2013

The Wireless Readiness Innovation Index: Enhancing the Effectiveness of the Public Sector in New Service Introduction

Anna E. Kasimati
Athens University of Economics and Business, akasim@aueb.gr

Panos Kourouthanassis
Ionian University, pkour@ionio.gr

Efpraxia D. Zamani
Athens University of Economics and Business, ezamani@aueb.gr

George M. Giaglis
Athens University of Economics and Business, giaglis@aueb.gr

THE *WIRELESS READINESS INNOVATION INDEX*: ENHANCING THE EFFECTIVENESS OF THE PUBLIC SECTOR IN NEW SERVICE INTRODUCTION

Kasimati, Anna E., Athens University of Economics and Business, Greece, akasim@aueb.gr

Kourouthanassis, Panos E., Ionian University, Greece, pkour@ionio.gr

Zamani, Efpraxia D., Athens University of Economics and Business, Greece, ezamani@aueb.gr

Giaglis, George M., Athens University of Economics and Business, Greece, giaglis@aueb.gr

Abstract

National and regional public authorities need to align their planned introduction of mobile/wireless innovation with the maturity levels of both their workforce (who will manage and maintain the new applications) and their citizens (who will use them). We draw on the experience of working with local authorities in three Mediterranean countries (Greece, Italy and Spain) to develop a method towards the effective introduction and adoption of innovative mobile services by public organizations. Specifically, we discuss the development and pilot implementation of a) the "Wireless Readiness Innovation Index", a tool that aims at measuring the local authority's and end users' readiness towards providing and using innovative wireless services and b) the "Wireless Innovation Operational Toolkit", a tool that aims at matching users' and local authority's readiness levels with candidate services so as to maximize the likelihood of successful introduction and sustained use.

Keywords: wireless, mobile, innovation, toolkit, government, Mediterranean

1 Introduction

Information and Communication Technology has been widely recognised as an important driver of social/economic growth as well as an enabler of innovation and competitiveness. Additionally, technological innovation has proved to be vital to confront cost pressures and to increase the efficiency of public services (Mulgan & Albury, 2003) and until now, there is an ever increasing number of Public Sector organisations that aspire to take advantage of the merits of wireless technology. This paper aims to provide LAs with the necessary tools to assess their current readiness for the development and effective use of such services. To this end, we present the Wireless Readiness Innovation Index (WiRII) and the Wireless Innovation Operational Toolkit (WiROT), the first systematic research efforts to measure wireless readiness in public sector organisations.

2 The Wireless Readiness Innovation Index (WiRII)

Towards the finalization of WiRII's structure, it was necessary to identify which are the features that can impact the Wireless Innovation Readiness of a LA. At first, in order for a LA to be able to develop and to efficiently provide innovative services, it needs to be itself an innovator. As a result, the WiRII should include an **Innovation Index** aimed at measuring LA's innovation capacity. Moreover, taking into account that a body's Innovation Readiness is closely related to its ability to exploit leading technologies, the **Technological Readiness** of both LA and End Users (EU) should also be measured. Finally, since the WiRII refers to wireless innovation, the **Wireless Readiness** of both the LA and EU is also incorporated in the WiRII. As a result, the proposed WiRII is developed around three main components: Innovation, Technological Readiness and Wireless Readiness. Each component is analysed in sub-indexes and WiRII consists in total of 79 micro-indexes, that is, variables, allowing for more of the complexity and diversity to be captured (Table 1).

INNOVATION INDEX	TECHNOLOGICAL READINESS	WIRELESS READINESS
R & D activities (8 variables) **Consultancy & Strategic Alliances** (4 variables) **Intangible assets** (4 variables) **ICT Infrastructure** (7 variables) **Human Resources** (8 variables) **Institutional performance** (8 variables) **E-government, online services** (2 variables) **Origins of innovation** (6 variables) **Innovation outputs** (4 variables) **Impacts & Scope** (3 variables)	**Optimism** (3 variables) **Innovativeness** (3 variables) **Discomfort** (6 variables) **Insecurity** (3 variables)	Wireless Savvy/Literacy **(LA & EU)** Wireless Broadband Access **(LA & EU)** Wireless social networking **(LA & EU)** Wireless Innovation (LA) Organizational Authority (LA) Wireless Ecosystem (LA) Wireless Technology (LA) Wireless Content (LA) Wireless Interconnectedness (LA) Wireless mass collaboration (LA)

Table 1 The WiRII structure

Innovation: The method towards the creation of the WiRII follows that employed by NESTA (LSE Public Policy Group, 2008), to ensure that the proposed index can be equally acknowledged and accepted by researchers and practitioners concerned with innovation. This index is divided into four pillars, Innovation Inputs, Innovation Enablers, Innovation Outputs and Innovation Impact.

