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Mobile Business and the Smart City: Developing a Business Model Framework to Include Public Design Parameters for Mobile City Services

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Abstract

This article proposes a new business model framework that allows the design and analysis of value networks for mobile services in a public context. It starts from a validated business model framework that relies on 12 design parameters to evaluate business models on, and expands it by eight parameters to include important aspects that come into play when a public entity (i.e. a city government) becomes (or wants to become) involved in the value network. This new framework is then applied to the case of the 311 service offered by the City of New York. Given the quickly changing power relations in the mobile telecommunications industry, this framework offers both an academic and practical tool, enabling the comparison and analysis of mobile city service business models.

Keywords: Mobile services, Mobile applications, Business models, Public governance, Public value, Public administration

1 Introduction

The mobile communications sector has undergone profound change in recent years, as commercial and public entities aim to find strategic fits while adapting their business models. This also applies to the subsector of mobile service provision on a regional, municipal or more local level. New players enter the sector, actors shift their business strategies, roles change, different types of platforms emerge and vie for market dominance while technological developments create new threats and opportunities (for a visualization of this complexity, see e.g. [5]). Since Apple and Google entered the mobile communications sector with the iPhone hardware and Android operating system respectively in 2007, the industry has been somewhat turned upside down, forcing existing players, including mobile operators, to rethink their strategies and adapt their business models to this new reality. These new entrants have seen a tremendous growth since their introduction and have launched new models for selling hardware, software and content to consumers. This has transformed the mobile communications and services sector from a rather static one, dominated by the same actors for many years, to a much more dynamic one, where innovative services and mobile data communications have taken up a leading role in a very short time span.

These developments have not been without importance in the context of major metropolitan areas, as illustrated by the recent prominence of the Smart City concept in a business and policy context. Both private parties as well as city governments have seen the potential of mobile services, and several, divergent initiatives have been set up and applications or services developed. For example, the increasing capabilities of mobile devices (including various sensors, GPS-chips, larger screens etc.) made services and applications based on a user's location possible, which becomes particularly relevant in densely populated and commercial areas. Mobile services can be attractive in fields such as mobility, cultural activity (discovery), tourism, hotel and catering industry, interactions with government and so on.

However, as these services grow in popularity and importance in the market, questions arise for city governments interested in harnessing the potential of mobile service provision in order to increase the quality of life for citizens in a meaningful way. For several years, the main concerns seemed to revolve around providing connectivity throughout the city. This was typically done through wireless solutions such as WiFi, WIMAX or other technologies, after which the applications were built, based on this type of connectivity. However, in recent years and amongst others as a consequence of the growing popularity of mobile data communications, these connectivity-related initiatives have all but disappeared (for examples see: [12], [25], [47], [48], [56]) as the focus gradually shifts to mobile service provision in the form of mobile applications or mobile websites. This evolution raises new questions for city governments as to which roles to take up in the value network, how they should interact with emerging players, which data they may leverage in providing services, how they may take up platform roles or how they can create additional public value.

This article will provide an initial step towards answering these questions by building on the business model matrix, developed and validated in [3]. We will expand it to include business model design parameters that become relevant as soon as a public entity or government actor becomes involved in the value network. We start with a quick reminder of the parameters in the original framework –as they remain important in the newly developed matrix– followed by the development of the additional parameters. Finally, we propose an expanded framework that can be used both as a design and validation tool in discussing business models for mobile applications, which include public actors. This article decidedly starts from the perspective of the city and takes mobile city services as a case to explore new ways of thinking about business models in a public context and proposes a new theoretical framework to tackle pressing questions in this area.

2 Mobile and the Smart City

Even though the term is relatively young, the operationalization of what a Smart City is, can vary dramatically depending on the approach. It has been used to describe a cluster of innovative organizations within a region, the presence of industry branches that have a strong focus on ICT, business parks, the actual educational level of the inhabitants of a certain city, the use of modern technologies in an urban context, technological means that increase government efficiency and efficacy and so on. Several attempts have been made at formulating a definition of the Smart City, taking different perspectives (e.g. in [12], [26]). Although these perspectives vary from top-down approaches, to crowdsourcing and stimulating bottom-up initiatives, a recurring aspect to the definition of the Smart City is the use of ICTs in some way. It is in this light that we will take a closer look at mobile services in the city as an example of an ICT subsector that is likely to be a significant part of the Smart City. New mobile software ecosystems (as e.g. offered by Apple and Google) also inspire developers to create applications and services that enhance life in the city in divergent ways: from providing easier access to information on public transport, over location-based check-in games, to more advanced augmented reality applications, adding new layers of information to the city. As smartphones become more affordable and popular, it is expected that innovative mobile devices and services will be important tools in making life in the city *smarter*.

When looking at the mobile industry from the perspective of the Smart City, a few important trends and issues come to light. A first point is infrastructure and the evolutions in networking technology, or how mobile devices connect to

the network. The trend of cities aiming to offer ubiquitous wireless coverage (using e.g. WiFi or WiMAX) to its citizens seems to be subsiding after several failed experiments around the world. Particularly the model in which independent investor-operators offered large scale WiFi roll-outs in major urban areas as a *third pipe* (often competing with incumbent operators) has proven unviable [56]. Although different business models were experimented with, today city initiatives have been outpaced by commercial WiFi projects offered by incumbent operators, or high-speed cellular networks like LTE. One area related to infrastructure where the city is more likely to play a role is the development and deployment of wireless sensor networks, connecting everyday items and city infrastructure (e.g. street furniture) or in the creation of applications and services that make use of this new infrastructure.

