COMPARING HABITATS

How Urban Sustainability Principles Feed into Project Goals and Evaluation Processes.

A Comparative Reading of Two Intelligent Transport and Mobility Systems Projects.
Abstract

There is an ongoing scholarly debate on the extent to which technological and organizational innovation can provide the necessary support to achieve urban sustainability and, by extension, how relevant it is to fund research and development from the public budget. The intelligent transport systems concept has provided a fertile ground to formalize the promise of simultaneously delivering social wellbeing, environmental health and economic development. Knowing that such categories as costs and benefits are always relative, situated and conditioned, what makes it possible to ensure that a new transport infrastructure or mobility service will prove relevant to distinct social and economic configurations, and in specific territorial contexts and time frames? The proposed research paper investigates how sustainability relates to project goals and evaluation processes by doing a comparative analysis of two intelligent transport systems projects that were funded through national ‘innovation budgets’ with explicit reference to sustainability as an overarching goal: the ‘Phileas’ bus-way infrastructure project in Eindhoven, the Netherlands (2000-2007), and the ‘MK: Smart’ data creation and sharing system in Milton Keynes, the United Kingdom (2014-2016). Our analysis reveals that funding authorities give project leaders considerable (methodological) leeway in interpreting the sustainability paradigm and determining monitoring and evaluation frameworks. To successfully achieve these goals and provide evidence project teams rely heavily on existing environmental policies, local demographic perspectives, spatial-economic development strategies, and the competencies of advocacy organizations and citizen associations that appear as intermediaries expressing inhabitants’ needs. They use these specifically local elements as frameworks within which the proposed organizational and technological novelties can be handled so as to ensure their usefulness to specific social, economic or spatial configurations (types of users, spaces, temporalities, etc.).

Keywords: innovation, intelligent transport systems, smart mobility services
Introduction

Social science research has developed a tradition of studying socio-technical change through comparison. By doing parallel case studies on innovation diffusion processes scholars have revealed that institutional singularities condition the diffusion of novel organizational systems and technologies [1], and a similar process takes place at territorial level [2]. Comparative approaches have also been mobilized in epistemological efforts to define innovation and its relationships to the territorial dimension [3,4]. This research paper contributes to methodological efforts in this field by analysing how the sustainability paradigm is translated into discursive and operational categories in view of articulating the local relevance of specific technological, organizational and political choices that structure innovation.

The term “sustainability” appeared in the discourse of funding authorities at the outset of both projects discussed in this research paper: the ‘Phileas’ bus-way public transport infrastructure project in Eindhoven, in the Netherlands (2000-2007), and the ‘MK: Smart’ urban data sharing system in Milton Keynes, in the United Kingdom (2014-2016). We use this common denominator as a starting point for our analysis. We describe and compare how the three pillars of sustainable development feed into definitions of project goals, and, further on, how these definitions are transcribed into monitoring and evaluation frameworks.

We have chosen two projects that use technological and organizational tools through the ‘intelligent transport systems’ concept (ITS) precisely because of its relationship with sustainability discourses. ITS emerged after the Second World War as a new approach to transport development that relied on information and communication technologies as a means to achieve a better service and performance level. By the late 1980s, it had become the subject of fierce international competition. The development of an entire industrial sector around the ITS concept has provided fertile grounds for the development of discourses on so-called ‘green technologies’ as a response to the actual problems of natural resource depletion and crisis in environmental health (WBCSD 2001). ‘Phileas’ and ‘MK: Smart’ represent development phases of the ITS sector from a chronological perspective, hence the interest to compare them. However, these projects also correspond to two systemic approaches. ‘Phileas’ was designed as a semi-automated bus-way public transport system; it represents a more conventional approach to developing new infrastructure directly for travel purposes, hoping that increase in the quality of services will get more people to use them. The transport package of the ‘MK: Smart’ project aimed to develop the so-called ‘mobility-as-a-service’ concept by implementing sensing infrastructure for data collection and creating a platform for its use. The latter approach relies on existing infrastructure and uses relatively small-scale additional infrastructure for a maximum impact.
on mobility behaviour. These systemic differences are the cornerstone of our comparative approach.

