Chapter 5

Policy-Related Decision Making in a Smart City Context: The PoliVisu Approach

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Abstract Dealing with the growing quest for better governance, the advancement of ICT provides new methods and tools to politicians and their cabinets on an almost daily basis. In this changing landscape, the PoliVisu project constitutes a step forward from the evidence-based decision making, going towards an experimental approach supported by the large variety of available data sets. Through utilizing advanced data gathering, processing and visualisation techniques, the PoliVisu platform is one of the most recent integrated examples promoting the experimental dimension of policy making at a municipal and regional level.

Keywords Policy-related decision making · Evidence based policy making · Experimental policies

5.1 Evidence-Based Policy Making and the Rise of ICT

The need for utilizing advanced Information and Communication Technologies (ICT) infrastructures and services, for assisting public sector decision makers in reaching justified decisions has been a primary role for technology in our society, since the previous century. Coined as “evidence-based policy making” in the UK and rapidly expanding to the US and the rest of the world since the rise of the 21st century (Sanderson 2002), this attempt to follow the practices of science in public management has found significant interest among Digital Governance scholars, practitioners and communities.

In this quest for better governance, the advancement of ICT provides new methods and tools to politicians and their cabinets on an almost daily basis. Some of the key technological offerings to support policy making in a systematic manner but not always in an easy way, are the following:

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- The vast amounts of data that can now be acquired, managed, stored and reused forming what we now call Big, Open and Linked Data (BOLD)—a basic layer for the myriad of processing tools to follow (Janssen et al. 2012).
- The development of systems and services for enabling citizen participation in various parts of the policy making cycle. Systems of e-participation, e-deliberation, even e-voting and collaborative design, are giving citizens more opportunities to take a vivid part in decision making at local, national, or international level.
- The rapid advancement in systems and services making use of artificial intelligence (AI), that offer novel opportunities to understand societal phenomena, make advanced simulations to analyse and predict the impact of policy decisions—while also making decision making faster but also less transparent in some cases (Androutsopoulou et al. 2019).
- The evolution of data visualisation and visual analytics toolsets, providing ways to give new meaning to numbers and more levels of abstraction that can support the capabilities of the specialists but also attract the attention of the non-experts (Osimo et al. 2010).

5.2 ICT-Enabled Policy Making in a Smart City Context

As technological evolutions in the areas of Big, Open and Linked Data, Artificial Intelligence, Visual Analytics and Electronic Participation platforms are getting more connected to policy making, new opportunities arise for policy makers at all levels of administration. Through multi-method applications, ICT can now assist the public sector at all levels to untap completely new opportunities such as:

- Identification of possible policy interventions, through combined big data analytics and citizen participation with advanced opinion mining.
- Ex-ante policy impact assessment, through data analysis and societal simulation, combining techno-economical with behavioural parameters.
- Ex-post impact assessment of policy and legislation, integrating the monitoring of myriads of sensor-based indications together with citizens' sentiment analysis on policy measures and laws.
- Advanced monitoring of societal evolution in relevant policy areas, through complex dashboards supporting better public policy making and even legislation preparation at real time.
- Real-time decision making, through the application of advanced algorithms making use of openly available big data, with the proper regulation for transparency and good governance.

In parallel with increased ICT utilization in policy making, another big move in societies is happening: Urbanisation and the need for stronger local governance and advanced services provision gives rise to the Smart Cities movement, where policy making is moved from the national level to regions and municipalities who now also

require the advanced ICT services at equal to the central government levels (Albino et al. 2015).

Along these two major axes of ICT utilization in policy making and the empowerment of municipal and regional administration that leads to Smart Cities, is where the PoliVisu project on “Policy Development based on Advanced Geospatial Data Analytics and Visualisation” takes place.