A second important trend impacting the development of mobile services in a city context relates to open data. City governments are currently *sitting* on a wealth of information related to different aspects of life in the city, but this data is either not publicly available or not easily interpretable. This has sparked a movement to encourage the opening of datasets, under the *open data* moniker, which is gaining traction across local and national governments throughout the world. In very recent years, we have seen several large and small cities worldwide undertaking initiatives to open up data to citizens and developers in the interest of transparency. This was (in Europe at least) in part a consequence of the implementation of the Re-use of Public Sector Information Directive, created by the European Commission as a first step to open up data from the public sector to citizens. Several cities organized *hackathons* and *Apps for x* competitions in order to stimulate developers to create innovative visualizations or new services based on this new source of data. Although many business and technical questions remain (mainly related to machine-readability, standardization and interoperability of the datasets), these first initiatives are seeing increasing success and providing intriguing results.

A third and very important business trend currently at play in the mobile industry is platformisation. This refers to companies employing divergent types of platform strategies, leveraging several *sides* of the market in innovative ways in order to try and attain dominance within the mobile industry in this case. Such strategies are well illustrated by the approach taken by Apple and mimicked by Google, Microsoft, Samsung and others of offering a tight integration between hard- and software (including media content) that creates an attractive value proposition for hardware manufacturers, developers, content providers and end users. These strategies simultaneously have led to and are the result of a highly competitive industry in which the power relations can quickly and dramatically change. This adds an important level of complexity for cities and government administrations that want to be active in this sector. The high innovation pace of the sector is an aspect slower moving governments will need to be able to cope with on an organizational level.

The trends and issues listed above indicate the potential business model difficulties that may arise when a public organization becomes an active actor in the mobile services value network. In what follows we will develop a framework to analyze business models that involve public entities in the value creation process. Although the development of this framework starts from generic literature (leaving it open for use in other sectors), given its origins in the analysis of the mobile services industry, we will look at how it can be applied to mobile services in the case study in Section 7.

3 Business Model Matrix

In this section we briefly reiterate the basic concepts of the business model framework we will be building on, as well as its positioning in literature. While there have been prior mentions of the term, the general use of the concept of a business model as an articulation of the *architecture of a business* is closely linked to the rise of Internet-based e-commerce [28]. The additional sales channel offered by the on-line environment spurred firms to devise new ways of interacting with their customers, in the expectation that more direct or valuable ways of interaction would become possible. Early approaches to business modeling therefore focused on the selection of the most appropriate virtual channels and revenue models (see e.g. [49], [53], [58]). These *new economy* approaches have been fairly well documented, although they were often lacking conceptual clarity [45]. As a rule, they were concerned with typologies and taxonomies of specific internet-related revenue models or value propositions (e.g. on-line auctions, virtual marketplaces, etc.).

As the *new economy* fever subsided, the attention of business model literature shifted towards the integration of virtual activities into the real-world marketplace. Also, another ICT sector was by this time facing the redesign of its *business architecture*, i.e. the mobile telecommunications industry, as it was gradually moving from a voice-centric towards a data-centric set-up. In the wake of the success of i-mode in Japan, a success that was mainly credited to its innovative business model, it became clear that for mobile telecommunications, the provision of new services through appropriate cooperation and coordination models (including revenue sharing models) was the main business model issue [39], [37]. From then onwards, the main questions to be solved by new business models increasingly became those connected with shifting firm boundaries, the level of vertical and horizontal integration in the industry and the complex provision of new services.

As a result of all this, the focus of business modeling has gradually shifted from the single firm to networks of firms, and from simple concepts of interaction or revenue generation to extensive concepts encompassing the value network, the functional architecture, the financial model, and the eventual value proposition made to the user [21],

[36]. Due to the shifting preoccupation from single-firm revenue generation towards multi-firm control and interface issues, the guiding question of a business model has become “Who *controls* the value network and the overall system design” just as much as “Is substantial *value* being produced by this model (or not)” [2].

[2], [3] proposes a matrix that is centered around two types of parameters: control parameters on the one hand and value parameters on the other. It examines four different aspects of business models: (1) the way in which the value network is constructed or how roles and actors are distributed in the value network, (2) the functional architecture, or how technical elements play a role in the value creation process, (3) the financial model, or how revenue streams run between actors and the existence of revenue sharing deals, and (4) the value proposition parameters that describe the product or service that is being offered to end users. This matrix is represented in Figure 1.

CONTROL PARAMETERS				VALUE PARAMETERS			
Value Network Parameters		Functional Architecture Parameters		Financial Model Parameters		Value Configuration Parameters	
Combination of Assets		Modularity		Cost (Sharing) Model		Positioning	
Concentrated	Distributed	Modular	Integrated	Concentrated	Distributed	Complement	Substitute
Vertical Integration		Distribution of Intelligence		Revenue Model		User Involvement	
Integrated	Disintegrated	Centralised	Distributed	Direct	Indirect	High	Low
Customer Ownership		Interoperability		Revenue Sharing Model		Intended Value	
Direct	Intermediated	Yes	No	Yes	No	Price/Quality	Lock-in

Figure 1: Business model matrix [2], [3]

For each of these four business model design parameters, three underlying factors are at play, which can be summarized in a dichotomous way, but in reality operate on a scale between the proposed extremes. The use of the matrix as a tool for qualitative analysis has been validated through case studies in several sectors and extensively in relation to mobile services (e.g. in [4]). However, the specific nature of mobile city services, and more particularly the addition of a public component into the value network, adds increased complexity to the business model. In order to capture the intricacies of combining commercial and public control and value creation we propose a reorientation and expansion of the business model matrix.

We note here that all the design parameters important for the business model certainly remain so when a public entity is involved or when certain policy goals are to be achieved. These criteria stay applicable and are not in need of retooling. However, when we take the perspective of a city government or various public bodies, additional business model design parameters become important. We simply refer to these extra parameters as *public design parameters*. The main division in the business model matrix between control and value highlights the two most fundamental aspects of a business model. We propose a similar approach in defining the core principals of a public business model which comes down to the questions *Who governs the value network?* as well as *Is public value being generated by this network?*. We thus propose *public governance* and *public value* as two fundamental elements in business models that involve public actors.