Technological Readiness (Local Authority, End-Users): Refers to users' willingness toward adopting and using technology in general to fulfill their goals and complete tasks both in the everyday and the work environment. The WiRII's Technological Readiness component develops based on the Parasuraman's index (2000), an index that recognized the primary determinants of technology readiness and grouped people into distinct segments based n their technology readiness, and is structured around four sub-indexes: ***Optimism*** (a belief that technology offers people increased control, flexibility, and efficiency in their lives), ***Innovativeness*** (a tendency to be a technology pioneer and thought leader), ***Discomfort*** (a perceived lack of control over technology and a feeling of being over-whelmed by it), and ***Insecurity*** (distrust of technology and skepticism about its ability to

work properly, which is a strong predictor of human behaviour within a computer environment, e.g. (Xiu & Liu, 2005). Of these four sub-indexes, optimism and innovativeness are drivers of technology readiness, whereas discomfort and insecurity are inhibitors.

Wireless Readiness (Local Authority, End-Users): Identifies the enabling factors for a LA to fully benefit from wireless ICT advances while highlighting the joint responsibility of all social actors, namely end users (EUs), employees and decision makers. This component derives from Snyder's (2009) research on 4G networks and applications, and is measured using ten sub-indexes. However, most of the sub-indexes that Snyder developed for accessing users' Wireless Readiness are primarily focused on the internal environment of an organisation. Therefore, in an effort to keep only the most relevant ones to the EUs' nature, the EUs' Wireless Readiness includes only the selected sub-indexes (presented in Table 1) while LA's Wireless Readiness examines all ten sub-indexes.

As in the case of all widely accepted indexes [e.g. (Dutta, et al., 2003; LSE Public Policy Group, 2008; Parasuraman, 2000)], the three component indexes are treated as equal. As a result, the WiRII is a simple average of the three component index scores, while each component index's score is a simple average of its sub-indexes:

WiRII = $^1/_3$ Innovation + $^1/_3$ Technological Readiness + $^1/_3$ Wireless Readiness

Similarly, all three component-indexes are computed again as simple averages:

Innovation = $^1/_4$ ($Input_{mean}$ + $Enablers_{mean}$ + $Outputs_{mean}$ + $Impact_{mean}$)

Technological Readiness = $^1/_4$ ($Optimism_{mean}$ + $Innovativeness_{mean}$ - $Discomfort_{mean}$ - $Insecurity_{mean}$)

Wireless Readiness: $^1/_n$ (WR1 + … + WRn), n=10 for LAs and n=3 for EUs (see above).

3 Wireless Readiness Operational Toolkit (WiROT)

The Wireless Readiness Operational Toolkit takes into consideration the readiness status of the LA, deriving from the calculation of the Wireless Readiness Innovation Index, together with a set of potential mobile/wireless services and applications, and proposes the most feasible and relevant wireless services to be deployed. Specifically, it suggests the most appropriate mobile and wireless innovative services that will allow the given LA to augment its innovativeness and effectiveness, while offering useful services to citizens. The toolkit might be interpreted as an atypical decision making information system which a) takes as input the readiness indexes for a LA and its EU base, as well as the innovation index of the LA, b) presents the current capabilities of the LA to develop, and/or deploy mobile/wireless applications and c) identifies new pertinent mobile/wireless applications and services that will increase the LA's innovation index should the LA decides to implement them. The development of the WiROT was based on an Expert Survey that was carried out based on the principles of the Delphi Method. The experts were researchers and practitioners in the field of mobile and wireless technologies, as well as public sector representatives operating in the field of public sector innovation and R&D activities. The expert survey was aimed to identify the wireless services that should be incorporated in the WiROT, accompanied by the relevant readiness score (as calculated by the WiRII) for both LAs and EUs. Following the expert survey, the identified candidate wireless services were mapped onto the WiROT matrix. The matrix, as shown in ***Figure 1***, incorporates two axes: the horizontal axis, which refers to LA's readiness, and the vertical axis, which refers to EUs' readiness as calculated by the WiRII. The applications that present low barriers for implementation are placed at the bottom left corner of the matrix (low EUs' and LA's readiness), while innovative mobile services (such as augmented reality applications or RFID) are placed on the up left corner of the matrix (high EUs' and LA's readiness). The WiROT also provides information on the maximum innovation capacity that LA and EUs can achieve, based on their WiRII scores. This feature has also been incorporated and illustrated in the matrix with the form of a straight line (Appendix).