The PoliVisu project constitutes a step forward from the evidence-based decision making, going towards an experimental approach supported by the large variety of available data sets. Through utilizing advanced data gathering, processing and visualisation techniques, the PoliVisu platform is one of the most recent integrated examples promoting the experimental dimension of policy making at a municipal and regional level. As illustrated in Fig. 5.1, the PoliVisu approach combines data openness and citizen participation with advanced use of ICT and big data utilization, clearly differentiating from previous paradigms, like:

- Traditional e-participation systems, where citizen involvement may be great (if the system is properly used and populated) but use of ICT in policy making is minimum.
- Advanced big-data based analytics, where the amount of data, the complexity of processing and the validity of results for policy makers may be high, but citizen involvement and “buy-in” usually suffer.

Fig. 5.1 Placing the PoliVisu approach in the collaborative decision-support map

- Traditional, not open or collaborative ways of decision making, where both openness and performance are a significant question, that nevertheless are still in operation in not a small minority of cities over the world.

5.3 The Unique Characteristics of the PoliVisu Approach

PoliVisu is a Horizon 2020 Research and Innovation (R&I) project with an aim to improve the traditional public policy making cycle, using big data and geospatial information visualisation techniques. The broad objective of the project is thus to assist public sector decision making at city level to become more open and collaborative by experimenting with different policy options through impact visualisation and by using the resulting visualisations to engage and harness the collective intelligence of policy stakeholders towards the development of collaborative solutions (PoliVisu 2020).

Working with real problems from three cities and a region (Issy-les-Moulineaux in France, Plzen in Czechia, Ghent and Flanders Region in Belgium) to address societal problems linked to smart mobility and urban planning, PoliVisu vision is to enable public administrations to respond to urban challenges by enriching the policy making process with tools for policy experimentation. The project supports three different steps of the policy cycle (design, implementation, and evaluation) in an attempt to enable the city officials to tackle complex, systemic policy problems.

But which are the unique, differentiating characteristics of the PoliVisu approach? The differentiating characteristics of the project can be analysed as following:

- a. PoliVisu tools for urban and traffic planning utilize vast amounts of data, coming from a variety of sources like sensors, information systems and citizen inputs (e.g. Traffic counts, public transport data, parking availability, real time bus tracking and bike sharing data, as utilized in the Issy-les-Moulineaux case). The volume, variety and continuous flow of such data put the approach clearly in the big data area.
- b. The project shows clear merits in the Geospatial Data Visualisation, through pilot applications in Plzen and Issy-les-Moulineaux that make use of active maps that visualise traffic volumes, public works planned, passenger flows and more, allowing for dynamic monitoring and routing of traffic volumes.
- c. PoliVisu makes an important contribution in the area of real-time Dynamic Dashboards, through the PoliVisuals policy visualisation dashboard, that combines several monitoring, visualisation and real-time decision support elements in an integrated manner (PoliVisuals 2020).
- d. Algorithmic decision making is also within the project scope, utilized in automated or semi-automated, dynamic, traffic-related decision making in applications in cities like Plzen, Issy-les-Moulineaux or Ghent.
- e. The Polivisu approach shows a deep understanding of issues and problems to be tackled at Municipal and Regional Level, where policy making needs to be more

pragmatic and results-oriented but where cross-city collaboration and fundraising for ICT infrastructures can be extremely challenging.

- f. Finally, the project shows novel approaches in the areas of citizen participation and collaboration via digital means, where citizens provide data inputs, see and reuse openly available information and can also contribute to problem solving in a crowdsourcing way.

The above characteristics of the PoliVisu approach are illustrated in Fig. 5.2, where the project offering is compared to two others, well defined and currently often utilized systems:

- A traditional e-participation system, where citizen participation and municipal/regional orientation are emphasized over data acquisition, processing and visualisation that are usually weaker.
- A traditional Geographical Information System (GIS) with advanced analytics and capabilities in traffic management and urban planning, but where openness and collaboration with citizens, businesses and other authorities remain in question.

The comparative analysis shows the merits of the approach, that combines advanced data analytics, geospatial data processing and visualisation, with citizen engagement and collaboration at municipality or regional level.