4 Public Governance Parameters

The concept of governance is used in a variety of fields and can be defined in divergent ways. Corporate governance is for example used in strategic management literature to refer to the way in which a company or organization is managed and how managerial and executive processes are organized [30], or how the market can be seen as a source of governance, influencing firms (e.g. in [58]). This view is less suited for our approach: the business model matrix assumes a complex value network of several companies, rather than focusing on the internal operations of a single firm. Even when adopting a *stakeholder approach* in strategic management, this still starts from the perspective of a single firm emphasizing “the importance of investing in the relationships with those who have a stake in the firm... (this) depends on the sharing of, at least, a core of principles of values” [24]. Additionally, given the initial premise of starting from the city’s perspective, we require a more *public* operationalization of the governance concept and will thus refrain from a strategic management based approach to the notion.

Another field where the concept is also used, and where it already has a closer link to the public sector, is the cultural industries. In critical cultural studies, the term is e.g. used to refer to the presence of government, management and control in determining cultural policies as well as the processes involved in developing such

policies (as described by e.g. [33]). [45] uses it to delve deeper into the tensions between industry, the cultural sector and policy makers and makes a case for “*new spaces of governance of the cultural industries*”.

Again, for our purposes, we will use the concept of governance starting from the perspective of the institutions organizing it, i.e. local governments. Our approach is thus based in the idea of *public governance* as described in e.g. [11] who refer to public governance as “*how different organizations interact in order to achieve a higher level of desired results*” and put a clear emphasis on the “*processes by which stakeholders interact*”. This comes back in [55], who define governance as: “*... the process of decision-making and the process by which decisions are implemented (or not implemented)*” and identifies government as the main actor. It also highlights the added complexity to governance in an urban context, given the large number of actors involved [55]. A policy brief by the Institute on Governance focuses more on the public characteristics of the concept and defines it as being: “*... about how governments and social organizations interact, how they relate to citizens, and how decisions are taken in a complex world. Thus governance is a process whereby societies or organizations make their important decisions, determine whom they involve in the process and how they render account.*” [26], [60] offers another take on the process and says governance highlights efficient management of government resources and a mutual respect between citizens and the state.

Depending on the viewpoint, the operationalization of governance can thus be quite variable. For the purposes of defining the governance parameters in relation to the business model matrix, we take note of the definition in [55] and can already identify two different layers on which governance can operate, namely in reaching certain policy goals (the implementation process) and organizationally (decision-making). This idea will be expanded upon later on. Elements that are related to the relationships between public and private entities, which stakeholders are involved in the decision-making process, how power and competences are distributed in the value network, the impact of different levels of regulation (transnational, international, national, regional, local), how decisions for or against certain technologies can have effects on the value network and value proposition and so on, are important parameters related to governance, which can be added to the business model through the participation of a public actor. The following section will detail the second set of public design parameters as an addition to the value parameters in the original matrix, namely those related to public value.

5 Public Value Parameters

The extension of value parameters to public value parameters is a logical one as it is clear that the involvement of a public entity in the value creation and value proposition can have consequences in the public sphere. For example, when public funds are used to develop and deploy a certain service, one might expect a government to justify to tax payers why such an investment is important and whether it fulfills a certain public value. In that context, the notion is often used in public service broadcasting research (particularly when it comes to measuring public value), which can serve as an inspiration towards defining the public value parameters in relation to the business model matrix.

Mark Moore, author of the seminal work *Creating Public Value* [39], together with John Benington, starts by exposing two ways in which public value can be regarded: firstly, “what the public values and secondly, what adds value to the public sphere” [7]. He argues that the first question *what the public values* is a more recent one and can serve as a counterbalance to the top-down determination of what public value *should* be. It empowers citizens to become more active participants in government. However, tensions can form between these two, for example when public service is regulatory in nature (e.g. police) and may impose things on an “unwilling user” [39]. With relation to the second question of what adds value to the public sector, [7] answers with more questions in trying to define what the public sphere or the public itself is, as well as the interesting point on “what value constitutes in the public sphere, and who decides?”, exposing questions on power relations, the process of democratic dialogue and absolute and relative values, which are relevant to our analysis. He goes on to detail potential actors that can create value, situate where and how value is created and how it may be measured, and we will come back to this later.

[49] takes a related approach and identifies different areas in which public values may conflict and proposes that understanding these competing values better, offers a way for public agencies to deal with them. He selects five dimensions on which a public entity should satisfy the public: trust and legitimacy, collectivity, security, personal utility and autonomy. Already, we begin to see similar concepts emerging to the ones appearing in the section on governance and issues such as transparency, responsibility, participation, trust and accountability will be an important part in the further development of the business model matrix.

We will not go into further detail here, but take away that the concept of public value is clearly a multi-layered and complex one. For our purposes, we will need to limit the scope in analyzing public value to a more narrow set of parameters.

6 Introducing Public Design Parameters

The combination of governance and public value parameters with the control and value parameters of the business model matrix means expanding the framework downward to include additional parameters. These remain related to the already defined business model domains of value network, technical architecture, financial architecture and value proposition, but add criteria to reflect the increased complexity when public actors are introduced to the value network. As was already noted in the section on governance, and emerging from the definition(s) of the concept, two levels of public design parameters can be distinguished: one is related to the (Smart City) *goals* a government sets out for itself and the other is focused on how the government *organizes* itself to reach those goals. These two levels of analysis are also included in the updated matrix. The new parameters related to the public domain are explained below. Each time, the first parameter reflects a policy goal, the second an organizational challenge.

6.1 Governance Parameters Related to the Value Network

The following paragraphs describe the parameters that are linked to the value network parameters of the original business model matrix. These are mostly concerned with the actors involved in offering the value proposition and the relationships between them. The public design parameters we introduce are good governance and stakeholder selection and management.