Translating sustainability

The international context of environmental, social and economic politics is quite undoubtedly the origin of sustainability in the sense that this discursive category was used by Dutch and British funding authorities. The Dutch Ministry of Housing, Spatial Development and the Environment and the Dutch Ministry of Transport, Public Works and Water Management on the side of ‘Phileas’, and the Higher Education Funding Council for England (HEFCE) on the side of ‘MK: Smart’ developed their reading of sustainability in line with national governments’ political choices. Their task was to evaluate how individual projects could fit into this landscape.

The striking similarity is the Dutch and British funding authorities’ initial choice to prioritize economic development objectives (notably workplace creation) as the top argument motivating the attribution of funding. Environmental health and social wellbeing remained at the forefront even though funding authorities requested that projects demonstrate positive effects with regard to these categories as well. Our attention is drawn to the nuances in respective interpretations of the sustainability paradigm and how they changed in line with the project itself, thus revealing the evolutionary relationships between innovation as a systemic approach and sustainability as a paradigmatic context.

When a group of private and public players from the Eindhoven municipality and the Noord Brabant province requested funding from the Dutch national government, the latter saw the ‘Phileas’ bus-way infrastructure project as a promising industrial product and an opportunity to test-drive an integrated approach to land use and environmental health policies – also known as the transit-oriented development principle [5,6]. The project team had to decide how exactly this process should be organized and monitored, while national institutions chose to remain in a contemplative position. ‘Phileas’ project’s contents evolved throughout the 1990s, thus coinciding with the gradual consolidation of sustainability as a structuring axis for Eindhoven city council’s policies [7]. By the late 1990s, Eindhoven and Veldhoven municipal councils, the metropolitan area authority Samenwerkingsverband Regio Eindhoven (SRE), and their industrial partners within the VDL consortium (note a), had taken up the task to put a collective effort into translating the sustainability paradigm into distinct project goals. The challenge was to continuously articulate the technological and organizational choices with the local political framework by taking into account the required balance between the three pillars of sustainability.
Since the early 2010s, HEFCE had defined itself as higher education institutions' guide in “protecting and enhancing quality of life for current and future generations” by means of pursuing the social, economic and environmental values that sustainable development stands for [8]. The funding institution insisted on short-term contributions to economic growth, whilst reminding that projects “should demonstrate an expectation of long-term sustainability” [9]. Yet, HEFCE's positions on sustainability provided just one of the many sources that Milton Keynes Open University's researchers used in defining 'MK: Smart' initiative's goals, the means to achieve them, and the methods to evaluate the costs and benefits of specific technological and organizational choices [10]. The funding institution claimed to value the “tradition of academic freedom” and portrayed academic research institutions as “valuable forums where differing views, metrics and interpretations of evidence are articulated and their implications debated” [8] (p.3), thus giving project leaders maximal leeway in their readings of sustainability, and, from there, formulating the goals and methods to monitor their successful achievement (note b). Thus, each of the 16 teams having submitted requests to receive money from the 'Catalyst Fund' were to invent their own theoretical framework and methodological approach to assess how their proposals corresponded to sustainability goals, how locally relevant they were, who and how could benefit from their distinct components. Funding authorities obliged project teams to deal with the problem of relevance on their own. It was up to academic researchers from the Milton Keynes Open University who headed the project in partnership with local authorities, the private sector and non-governmental advocacy organizations (note c). Project teams were bound to acquire many competencies: the knowledge on how to articulate national-level readings of the sustainability paradigm with local cultural, political, geographic and economic characteristics, and the know-how of transforming them into measurable categories.

Integrating environmental health policies and spatial development strategies

As a result of gradual decentralization processes, municipal councils in such countries as the Netherlands and the United Kingdom have been made responsible for developing their own methods to implement policies and assess their successful accomplishment. Since the early 2000s, local transport plans have provided a framework for the conversion of sustainable urban development visions into specific goals and, further downstream, into measurable categories. Thus, over the last few decades, municipal council teams have consistently been measuring the effect of local policies on such categories as traffic safety, air pollution, noise levels, congestion etc. However, these
methodological frameworks are rarely used as protocols in the framework of ‘innovation projects’, often because of the limited scope of projects. To adapt existing evaluation protocols to the needs of innovation projects, project teams rely on the performance of existing policies hoping that accumulative effects will lead to the desired result.