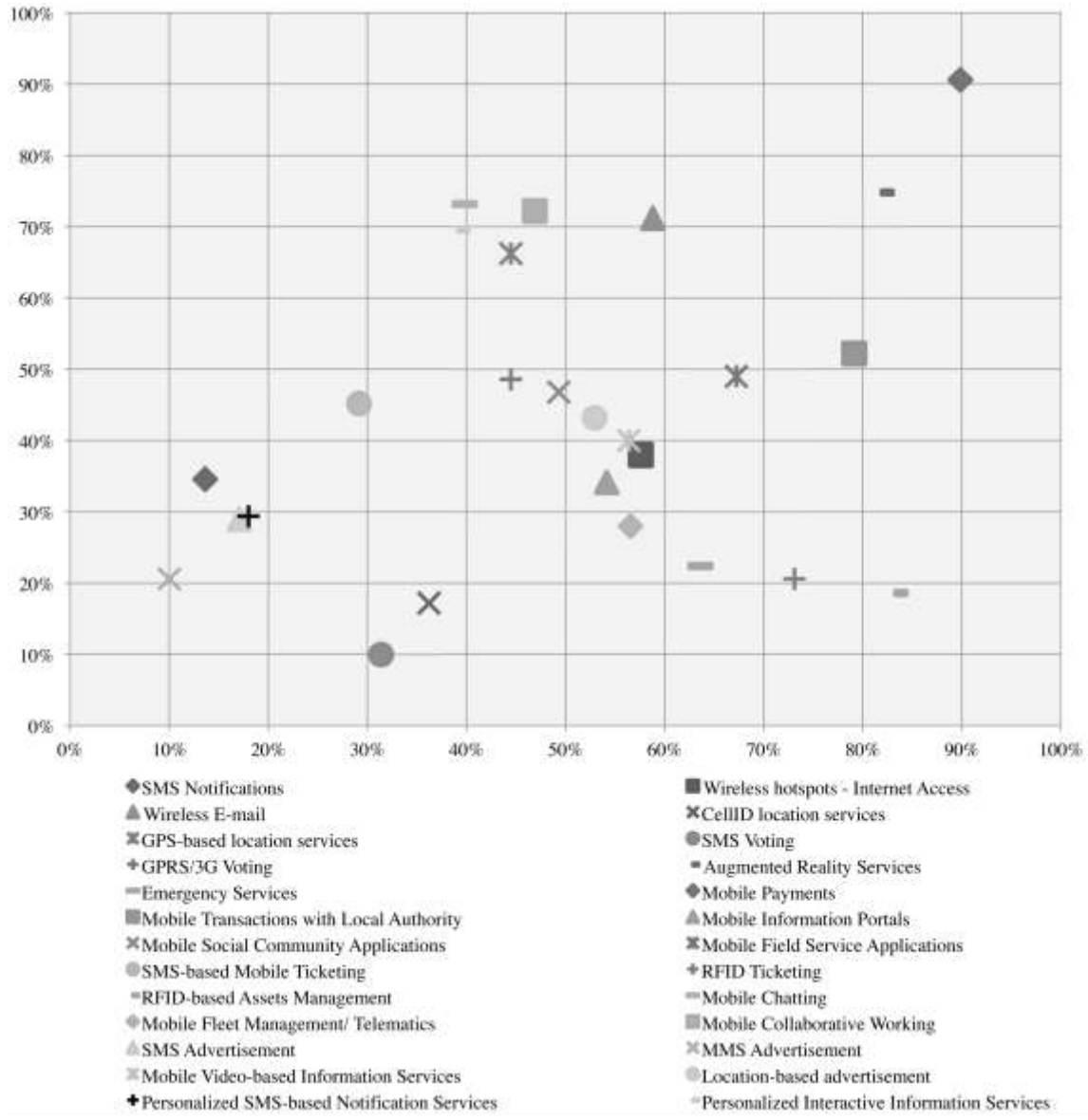

Figure 1 Mapping of the proposed services according to the survey's results

4 Pilot application & Results

The WiRII and the WiROT were pilot applied in four LAs in Larissa (Greece), Genoa (Italy), Velez-Malaga (Spain) and L'Aquila (Italy). The results calculated varied considerably, illustrating cross-country differences in the adoption of wireless services by EUs and LAs (Table 2). Specifically, the two Italian LAs were found to be Wireless Innovation readier compared to the other two participating regions. Moreover, in all regions studied the EUs are readier for wireless innovation than the respective LA, which can be due to the bureaucratic operations of LAs.