6.1.1 Good Governance

This parameter again finds its origins in the literature on global development, but given its close relation to the organization of government, easily fits our purpose of defining what public activity in a value network can mean. Similarly to governance, several definitions can be found. The United Nations Development Program states good governance is “participatory, transparent and accountable”, as well as “effective and equitable” and “promotes the rule of law” [53]. [28] proposes a definition, which focuses on the stabilizing elements good governance should entail, and [41] emphasizes the importance of participation in governing. [26] list five principles for good governance (*legitimacy and voice, direction, performance, accountability and fairness*), based on a similar list of eight characteristics of good governance defined by [55] namely *participation, rule of law, transparency, responsiveness, consensus oriented, equity and inclusiveness, effectiveness and efficiency, and accountability*.

Given the relatively vague nature of these concepts and the difficulties in operationalizing them, we will focus on what binds them together: a striving towards equilibrium in governing. This often means finding a balance amongst existing policy goals on the one hand and between those policy goals and existing regulation on the other, as suggested by [11] when discussing the potential trade-offs that politicians need to make when taking policy decisions. As existing policies and regulations can in many cases be contradictory, a striving towards consensus and harmonization of interests is deemed essential in good governance [28]. Since good governance can hardly be regarded as a confined concept [31] and several sources state it should be seen as a process, we propose selecting the trade-offs between often contradictory, existing policy objectives and regulation as an important parameter. In practice, this parameter is dependent on the context in which a certain initiative is taken, but could for example entail an analysis of the goals a service tries to reach and to what extent it contradicts other policies within a government (or e.g. a political coalition) or existing regulation. For example, as more ICT-related regulation comes into play on different decision-making levels (e.g. the Digital Agenda framework laid out by the European Commission [18]), local authorities need to take their compliance with this regulation into account when developing an initiative.

Additionally, we emphasize the concepts of accountability and trust, as it is important to consider which public entity can be held accountable if something should go wrong and how the citizen's rights are protected or can be enforced (see for example [16] and [11]).

6.1.2 Stakeholder Selection and Management

This organizational parameter refers to the choices that are made related to which stakeholders (be they public, semi-public, non-governmental, private or so on) are involved or invited to participate in the process of bringing a service to end-users (see also the section on governance) [11]. In light of the good governance parameter and the striving for balance and consensus described above, including or excluding a particular stakeholder can have consequences for the viability of the final value network and is related to achieving a strategic fit [3] within the business model (cf. *supra*). Several (sometimes even pragmatic) elements can be important to take into account when deciding on which stakeholders to involve. For example, one aspect could be how competences are distributed among the government actor(s) involved in the value network. When discussing the city, it quickly becomes clear many different levels of government could come into play when offering a certain service, e.g. international, transnational, national, regional, provincial and local. Particularly in the case of large cities or municipalities with large or complex structures, it will be necessary to consider which public organization is responsible for a certain competence or application domain when developing a service, and how these different levels are organized and interact with each other. With the goal of achieving a strategic fit among the actors involved, the selection process of which stakeholders to involve or not, and how this is decided, is thus important to consider in the analysis.

6.2 Governance Parameters Related to the Technical Architecture

Next, we expand the framework for the technical parameters found in the original matrix. When a public entity becomes an active player in the value network, we also need to take into account technology governance and the ownership of public data in describing the business model.

6.2.1 Technology Governance

We borrow this term (more precisely *technological* governance) from [62] who builds upon the concept of *technological citizenship* and links it to how technology is shaped by powerful actors within society. He makes an argument for a more participatory process in which the citizen is the deciding entity in technological choices, which should lead to those technologies “being more compatible with democratic principles” than some current “authoritarian technologies”. We are not inclined to go as far in this argument, but do recognize the importance of transparency, participation and emancipation in making technological choices, especially by public entities. Choices for a particular technology or platform (e.g. by only offering an iPhone application) may exclude certain parts of the population, something a government should be wary of. This is captured in this parameter through the area of tension “inclusive versus exclusive”.

A second element we link to technology governance is the use of open data and whether government information is made available to citizens through the use of ICTs. Many cities and governments are sitting on a wealth of information, which does not find its way to citizens. [44] lists five important principles related to open government and citizen access to information through digital technologies and ICTs, namely *access, process, awareness, communication and involvement*. Opening up certain data sets and letting developers and the public experiment with them can be an important addition made by a public entity in the mobile services value chain. The choice of a public entity whether or not to open up its data is captured by this parameter.

6.2.2 Public Data Ownership

If the decision to open government data to the public is made, the responsible government body should carefully consider the terms under which this data is opened up and to which actors. This is a technological decision in the sense that selecting or limiting the type and amount of formats the data is available in, has consequences to which parties can start working with it (e.g. if the data is machine-readable or not, presented in natural language as well, only available in proprietary formats and so on). Related to this we also consider whether the data is made available to exclusive partners or not and what type of licensing schemes might be in place, as well as their terms. This could be the case when for example a public transportation company decides to provide its real-time travel information to Google, but blocks small developers from accessing the data (which occurred e.g. both in Belgium and The Netherlands with the respective rail road companies [51]). These are technical and organizational decisions that can have an important impact on the way the business model is constructed and the final value proposition to the end user.

6.3 Public Value Parameters Related to the Financial Structure

The financial model is strongly impacted by the involvement of public entities in the business model, given their different organizational model and the ways in which these institutions are financed. When expanding the financial design parameters, we take return on public investment and the presence of public partnership models into account

6.3.1 Return on Public Investment

The phrasing of this parameter is far from new; the notion of expecting a return on public investment in the economic sense is for example mentioned by [36]. In the context of the business model matrix, we mainly refer to the question whether the expected value generated by a public investment is purely financial, public, direct, indirect or combinations of these, and - with relation to the earlier governance parameters – how a choice is justified. A method, which is often used in this respect, is the calculation of so-called *multiplier effects*, i.e. the secondary effects a government investment or certain policy might have, which are not directly related to the original policy goal. In practice, these effects could be measured by looking at increases in GDP, economic activity, job creation and so on. The calculation of these factors would lead us too far, but we will consider if such indirect return effects are expected or formulated by governments investing in a particular initiative. Also important to consider here is whether these reflections are made *ex-ante* or *ex-post*, i.e. before or after a value proposition is offered to end-users.