The two projects discussed in this research paper share a common approach: the conditions for urban sustainability were analysed from a mobility demand management perspective. ‘Phileas’ infrastructure’s specific relevance to Eindhoven and Veldhoven was determined by assessing how it could improve access to residential areas and the city centre, and how it could promote ‘livability’ (leefbaarheid). The ‘livability’ concept historically preceded the sustainability paradigm. Its origins are closely tied to the political and economic cultures and historic lifestyle patterns in the Netherlands [11]. By the late 1990, to bureaucrats working for the Noord Brabant province and the Eindhoven metropolitan area public authority, this concept represented an integrated vision of environmental health policies and land use strategies with an aim to reduce air pollution, noise and improve traffic safety [12]. These public authorities observed the negative effects of the high modal share of private motorized transport in the Eindhoven metropolitan area and recognized that public transport service levels were continuously deteriorating. It all contributed to a shared opinion that a new public transport vision was needed.

Fig. 1. ‘Phileas’ project impact area. The bus-way infrastructure connects Eindhoven city centre with Veldhoven municipality, and the airport. Author’s legend and drawing on Open Street Map cartography.
Fig. 2. Photographs of the ‘Phileas’ bus-way infrastructure and the semi-autonomous vehicle. Copyright: VDL consortium, 2007. Photograph used with the Eindhoven metropolitan area public authority's permission.

Eindhoven and Veldhoven municipal councils and the Eindhoven metropolitan area public authority (SRE) decided that a new bus-way line should be used as the backbone for future urban development. This transport-oriented development approach enabled to pursue densification policies that Eindhoven city council hoped to implement as part of its urban sustainability vision. The future bus-way transit line was planned to connect the city centre to the future business district ‘Flight Forum’, the future Meerhoven residential district in the East, and the former Philips factory area ‘Strijp S’ which was supposed to be redeveloped into a new office and residential district (fig.1). ‘Phileas’ was now considered a contribution to the metropolitan area’s overall development. The bus-way infrastructure had to ensure a high-quality public transport system and build strong spatial links to mobility spaces for pedestrian and cyclist movement (fig.2). With time, these accompanying projects – the extension and densification of the bicycle path network, the refurbishment of pedestrian access paths to the bus way infrastructure - became as important as ‘Phileas’ itself, thus performing a complete reversal in the hierarchy of project goals. The low-tech and cheaper components became decisive elements to ensure the relevance of the project for the Eindhoven metropolitan area.
On the side of Milton Keynes, managing mobility demand to avoid future congestion was deemed possible not by increasing the linear kilometres of public transport infrastructure, but by dealing with mobility needs more efficiently. Open University’s researchers defined ‘MK: Smart’ project’s mission as follows: to meet “the challenge of sustainable growth without exceeding the capacity of the infrastructure” whilst “meeting key carbon reduction targets” that Milton Keynes council had set out early in the 2010s in its development visions for 2030 and 2050 [13]. The ‘MK: Smart’ project team resolved to meet the challenge of future demographic growth while ensuring that Milton Keynes conserved the ‘quality of life’ it was designed to provide: Milton Keynes new town was planned as a low-density urban settlement, where built environments would always be surrounded by unbuilt land [14].

Fig. 3. ‘MK: Smart’ project impact area and ‘Motion Map’ sensor location. Author’s legend and drawing on Open street map cartography.

Decreasing the use of private motorized and fossil-fuel propelled transport while promoting walking, cycling, and public transport use was a means to optimize mobility demand [10]. Developing a data platform for commercial and non-commercial purposes was argued as a cost-efficient solution, and one which could structurally integrate existing and future mobility services with the territorial singularities [10]. A network of sensors was implemented in the central area of the new town, but the project was developed city-wide (fig. 3).

