Computers, Environment and Urban Systems 41 (2013) 276–288

Contents lists available at SciVerse ScienceDirect

Computers, Environment and Urban Systems

journal homepage: www.elsevier.com/locate/compenvurbsys

Estimating benefits of Spatial Data Infrastructures: A case study on e-Cadastres

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ARTICLE INFO

Article history:
Received 1 February 2012
Received in revised form 24 May 2012
Accepted 26 May 2012
Available online 29 June 2012

Keywords:
Spatial Data Infrastructure
e-Government
Cadastre
Benefit
Users

ABSTRACT

The investments of public administrations and organisations for the development of Spatial Data Infrastructures (SDIs) should be informed by the analysis of the concrete benefits that such infrastructures may bring to their providers, their users, and society at large. Bibliographic evidence suggests that very little has been done in this respect, apart from theoretical hypotheses and some ex-ante assessments using the few data and experiences available. On the other hand, recent studies on regional SDIs have indicated that the application related to the Cadastre may have a big impact on society, due to the large number of users recorded. Indeed, e-Government services, including the ones providing access to Cadastral activities, have seen a big development in recent years. This paper analyses the case study of e-Cadastre, focusing on the benefits that society may obtain, in comparison with the traditional paper-based Cadastral service which still coexists with the e-Cadastre. The paper will present and analyse the results of a survey to several European Cadastral Agencies, focusing on the benefits for the users, in terms of time and cost saved. The findings show that the shift from the paper-based alternative to the electronic alternative helps citizens save time and money, and therefore provides partial justification to the required investments.

1. Background

1.1. Introduction

During the last 20 years we have witnessed concerted efforts worldwide to develop Internet-based infrastructures to make data and information products more widely accessible and shareable to support science, public policy in different thematic areas, and provide improved services to public sector, citizens and business.

Along these lines, the e-Government phenomenon, intended as the use of Information and Communication Technology (ICT) to improve services provided by public government to businesses and citizens, has transformed the way in which citizens and business interact with the public sector and access public sector data, while allowing a more efficient management of government service delivery.[2] As pointed out by Nogueras-Iso, Latre-Abadía, Muro-Medrano, and Zarazaga-Soria (2004), public sector administrations (PAs) are the main providers of geographic information, representing great part of the public sector data needed to deliver governmental services. For this reason, they need Spatial Data Infrastructures (SDIs) to manage and coordinate the use of such spatial data. We intend SDIs as the "relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data" (Nebert, 2004, p. 8[3]).

In Europe, the INSPIRE Directive (European Commission, 2007) has accelerated the pace of SDIs implementation as it requires that all Member States of the European Union develop their own infrastructures and make them interoperable through agreed technical specifications.

The Joint Research Centre (JRC) of the European Commission is the overall technical coordinator of INSPIRE. One of its responsibilities is to identify suitable frameworks that may be useful to the Member States in assessing the impact of their infrastructural investments in INSPIRE. With this in mind, the JRC, which was involved in the early impact assessment of the INSPIRE proposal in 2003–04 (Dufourmont, 2004; INSPIRE FDS & Craglia, 2003) launched a programme of activities to verify whether the assumptions on costs and benefits made at that time could be verified in practice. This programme is still in progress but has yielded some interesting results, largely validating, so far, the assumptions made in 2003 (Craglia & Campagna, 2010; Craglia & Nowak, 2006; Craglia, Pavanello, & Smith, 2010; Garcia Almirall, Moix Bergadà, Queraltó Ros, & Craglia, 2008).

In parallel, the international community, involving experts from Australia, Canada, US, Europe has organised various workshops since 2006, in order to share experiences and discuss the rationale

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[3] Available at http://www.gsdi.org/docs2004/Cookbook/cookbookV2.0.pdf.

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http://dx.doi.org/10.1016/j.compenvurbsys.2012.05.004

and the steps for a sound assessment of the value of geoinformation, Earth observation and Spatial Data Infrastructures. Detailed reports are available in Craglia and Nowak (2006), Macauley and Laxminarayan (2010), HafenCity University (2010), the Special Issue of the International Journal of Spatial Data Infrastructures Research about the Value of Geographic Information (Borzacchiello & Craglia, 2011; Various authors, 2010).

In the course of these studies, three elements emerged that are at the basis of the work reported in this paper. Firstly, that estimating benefits is even more difficult than estimating costs; secondly, that to do so it is worth focusing on specific application areas rather than generic SDIs, and on small benefits taking place many times than looking for the big one-off benefit. Thirdly, that of the many application areas, those based on land and property are some of the most widely used. Evidence in this respect emerged from a comparison of advanced regional SDIs in 2010 (Craglia & Campagna, 2010): those who did not provide access to cadastral services had users in the range of a few thousand or tens of thousands; those who provided access to cadastral services had millions of users.