6.3.2 Public Partnership Model

The organizational parameter to consider in this case is how the financial relationships between the private and public participants in the value network are constructed and under which legal entities they set up cooperation. One example of such a model is the public-private partnership (PPP). [21] highlights the importance of politics and political tensions behind PPP-constructions as an addition to the traditional analyses from an administrative, managerial, financial or technical viewpoint. While we acknowledge the importance of the political aspect behind PPPs and take into account that political issues may delay or advance particular initiatives, a complete analysis of political tensions underlying certain PPPs is out of scope here. PPPs can also operate in very different areas such as

public transport, public utilities, infrastructure and so on. [61] lists critical success factors for PPPs in infrastructure development such as a favorable investment environment, economic viability, a strong technical consortium, a sound financial package and an appropriate allocation of risk via contractual agreements. [9], [10] provides an overview of PPP development in the UK and details several potential purposes for and types of PPPs. We also take note of his remarks related to responsibility and risk distribution in this context:

"...(the PPP's) performance should be judged at the level of the partnership, rather than simply at the level of the agency. Asking each individual partner to account for its contribution to the partnership, and whether it is getting 'value for money' from these contributions is highly dangerous — it is like separating out the roots of a plant to see which is contributing most to the health of the plant, with the consequence that the plant is significantly weakened. Once each agency has to account in public for whether it is getting more out of a partnership than it is putting in, the relationships in the partnership are endangered. It is more appropriate that agencies should be held to account for whether the partnership is itself working successfully and whether the agency might do more to contribute to its success." [9]

In the context of the business model matrix, and given the location of the parameter in the financial architecture column, it is clear we choose to emphasize the financial implications and risk distribution effects of a PPP-model. While other considerations related to the structuring of a PPP are clearly important to the business model design, these are already captured in other public design parameters, e.g. those on *good governance* or *technology governance*. In this perspective, it is also interesting to consider other models, such as a Private Finance Initiative (PFI), a "more financially-driven PPP, in which the motive for the partnership is fundamentally the readier access to capital finance enjoyed by private sector partners" [10] or forms of purchasing consortia (PC) which are aimed at seeking economies of scale and bulk purchasing. These and other financial constructions between public and private entities are the subject of this parameter.

6.4 Public Value Parameters Related to the Value Proposition

Finally, we need to consider the impact of the business model on the value proposition and the value that is generated by the service. Where, in a typical commercial business model, the value can usually be measured in financial terms, when it comes to public services, this value is often more difficult to capture.

6.4.1 Public Value Creation

This parameter examines public value from the perspective of the end user and refers to the justification a government provides in taking the initiative to deliver a specific service, rather than leaving its deployment to the market. A first element that can be of interest (borrowed from the public broadcasting sector) is whether a form of *market failure* is present in a certain domain, i.e. when there is a lacuna in service provision that cannot be met by commercial entities. Of course, depending on the domain, this can be a sensitive discussion (as it is in broadcasting), so together with establishing whether market failure can be identified, we should consider if the fact that there is a specific need in society that is not being met (so that government needs to intervene) is contested by other actors in the value network, or not. And in the spirit of transparency and good governance, such a justification should also be provided to the public.

We also refer to Moore again here, who, in his Public Value Framework for public organizations [39], proposes some attention points in creating public value (see also [49]): organizational vision (captured in the next parameter by us); strategic goals; links among goals, activities, outputs and outcomes; the range of outcomes; and activities and outputs that create outcomes. We take away here that the goals, outputs and outcomes that public entities wish to achieve need to be clearly outlined and detailed ex ante, so that they can be verified once a service is launched (see the next parameter) and be held accountable (under the good governance principles) should questions on improper behavior arise. The definition of these goals and the promise of their evaluation may also alleviate concerns that can be present with the public.

6.4.2 Public Value Evaluation

The organizational parameter we identify as important for the value proposition is whether and how the public value that is (supposedly) created by a public service, is evaluated. One way of evaluating the potential success and impact of a public service, can be found in public service broadcasting, with the public value test (PVT) organized by the BBC Trust (the body governing the BBC) and Ofcom (the UK media regulator) as probably one of the most famous examples of such a test. The PVT consists of two parts: the Public Value Assessment (PVA), which is performed by the BBC Trust, and a Market Impact Assessment (MIA), performed by Ofcom. The Trust has a general framework it applies to identify the public value of a service (in some cases ex ante, in others ex post as the debate on which is favorable in which case has not been settled), which is an extension of the public purposes the BBC should fulfill in its role as broadcaster. The parameters of this framework are:

- *Reach: how far will the proposal extend the BBC's reach and usage?*
- *Quality: is the proposal of high quality and distinctive?*

- *Impact: will the proposal create consumer and citizen benefit (i.e. for individuals and/or society as a whole)?*
- *Cost and value for money: how much will the proposal cost to deliver and will it provide value for money? [6]*

These parameters are quite broad and will receive a particular interpretation depending on the service under investigation according to the Trust. The PVA is executed in close collaboration with the MIA done by Ofcom simultaneously in order to avoid overlap. The MIA looks at the potential direct and indirect impacts a proposed service may have on consumers and producers of other services in the market [42]. While Ofcom admits such an impact assessment is a difficult undertaking, it has developed a broad methodological framework, which is consultable on their website and hopes to alleviate these difficulties. Given the specific nature of broadcasting and the still broad terms describing the PVT, the main take-away towards the business model matrix is whether or not an evaluation is performed in the first place, as well as a description of the form of that evaluation (e.g. a PVT). Clearly, such a test requires clear policy goals that have to be laid out by policy makers and a set of predefined targets such as an evaluation should verify.

Now that we have established which parameters are important in a context where a public entity becomes part of the value network in offering a service, and how we interpret the different terms, they can be added to the business model matrix. The parameters from the original matrix are captured in the *business design parameters* and although they are sometimes mildly rephrased, they cover the same aspects as represented in Figure 1. The updated matrix is represented in Figure 2.