Choices made in the framework of ‘MK: Smart’ cannot be understood without taking into account the project’s origins. The ‘smart city’ concept - the starting point of Open University researchers’ work -
did not come from HEFCE’s incentives but from a previous collaborative initiative. The ‘smart cities’ approach as a means to foster sustainable development throughout the new town first came up in the early 2010s, when a team of private and public organizations from Milton Keynes submitted a project proposal to the national innovation agency’s ‘Future Cities Demonstrator Programme’ [15]. “As a new and growing city Milton Keynes will integrate its city-wide systems to maximise enterprise and jobs growth, business innovation, research and technology development. (...) It is only with a smart and holistic approach that MK can meet its ambitions to grow the city and its economy rapidly while remaining sustainable and reducing environmental impact” [16] (p.17). Winning the first phase of the competition enabled the Milton Keynes partnership to have access to financial resources and time needed to analyse feasibility of several transport infrastructure and mobility service innovation projects that it desired to implement: testing autonomous vehicles, electric buses, electric vehicles; implementing a bicycle share system, a small vehicle transit scheme, and an East-West rail connection. “Low carbon urban transport” was just one of the many fields of action within the partnership’s initial proposal, which created a narrative on how ‘smartness’ could become the structuring axis for management of energy and waste, health and wellbeing, housing and the built environment, learning and research, security and resilience (16).

Failing to win the second phase of the ‘Future City Demonstrator Programme’ competition did not prevent Milton Keynes council from implementing part of its transport infrastructure and service renewal projects. The partnership’s main goal - to better manage mobility demand - continued to be partly addressed by the Milton Keynes council in the framework of its competence to develop local transport policies. In 2014, when Open University’s staff learned about the funding possibilities provided through HEFCE’s ‘Catalyst Fund’, the Milton Keynes council requested that a researchers’ team steered the project. The responsibility for mobility demand management in the new town could henceforth be shared between the municipal council and the research institution, at least as long as the ‘MK: Smart’ project went on.
The Open University researchers’ team began by doing a state of the art on existing ‘smart city’ projects, their goals and the means through which stakeholders tried to achieve them. Corporate players’ agenda to sell new products and services regardless of what people expected and needed rooted their critique of many existing initiatives [17]. Open University’s researchers decided to pursue the opposite path, which meant focusing on city dwellers, people who worked or studied in Milton Keynes, or transited the area on a daily basis and felt affected by everything that went on in the new town. This approach then became the centrepiece of the project team’s argument on the relevance of its proposition for Milton Keynes. By facilitating participatory practices through the development of an information and communication technology infrastructure researchers argued that democratic urban governance was possible in the time and space of the ‘MK: Smart’ project. The central element of ‘MK: Smart’ collaborative initiative’s transport package was the ‘Motion Map’ (fig.4) - “an urban sensing and visualization system designed to explore and develop the concept of cloud enabled mobility” [10].
The role of advocacy organizations and city dwellers in relevance discourses

Negotiating the relevance of a transport infrastructure and service renewal project is not only the task of project leaders but also a shared responsibility. Who and how participates in argumentative actions and evaluation processes tells a lot about the evolution of urban governance in a given territorial context. Since decentralization processes accelerated in the Netherlands and in the United Kingdom, in the 1970s, municipalities have been in charge of managing the complex structural relationship between transport systems, access to resources, and the specific cultural and morphologic traits that characterize urban territories and shape mobility behaviours. Eindhoven and Milton Keynes municipal councils remain to this day the competent agencies for environmental and climate governance, and they are responsible for social and economic development. In the space of infrastructure and service renewal projects, private and third sector organizations, as well as individuals, are increasingly called upon to participate by sharing their specific knowledge of the territory, by reflecting on their own needs, and those of other people residing, working and studying in these areas, or transiting through them on a daily basis.

In order to determine mobility behaviour tendencies in the Eindhoven area prior to implementing the bus-way infrastructure, the metropolitan area authority SRE began monitoring the modal split in 2000 and continued this assessment till the launch of 'Phileas' in 2006-2007. Two surveys were simultaneously conducted: one with households in the area where the 'Phileas' bus-way infrastructure was supposed to be implemented and another one in a reference area (note d). A third annual survey was carried out in the same period of time in view of determining the evolution in user satisfaction with existing public transport services along the transport axis where 'Phileas' would later be implemented [18]. This approach to monitoring and evaluation enabled local public authorities to gain knowledge on what current public transport users were dissatisfied with and what kind of improvements they most urgently awaited. Knowledge from public transport users' feedback was subsequently used by the VDL consortium to develop a set of incremental measures. Hardware and software solutions were implemented to provide information at bus stops, and a complementary infrastructure renewal programme was launched along the future 'Phileas' axis so as to facilitate walking to the nearest bus stop, getting there in a wheelchair or by bicycle [19]. The positive impact of these incremental improvements was monitored by other players than the Eindhoven metropolitan area public authority SRE. The local branch of the Dutch Cyclist union (Fietsersbond) tested bicycle parking and sharing facilities for user-friendliness; the local Pedestrians'
association tested access roads to bus stops; the local branch of the Dutch Disabled persons' organization tested the accessibility of 'Phileas' buses. Last but not least, a small group of Eindhoven dwellers were recruited to take part in user panels testing 'Phileas' buses and the bus-way infrastructure to provide feedback on general design issues (12).