The objective of this paper is (i) to study whether there are benefits deriving from the usage of e-Government services, compared to traditional non-electronic services and (ii) to present a methodology to estimate these benefits. For the reasons outlined above, we have focused on the case study of the e-Cadastre, namely the electronic system delivering the services traditionally provided by the Cadastral Office. As defined by Williamson, Enemark, Wallace, and Rajabifard (2010), the Cadastre "is at the core of Land Administration System". It provides "large-scale representations of how the community breaks up its land into usable pieces". This spatial information traditionally has been stored in paper format, but with the advent of GIS has been digitalised and made available in electronic format. e-Cadastres use digital cadastral information to provide governmental services to the citizens, business and other PAs (G2C, G2B, G2G[4]), within an e-Government framework, and they may be supported, or not, by SDIs. However, Williamson et al. (2010) argue that "efficient and effective Land Administration Systems" – including the Cadastre component – "that supports sustainable development require an SDI to operate".

The remainder of the paper is organised as follows: the rest of Section 1 provides a synthetic review of the studies on the impact of Spatial Data Infrastructures, e-Government and e-Cadastres. Section 2 presents the methodology used to seek information about the usage of Cadastral services, the main variables investigated in the study and the survey design. The main findings are then explained in Section 3, in terms of survey results, and their extrapolation to the whole of Europe, while in Section 4 some reflections on outcomes and conclusions close the paper.

1.2. The value of public sector data

Support to e-Government exists in many countries and continents and is being monitored for example by the Organization for Economic Cooperation and Development (OECD).[5] Recently the European Commission launched its Open Data Strategy for Europe, which is "expected to deliver a €40 billion boost to the EU's economy each year"[6] by making existing Public Sector Information (PSI) more widely re-usable also for commercial purposes, creating added value services, products and new jobs.

Claims as the one above are very important to justify the large investments made, and organisational changes that these investments imply, particularly at times of financial austerity. To retain credibility, these claims need to be backed up by evidence. For this reason, during the last five years we have witnessed a slow but sustained increase in research activities aimed at measuring the impacts of these investments. Examples in the area of Earth Observation include for example Bernknopf, Rabinovici, Wood, and Dinitz (2006), Macauley and Diner (2007), Khabarov, Moltchanova, and Obersteiner (2008), Fritz, Scholes, Obersteiner, Bouma, and Reyers (2008), Smirnov and Obersteiner (2009), Rydzak, Obersteiner, and Kraxner (2010), and Moltchanova, Khabarov, Obersteiner, Ehrlich, and Moula (2011). Examples of works related to Geographic Information (GI) include case studies in US by Smith and Tomlinson (1992), Bernknopf, Brookshire, Mc Kee, and Soller (1997), Gillespie (2000), Baltimore County Office of Information Technology (2001); and in Australia by Price Waterhouse Coopers (1995), ACIL Tasman (2008). More specific to SDIs is the work fostered in Europe by the adoption and implementation of the INSPIRE Directive, which places requirements on the Member States to report regularly on the costs and benefits associated with the implementation of the Directive. Progress in over 30 European countries on the implementation of "inspired" SDIs has been reported in a set of studies by Vandenbroucke et al. (2012), while Crompvoets, Rajabifard, van Loenen, and Fernandez (2008) have collected a range of theoretical perspectives informing the work on SDIs.

1.3. The spreading of e-Government

The adoption of e-Government services has grown rapidly in the last decade (Rowley, 2011), firstly as isolated pilot cases, then following institutional and national strategies. The first country adopting an e-Government national strategy was Canada with the "Government online" initiative in 1999[7] (Reddick & Turner, 2012), followed by the e-Japan strategy in 2001 (Yamada, 2010), the American e-Government Act in 2002,[8] the European PSI Re-use Directive in 2003 (European Commission, 2003), and the Australian e-Government strategy in 2006[9] (Australian Government, 2006). The spreading of e-Government strategies is monitored by the EU ePractice portal (http://www.epractice.eu/en.), which has collected more than 1500 cases of best practices from 2008 to 2011 in 35 countries, including African, Oceanian, Asian and North/South American countries, in the field of e-Government, e-Health and e-Inclusion.

Attempts to assess the impacts of e-Government include for example the US Report to the congress about the benefits of e-Government initiatives (OMB, 2011), containing interesting "descriptions of each e-Government initiative, related objectives, costs, benefits, risks and development statuses as well as sources and distribution of e-Government funding", also in quantitative terms. In Europe, the EU funded e-Government Economic Project (eGep) developed a framework to measure the benefits of e-Government, based on the findings of an extensive survey of 64 e-Government projects within and outside EU. According to this framework, benefits of e-Government could be viewed along three dimensions: (i) efficiency, looking at benefits within organisations, in order to understand financial and organisational value; (ii) effectiveness, looking at benefits outside the organisations, to understand the "constituency value"; (iii) democracy, to see whether there is impact on the society as a whole, i.e. to understand the political value.

[4] Government to citizens, Government to Business, Government to Government.

[5] See OECD e-Government project at http://www.oecd.org/department/0,3355,en_2649_34129_1_1_1_1_1,00.html.

[6] http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1524&format=HTML&aged=0&language=EN&guiLanguage=en.

[7] http://www.tpsgc-pwgsc.gc.ca/apropos-about/fi-fs/ged-gol-eng.html.

[8] http://www.archives.gov/about/laws/egov-act-section-207.html.

[9] http://www.finance.gov.au/publications/2006-e-government-strategy/index.html.