	Value network	Technical architecture	Financial architecture	Value proposition
Business design parameters	Control parameters		Value parameters	
	Control over assets	Modularity	Investment structure	User involvement
	Ownership vs Consortium Exclusive vs other Influence	Modular v integrated	Concentrated v distributed	Enabled, Encouraged, Dissuaded or Blocked
	Vertical integration	Distribution of intelligence	Revenue model	Intended Value
	Integrated v disintegrated	Centralised v distributed	Direct v indirect	Price/Quality Lock-in effects
	Control over customers	Interoperability	Revenue sharing	Positioning
	Direct v mediated Profile & identity management	Enabled, Encouraged, Dissuaded or Blocked	Yes or no	Complements v substitutes Branding
Public design parameters	Public governance parameters		Public value parameters	
	Good governance	Technology governance	ROPI	Public value creation
	Harmonising existing policy goals & regulation Accountability & trust	Inclusive v exclusive Open v closed data	Expectations on financial returns Multiplier effects	Public value justification Market failure motivation
	Stakeholder selection	Public data ownership	Public partnership model	Public value evaluation
Organisational	Choices in (public) stakeholder involvement	Definition of conditions under which and with whom data is shared	PPP, PFI, PC...	Yes or no Public value testing

Figure 2: Expanded business model matrix

It is interesting to note here that the public design parameters are less dichotomous in their formulation than the business design parameters. This is not unexpected: in a purely business or economical context, the logic of the business model is more likely to be oriented towards profit optimization, leading to choices that are more easily summarized through opposing extremes. This is much less the case in a public context and the complexity added by the entry of public entities to the value network is much less evident to capture in dichotomies. It would detract from the need for nuance and consensus-seeking in governance, hence the less clear-cut distinctions in the public design parameters.

This updated business model matrix, incorporating public parameters, can be used in two ways. In the first place it can guide a qualitative analysis, facilitating the detailed description and comparison of business models in the mobile (public) services industry. By using the parameters to describe different aspects of the business model, a structural comparison between different models becomes possible. Secondly, the matrix can be a useful guide when designing potential business models during the conceptual phase of a service. It provides insight into important elements that

have to be considered when setting up a service in collaboration with a public partner. We also reiterate here that the framework was developed starting from more generic literature on public governance and public value, meaning it could also be applied to other sectors than mobile services in a public context. However, given the origins of the business model matrix in that field and the potential mobile services have in the Smart City context, we are initially only validating it in this area.

By means of illustration, we have included an example of how these parameters can be used to analyze a case in a structured way. This example only highlights how the new parameters can be a tool in the qualitative description of a case and does not illustrate how it could be used when designing the business model of a new service.

7 Case Study: New York City 311 Service

While the main focus of this work is the development of the theoretical framework, we have also included a brief case study as a way of illustrating how a business model analysis of a (partly) public service in the mobile telecommunications sphere, can be made more complete by including the additional parameters introduced above. The various services offered by the city of New York under the 311 moniker, are the subject of this case study. NYC 311 was launched by the Bloomberg administration in 2003 as a centralized call center, tasked with unifying the nearly 4.000 services offered by over 120 city agencies and organizations [1]. The service is a citizen's first point of contact with the city government for all questions and issues that are not an emergency (for which one would call 911-services) and quickly became successful. This led to the launch of multiple channels to reach 311, i.e. an online portal, a text message service, Skype account, Twitter account, blog and iPhone application [14]. Today, the service receives around 50.000 calls a day, serves 8 million citizens and reached the milestone of 100 million treated calls in May 2010 [32]. Citizens can ask questions or submit complaints on over 3.600 topics such as school closings, recycling, homeless shelters, parks, pothole repairs or other aspects related to life in the city.

While not solely a mobile offering, NYC 311 offers several functionalities and services related to the citizen's location or living environment. The investments in a texting service, the development of mobile applications and integration with social media and data-based communication services (such as Skype, Facebook and Twitter) underline this. We will use this case as an illustration of how the updated business model matrix can be used. While the initial business parameters remain relevant and important to the analysis (also when a public entity is involved in the value network), due to space limitations and the illustrative nature of this case study, we will focus on the new public parameters in the following sections. All the information presented below has been gathered through desk research and comes from official policy documents, as well as academic case studies and analyses in specialized popular media.

7.1 Public Governance Parameters

Aspects related to *good governance* appear to be an integral part of New York City's 311 service as they are in the mission statement of the call center and online service. The administration of mayor Bloomberg lists accessibility, accountability and transparency of city government and its services as core principles of an open government [18], concepts often used in public governance literature (see section 6.1.1). The city describes these principles as follows:

- “Accessibility – The 311 Customer Service Centre provides residents, visitors, and inhabitants of the City with one number to call to access all New York City government information and services while, at the same time, providing a superior level of customer service. Open 24 hours per day, every day of the year, and available in any one of 179 languages, the 311 service connects constituents with the appropriate city services and information they have requested – they do not need to know what agency handles their request – they just need to know what issue or question they have, and 311 will direct their inquiry or request to the appropriate party for a response.
- Accountability – The 311 Customer Service Centre helps City agencies improve their delivery of services by handling the customer service and call center functions of the service delivery process. In this way, each Agency is able to focus on its core mission and area of responsibility and manage its workload efficiently.
- Transparency – Through accurate and consistent measurement and analysis of service delivery, the 311 Customer Service Centre provides insight into ways in which City government can be improved and made more efficient. The city uses data from the 311 Customer Service Centre along with Business Intelligence tools and technologies to provide increased visibility into its operations. Whether it's a scorecard indicating an agency's performance, or easily obtained information on a service request made through the 311 center, this information is conveniently available to all constituents.” [18]

Through the constantly available phone number, but also the variety of other media the 311 service uses, such as social media and online tools, the city government has made a point of being as accessible as possible. Of course, such availability takes time and comes at a cost, resulting in a gradual expansion of the number of ways to reach 311

(e.g. some mobile platforms like Android do not have an official mobile application available). The bullet on accountability highlights how other government agencies may benefit from the 311 service by being able to focus more on their core responsibilities, but this works in two directions: the data gathered from the calls and requests coming into 311 may also bring to light how certain city agencies or organizations have been less than successful in their core assignments and may resist the notion of such a service.