Fig. 5.2 PoliVisu compared to traditional e-Participation or GIS Analytics systems

5.4 Barriers and Limitations to the Full Exploitation of Data Potential in Policy Making

All the above being said on the merits of utilizing ICT in public decision making, and also the various PoliVisu achievements, ICT-enabled, data-driven policy making is far from being a “rose-garden”. A number of barriers that prevent the use of ICT in policy making from becoming mainstream have been identified over the last decade, at least (Oliver et al. 2015; United Nations 2020). A brief analysis of those barriers and challenges is depicted in Table 5.1

5.5 Conclusion

All indications from research and practice, as well as the rapid technological evolutions in the areas of Big Data, Internet of Things, and Artificial Intelligence show that experiments-based policy making, or ICT-enabled decision support in the public sector, is a real need in public governance at different institutional levels (municipal, regional and national) in response to the growing request for transparency of public decisions.

Along this line of evolution, the PoliVisu project has made a significant contribution, through integrating large amounts of data with advanced visualisations and citizen participation, to tackle real-life urban planning and traffic management problems, going beyond the state-of-the-art in more than one ways.

Although the PoliVisu approach and results have significant reuse potential among European cities and regions, certain measures have to be taken by public sector officials and their collaborators, in order to overcome current challenges at organizational, technical and even societal levels. Then, the PoliVisu approach for evidence-based decision making using big data and advanced visualisation techniques will be more prone to success.

Table 5.1 Barriers for data-driven decision making

Barrier/Challenge	Description
Skills of Policy makers	Policy makers and decision makers (such as Ministers, Mayors, Region directors or other senior officials with decision making roles) should be able to understand and interpret reports in data analytics for value-adding insights and decision making while also being able to generate desired outcomes and impacts through strategic decision making. These new skills for policy makers may be even more difficult to become the mainstream, at local and regional level
Capacity and Interoperability of ICT tools and algorithms	Although technical barriers (e.g. the capacity of tools to assist in tackling a complex issue) are sooner or later being overcome by the rapid technological evolution, there are some aspects of the needed infrastructure that are still widely unavailable: (a) the ability of software models to analyse the non-techno/economical, behavioural aspects of societal problems or (b) the interoperability elements that would make such tools easily interconnected to one-another or (c) the mere capacity of such software models to understand and simulate situations of extreme complexity are still a quest and not a standard
Governance of Personal Data	Since most of the real-life applications of data-driven decision making involve the acquisition, processing, storage or publication of information that contains personal data of the citizens, a relevant regulatory framework has to be in place (aka in Law), so that both citizens and public sector officials feel adequately secure with such approaches. For local and regional administrations, this can be an even more high barrier, as such organisations typically cannot develop and enforce such a regulatory framework themselves, but have to wait for solutions at national level

(continued)

Table 5.1 (continued)

Barrier/Challenge	Description
Intension and Vision of Policy Makers	For experiments-based policy making attempts to turn finally successful, the high-level public sector officials (e.g. Ministers, secretaries, directors general, or other senior officials) must have a long-term vision for transforming policy making. This vision must be able to overcome or “absorb” the possible shortcomings or failures that will appear on the way. For the vision to be strong enough, an underlying intention to allow the “machine” to propose or identify solutions—against the human will sometimes, have to be present
Skills of Researchers	The researchers and practitioners that are engaged in data-driven policy making experiments must have a “multi-faceted” collection of skills: they have to be trained academically and have specific technical skills (e.g. able to deal with Python and other data tools or able to handle database infrastructure, data warehousing and statistics) while also they must have a non-trivial contextual understanding of the domain and the decision-making environment (e.g. knowledge of the city context and the specific problems with citizen mobility)
Collaboration with the Private Sector	Partnerships constitute an essential component of the data ecosystem for public decision making: a collaborative configuration involves the Government providing opportunities for public and private actors, that drive data innovation for the creation or modification of e-services with the aim of increasing economic or social benefits or otherwise generating public value. Enabling and empowering data-driven decision making infrastructures and services, involves making data widely available and creating opportunities for organisations and businesses to leverage on them

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