An important contribution to the project came from the regional branch of the Dutch Cyclist union, which had been arguing the relevance of bicycle-friendly policies since its foundation in 1978. In the early 2000s, the union carried out a survey on the conditions for cycling in Eindhoven, and publicly announced its strongly negative views, as the city critically lacked infrastructure and was considered generally unsafe for cycling [20,21]. The union's persistence convinced the Eindhoven metropolitan area authority SRE and the Eindhoven municipality that focusing only on public transport users in designing the bus-way infrastructure was not a relevant approach, and that attention should focus on all city dwellers as potential bus users, cyclists and pedestrians. This new approach to mobility planning confirmed the importance of spatial design in negotiating the relevance of infrastructure renewal projects.

Milton Keynes Open University's researchers involved third sector organisations upstream of the 'MK: Smart' project. Community Action Milton Keynes - an advocacy organization working in favour of a more democratic urban governance in Milton Keynes - functioned as an intermediary between project leaders and people living, working or studying in the new town. Most importantly, Community Action was responsible for recruiting people for 'Motion Map' workshops, during which Open University researchers discussed the design and possibilities of this tool with its potential future users. Business literature on "lead users"(note e) provided researchers with theoretical anchorage for their recruitment approach, which consisted in addressing people "interested in specific transport issues", "with strong needs", "direct experiences of the transport problems being addressed", and "a higher interest in adopting and championing Motion Map" [22] (p.3). Differently from 'Phileas', where surveys with households and public transport users provided massive amounts of homogeneous data, 'Motion Map' workshops generated heterogeneous feedback on different design and functional issues because the choice was to gather small groups of people that would engage in active discussion. The different profiles of people participating in these workshops (around 12 to 40 at a time) had a considerable impact on how the issue of relevance was addressed. While the 'Pedestrian-oriented workshop' was said to attract "an older and less tech savvy demographic", the 'Future of transport workshop' was described as gathering "a mix of participants including business actors with a higher level of technical literacy" [10]. The characteristics of these groups impacted the nature of discussions and, consequently, affected the redesign process of 'Motion Map'.
Another sub-project of the ‘MK: Smart’ initiative pushed co-creational practices even further. The ‘Our MK’ programme encouraged people living, working and studying in Milton Keynes to come up with their own ideas and then improve and clarify them together with people having more expertise in service provision, business model development etc. (note f) Among the many propositions received, however, few addressed collective transport and individual mobility issues. An interesting example is a project submitted by the Milton Keynes Physical Activity Alliance - ‘Gamification of Redways’, the aim of which was to foster the use of local bicycle paths for leisure and daily commuting purposes. The organization’s main motivation was to reduce obesity risks among the local population [13], whereas the relevance of this project was argued from three different perspectives: 1/ financial viability (there was no need to build a new infrastructure), 2/ social value (the use of redways was free of charge, walking and cycling was cheap and good for health), and 3/ environmental gains (none of the mobility practices allowed on redways were sources of local air pollution). The value of this project was not so much in its content but rather in the different perspectives that it offered, being developed by people who had knowledge of their own needs and a vision of how to improve mobility infrastructure in Milton Keynes. The shortcomings of the new town’s fully segregated mobility system with highways for motorized transport and redways for cycling and walking had been the subject of public debate for over three decades. What the project made possible was for people to draw attention to the cycling path network as a valuable infrastructure - one that was sufficiently safe and convenient to use on a daily basis. Promotional iconography for the ‘Our MK’ programme (fig.5) clearly underlined these typological singularities that define the infrastructure and landscape of Milton Keynes, “a city in the forest” (note g).
Fig. 5. A leaflet promoting the ‘Citizens’ Competition’ in the framework of ‘MK: Smart’. Copyright: Milton Keynes Council, Milton Keynes Open University, Community Action MK, 2016.