This raises an important point related to *stakeholder selection* and how these stakeholders are managed in the value network. The mayor's office decided on a hierarchical approach in the organizational structure of the 311 service. The service is a business unit of the Department of Information Technology and Communications (DoITT), which is headed by a Commissioner, appointed by the mayor. Day-to-day operations are managed by the 311 Call Center Director, who oversees various staff sub-levels. A major contribution to the success of the service appears to lie with the role the mayor played in unifying the over 45 different call centers of the existing city agencies: he imposed a short, one-year deadline for the launch of the service and mandated that all Commissioners of existing agencies participate in the initiative. Individual agencies were not able to *opt-out* of having its services or information handled by 311 [18]. It is likely to assume this complete and obliged integration of the directly involved public stakeholders is one of the main factors contributing to the success of the service. The Department of Housing Preservation and Development's services were the first to go live through the 311 system in 2003, with the service quickly growing to bundle information and services from over 30 city agencies. A second important characteristic of how 311 works together with public stakeholders is in its direct interaction with the 59 local representative bodies known as Community Boards that represent specific geographical areas of the city. These boards play an important role in land use and zoning, local services and the general welfare of their community. 311 liaises with these Community Boards on a frequent basis, to ensure that particular local issues and complaints reach the correct city agencies [18]. Furthermore, 311 works closely with New York City's HHS-Connect initiative, which integrates the information systems of the city's various health and human services agencies and has begun to introduce links and navigation to state and federal services (e.g. when a citizen wants to apply for a driver's license, he is referred to the DMV, a department which falls under the state's competences) [15], [18], [16].

One of the focal points for the service is the high level of customer service it has aimed to offer since its inception. Added to the three principles listed above, it becomes clear the city set out to achieve a concrete policy goal (bundling and improving scattered existing city information organizations and services) while adhering to some of the principals essential in what is understood as good governance and following an integrated approach when it comes to selecting and managing the stakeholders involved.

As far as *technology governance* is concerned, it appears the city of New York makes an effort to be as inclusive as possible towards its citizens. The 311 service originated as a phone number, which can be called free of charge, 24/7 and today offers a text messaging service, various social media account, an iPhone application and is reachable via TTY or text phone (a device for the hearing-impaired) [14]. As far as the official applications developed by the city of New York are concerned, there seems to be a focus on iOS development at the time of writing, with only two out of ten official apps available for both Android and iOS [42]. There also appears to be some criticism on the stability and use of the 311 iOS application, even by the mayor himself, as only around 4.000 requests have been made through the app, which was downloaded 23.000 times, since its launch in 2009 [57], [53].

One of the most important criticisms on the three core principals discussed above, is related to transparency and the fact that only a limited set of data gathered through 311 is openly available to developers and the public. While the city of New York does operate an *open data* portal, NYC DataMine, for a long time only a limited amount of data available there came from 311. While the DoITT is obliged to distribute monthly reports to the City Council and local Community Boards, as well as the public, the data was aggregated and for example not machine-readable, allowing little further analysis or development of new services or visualizations. This critique was repeated when the city launched a map of 311 requests in February of 2011, but did not provide access to the raw data, nor the time series of the data giving insight into the evolution of requests and complaints [33]. Although a data-driven approach was being pursued in the internal organization of 311 (e.g. sharing data and feeding results into NYCSTAT, the city's tool to track and measure data [7], or the development of an internal tool able to compile data on calls received, selected services, open tickets and the status of requests [18]), this raw information did not trickle through to the public [18]. At the end of 2011, the city began offering an NYC 311 application programming interface (API) to give developers quicker and easy access to the data generated by 311 in JSON and XML format [19]. This illustrates that after a period of hesitation on opening up specific datasets and a certain need becoming increasingly apparent with the public as well as an international move towards open data (see e.g. [18]), the city of New York has begun adopting an open approach to the data its services generate.

When considering the public governance parameters for the case of NYC 311, we conclude that several aspects related to good governance explicitly return in the approach taken by the city government, as well as a clear choice for an integrated approach when it comes to bringing relevant stakeholders to the table. With respect to the technical architecture of the service, there have been issues related to the openness and transparency of the generated data, which are gradually being ameliorated. The next section will take a closer look at the parameters related to the public value which is being generated by NYC 311.

7.2 Public Value Parameters

As far as financial aspects and the expected *return on public investment* is concerned, the main focus of the 311 project seems to lie in customer satisfaction and offering a high quality of service, rather than expecting a particular financial return. By consolidating the previously over 40 call centers, the city was able to reduce the distributed costs of these centers and was able to operate more cost-effectively, as it had a better overview [18]. In another effort to reduce costs, the city opted for the multi-channel approach, which required some initial investment, but is likely to save a lot of money in the longer term. For example, by offering the online 311 system where citizens can submit their requests themselves, some pressure is taken away from the call center, which is constantly seeing an increased call volume. By letting citizens submit requests themselves, the call center does not need to hire more staff as requests increase, keeping costs balanced [18]. The service's operating costs are carried by DoITT, which - as a mayoral agency- is funded directly by the city budget [18].

The main (somewhat intangible) return for the city is the large set of data gathered from the calls and requests coming into 311. By logging, mapping and tagging all requests coming into the service via its various channels, the city builds up rich information from which it can distill trends or structural issues in particular neighborhoods [32]. When such trends are identified, policy can quickly be altered or tailored to the specific needs of that area. The city does not list particular expected multiplier effects in official policy documents, but given the breadth of the service, it is likely to assume some secondary benefits arise as a consequence of a more efficient handling of citizen requests and concerns by government. For example, it is estimated that because of 311, the burden on the 911 emergency call centers has been reduced by 4 million calls between 2003 and 2009, allowing those centers to operate more efficiently and to focus more on their core tasks [1]. Some duplication of existing services has also been resolved by 311 [1].

