen involvement in smart cities may be considered as a disciplinary strategy [37] and seen as a means rather than as an end in itself; in other words, as a policy instrument aiming at improving efficiency rather than deepening democracy. Although already underlined by the literature [21], the ambiguous relation between co-production and governmental approaches to behaviour change would deserve further analysis when ICT is at stake.

Since the characteristics of co-design, co-creation, and co-production with citizen in Smart Cities are similar to those of mobility system, the involvement of pedestrians and drivers are essential as well as inevitable, although there are theoretical as well as practical difficulties. The implication to mobility system needs to be analysed through case studies.

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