The ‘MK: Smart’ project offered a new kind of approach for translating sustainability into measurable categories. The project demonstrates that evaluation can no longer be identified as a distinct process that is carried out post factum, but rather one that feeds into the design process – an omnipresent cooperative environment, where people discuss the relevance of individual solutions with regard to specific socio-economic, spatial or demographic configurations. Owing to their knowledge of the morphologic and topographic patterns, and the social landscape of Milton Keynes, project participants are expected to guarantee that infrastructural renewal processes are continuously reassessed for relevance. ‘MK: Smart’ has demonstrated that there can be as many frameworks to assess a project’s value as there are subjects that can perform the evaluation. In other words, everyone can invent his or her own protocol, and they are invited to do so.

Conclusion

Building coherent pathways between international and national policies (environmental health, social equity, economic development),
and articulating them with municipal operational frameworks is a lengthy and non-linear process [23,24]. This research paper sought to analyse how interpretations of the sustainability paradigm feed into project goals and evaluation processes, and to demonstrate how choices of specific technological and organizational tools are articulated with monitoring and assessment practices. It reveals that local public authorities rely heavily on competencies that they have already developed and cling to the expertise of other players to help perform the necessary transitions. Institutionalized state of multiple stakeholder cooperation is fragile but considered indispensable because it enables a necessary dialogue between users and providers of infrastructure and services. ‘Phileas’ and ‘MK: Smart’, the two infrastructure and service renewal projects that were analysed, show that non-governmental advocacy organizations play an important role in performing articulations between technological and organizational characteristics, and so do people who live, work, study and are otherwise present in these territories. Democratizing governance is not a goal in itself but a phase in the process or distributing responsibilities so as to ensure that relevant transport infrastructures and mobility services are provided at an acceptable environmental and economic cost. Who and how benefits from these organizational and technological solutions becomes a methodological problem, the result of which depends on how virtuously project leaders use the local cultural, political, demographic and economic configurations.

Notes:

a_ The VDL consortium for the development of Advanced Public Transport Systems was made of regionally-located companies for technology, the University of Groningen for the man/machine interface, and the Technical University of Eindhoven for electronic guidance (Van der Heijden, Argiolu, Bos, Marchau, 2006)

b_ Conversation with Miguel Valdez and Stephen Potter, 1st February 2017, at the Milton Keynes Open University

c_ Main partners of the ‘MK: Smart’ collaborative initiative: The Open University (project leader), University of Bedfordshire, University of Cambridge, British Telecom, Anglian Water company, HR Wallington company, Community Action MK non-governmental organization, Milton Keynes Council, Fronesys information and communication technology developer, Graymatter consultancy company, Smart Applications Catapult, Transport Systems Catapult, Playground Energy company.

d_ Documentation the author has had access to does not enable to determine which district of Eindhoven city was used as a reference area in the evaluation process, but we hypothesize that this might be the sum of residential neighbourhoods in Eindhoven. The municipality’s other intention was to monitor household
mobility behaviour in the new residential and office area after completion of the bus-way infrastructure. However, these surveys were never carried out. Electronic letter exchange with former SRE employee Mr. Ab Oosting, May 2017.

e_“(... lead users face needs that will be generated in a marketplace but face them months or years before the bulk of that marketplace encounter them; lead users are positioned to benefit significantly by obtaining a solution to those needs” (Urban, Hippel, 1988).

f_Such topics as “starting up a group”, “becoming a social enterprise”, “how to involve citizens”, “bid writing tips”, and “support with Our MK website” were addressed during the workshop. Projects that were recognized to complement existing services received a £ 5000 grant for further development and implementation.

g_This descriptive phrase refers to the new town’s planning principles and was used by the Milton Keynes Development Corporation since the early 1970s to argument choices regarding the morphology and infrastructure layout of Milton Keynes.
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