In order to develop and deliver the 311 service, the city has set up *partnerships* with various private actors. One of the largest partners in first developing the call center, followed by the online portal in a later stage, is the management consulting and technology service provider Accenture. The company was contracted by DoITT to provide technical architectures, testing and deployment capabilities, the design, building and implementation of the online portal, and a large-scale integration of services. Together with the DoITT, the company built a searchable knowledge base and taxonomy of city, state and federal services; built a new, integrated call center operation and introduced several operational processes using Oracle Systems technology such as Siebel Customer Relationship Management applications and content management tools from Interwoven [1]. Additional partnerships include an outsource vendor who handles overflow calls when the 311 service sees a peak in calls (e.g. on busy days with extreme weather conditions like snow or heat), a contract with Language Line which offers translation and interpretation services to be able to offer 311 in 179 languages and a close collaboration with the City University of New York to provide part-time jobs and internships to over 130 students [18].

In the framework of the open data idea (briefly touched upon above) and the open source movement, there is some criticism on this form of contracting between the government and private companies, particularly when it comes to the re-use of data. When private companies control the data generated by a particular service, they will be less inclined to freely open it, but would rather look to sell it [21]. Another specific concern is revenue-sharing contracts that are quite popular in city technology services and in which the city pays the supplier a fixed amount for a product or service, plus a percentage of what the city has as income over a longer period of time. When the city of Chicago privatized its parking meters in 2008 as a quick means of dealing with the recession, it got \$1 billion from Morgan Stanley under a revenue sharing contract. However, the company estimates making around \$11 billion over a longer period of time, based on the revenue share [21]. As far as the city of New York is concerned the spending on private contracts has almost doubled between 1996 and now, from \$5,7 million to \$10,5 million, with an increased focus on technology companies and a limited amount of transparency as to how these contracts come about [21].

The *public value* created by the 311 service has been touched upon several times in the preceding paragraphs. The investments in the service are mainly justified by the increased quality of service offered to the citizens of the city. 311 replaced 14 pages of city telephone number listings, as well as the so-called *Blue Book* which contained 40 pages worth of agencies, departments and phone numbers, with a centralized entry point (be it via phone, mobile or online) for citizens with a request or issue in the city. Given the public nature of the service, there is no particular market failure motivation used in policy documents to justify the existence of the service. It is rather the consolidation of existing services and increased quality of service that justifies the investment in 311.

Since 2008, 311 organizes a *public evaluation* of its services. The first survey showed that citizens were pleased with the service as it scored on par with the highest ranked private call centers and much higher than other government call centers [14]. A survey at the end of 2011 showed that customer satisfaction had only increased over the years, with the remark that more could be done to ensure accessibility for all [14]. 311 also organizes an internal evaluation in the form of key performance indicators (KPIs) that need to be met. These mainly relate to the speed with which calls are answered: 90% of calls should be answered within 30 seconds, with a maximum answer delay of 3 minutes [7], [18]. Apart from the general satisfaction survey and the internal KPIs there is no broader evaluation of the public value generated by the service and there is apparently no tradition of organizing a public consultation or test of potential new services by the government.

The discussion of the new parameters for the case of NYC 311 presented above, illustrates how the specificity and complexity of a value network including a public actor in the mobile telecommunications sphere requires a higher level of granularity. The addition of the public parameters to the business model matrix allows us to perform a more detailed analysis, while maintaining the methodical strength of the original framework.

8 Conclusion

This paper set out to build a framework that could facilitate a better insight into mobile service business models when public entities play a role in the value network. We started from the business model matrix, proposed by [2], and expanded it to include public design parameters. Similarly to the distinction [2] makes between control and value parameters, we propose a division between parameters related to governance on the one hand and public value on the other. Within this division, we delineated eight new parameters to take into account. These operate on two levels: an organizational one, which focuses on how the government organizes itself in realizing the first level, namely the policy goals it sets out to reach. These two levels of analysis are included in the updated matrix.

After making this distinction, we detailed the new parameters and explained their origins. Each of them can be linked up to the original business model matrix, of which the parameters remain applicable. The newly defined governance parameters are good governance, stakeholder management, technology governance and public data ownership. The parameters related to public value are return on public investment, public partnership model, public value creation and public value evaluation. We consider these parameters to be of importance when analyzing a business model in which a public entity (i.e. a city government) is part of the value network.

This expanded framework can be both used as a tool for qualitative analysis (a posteriori) and to design (a priori) the business model of new service initiatives. While the original business model matrix is established and has been validated on several occasions, the added parameters have not. This article provides the first application of these new parameters to a real-life case: New York City's 311 service. While the parameters are generic in nature and could thus be applied in different sectors as well, this initial operationalization uses the framework in the context of Smart Cities and more specifically the mobile services sector in an urban context. The parameters allow us to perform a structural analysis of the complex value network of this public service and help to identify important aspects that would have been less likely to come to light when only using the business parameters. The addition of the public parameters to the business model matrix adds an interesting and useful layer that allows a more detailed analysis of complex mobile service business models that include public actors.

9 Limitations

The original business model matrix focuses on the relations between firms and organizations and not so much on the internal organizational structures of companies or agencies. Since the newly introduced parameters build on the original matrix, there is no specific attention to internal organizational processes. This should thus not lead to confusion when a term like governance is used: this is purely to refer to public governance and not the governing principles of single firms (as seen for example in strategic management literature). The approach is rather one of applying existing business model logic to value networks that include public actors. The initial focus is on mobile services, but it is possible the framework is also applicable to other services.

Furthermore, the case study is entirely based on document analysis (see references), due to time constraints. In future research, interviews with the involved stakeholders could be planned in order to gain a more detailed perspective.

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