Local Authority	Innovation Capacity	Technological Readiness		Wireless Readiness		LA Readiness	EU Readiness
		LA	EUs	LA	EUs		
Larissa	22.00%	38.60%	40.20%	15.00%	16.60%	26.80%	28.40%
Genoa	57.2%	49.60%	55.40%	22.60%	33.40%	36.10%	44.40%
Velez-Malaga	62.6%	49.60%	43.80%	0.00%	16.60%	24.80%	30.20%
L'Aquila	32.20%	53.60%	53.00%	33.80%	41.60%	43.70%	47.30%

Table 2 WiRII results for Local Authorities

These scores were then mapped on the WiROT matrix. Table 3 shows the candidate services proposed by the WiROT per LA. The respective LAs, after having further analysed their needs and capacities, decided on the specific services to deploy in order to improve their wireless innovation readiness. The selected services (shown in bold in Table 3) were piloted during June 2011-February 2012 and LAs acquired useful experience on using wireless technologies in order to provide citizens with innovative e-services.

<table>
<tr><th></th><th>Larissa</th><th>L'Aquila</th><th>Genoa</th><th>Velez-Malaga</th></tr>
<tr><td rowspan="3">Recommended Services</td><td>Personalised SMS-based Notification Services</td><td>GPRS/3G Voting</td><td>Personalised Interactive Information Services</td><td rowspan="3">Mobile Field Service Applications</td></tr>
<tr><td>SMS Advertisement</td><td rowspan="2">Mobile Social Community Applications</td><td rowspan="2">Mobile Social Community Applications</td></tr>
<tr><td>SMS voting</td></tr>
<tr><td rowspan="2">Commodity Services</td><td rowspan="2">MMS Advertisement</td><td>SMS Voting</td><td>SMS Notifications</td><td>SMS Advertisement</td></tr>
<tr><td>Cell ID Location Services</td><td>Mobile Information Portals</td><td>MMS Advertisement</td></tr>
</table>

Table 3 List of candidate services for LAs, based on the implementation of the WiROT

5 Conclusions, Limitations and Future Research

The aim of the WiRII and the WiROT is to guide LAs towards increasing their efficiency and productivity by improving the delivery of mobile/wireless services for employees, businesses, and citizens. The WiRII and the WiROT make an important contribution in the field of Mobile Public Sector Innovation since they propose potential mobile/wireless services so as to enhance the readiness of the stakeholder group (EU, LA) that lags behind. Moreover, the proposed method can minimize the risks and maximize the benefits of LA's investment in new technologies and services, by indicating the most suitable mobile/wireless service. However, since WiRII and WiROT have been developed for specific local authorities, additional tests across other public and business service organizations are needed to enhance the validity and the conclusiveness of the proposed methodology. In addition, it should be noted that the WiROT is time dependent. This means that it should be upgraded often to be up-to-date and include the latest mobile/wireless services and applications.

6 Acknowledgments

This research was carried out within the framework of the WiNNOVATE project, which was co-financed by the European Regional Development Fund (ERDF) under the MED Programme. We thank the project's research partners, i2CAT (Spain) and Radiolabs (Italy), who have also contributed to the development and evaluation of the WiRII and the WiROT.

References

Dutta, S., Lanvin, B., & Paua, F. (2003). The Global Information Technology Report 2002–2003. Readiness for the Networked World. New York, Oxford: INSEAD.

LSE Public Policy Group. (2008). Innovation in Government Organizations, Public Sector Agencies and Public Service NGOs. Innovation Index Working Paper. UK: NESTA.

Mulgan, G., & Albury, D. (2003). *Innovation in the Public Sector*. UK: Strategy Unit, Cabinet Office.

Parasuraman, A. (2000). Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research, 2*(4), 307-320.

Snyder, S. (2009). The New World Of Wireless: How To Compete In The 4g Revolution: Wharton School Publishing.

Xiu, D., & Liu, Z. (2005). *A Dynamic Trust Model for Pervasive Computing Environments.* Paper presented at the The Fourth Annual Security Conference, Las Vegas, NV.

APPENDIX

The line that illustrates the maximum innovation capacity that LA and EUs can achieve, based on their WiRII scores, is characterized by the following two features (***Figure 2***):

Length: Takes into account the size of the rectangle placed at the bottom left corner of the matrix, using the following formula:

$Length_{IIS} = Length_{Diag} \times (Weight \times IIS_{LA})$, where:

$Length_{IIS}$: length of the innovation index line;

$Length_{Diag}$: length of the diagonal of the bottom left rectangle;

Weight is determined by a maximum estimated innovation number (e.g. 30%);

IIS_{LLA} is the score of the Innovation Index for the LA under investigation.

- **Angle:** It is dictated by the dimension of the toolkit that requires more strengthening for the LA under investigation. For example, a LA that scores 40% readiness on the LA dimension and 55% on the EU readiness will require the deployment of m/w applications that increase LA readiness. The angle of the innovation index line attempts to meet this requirement.

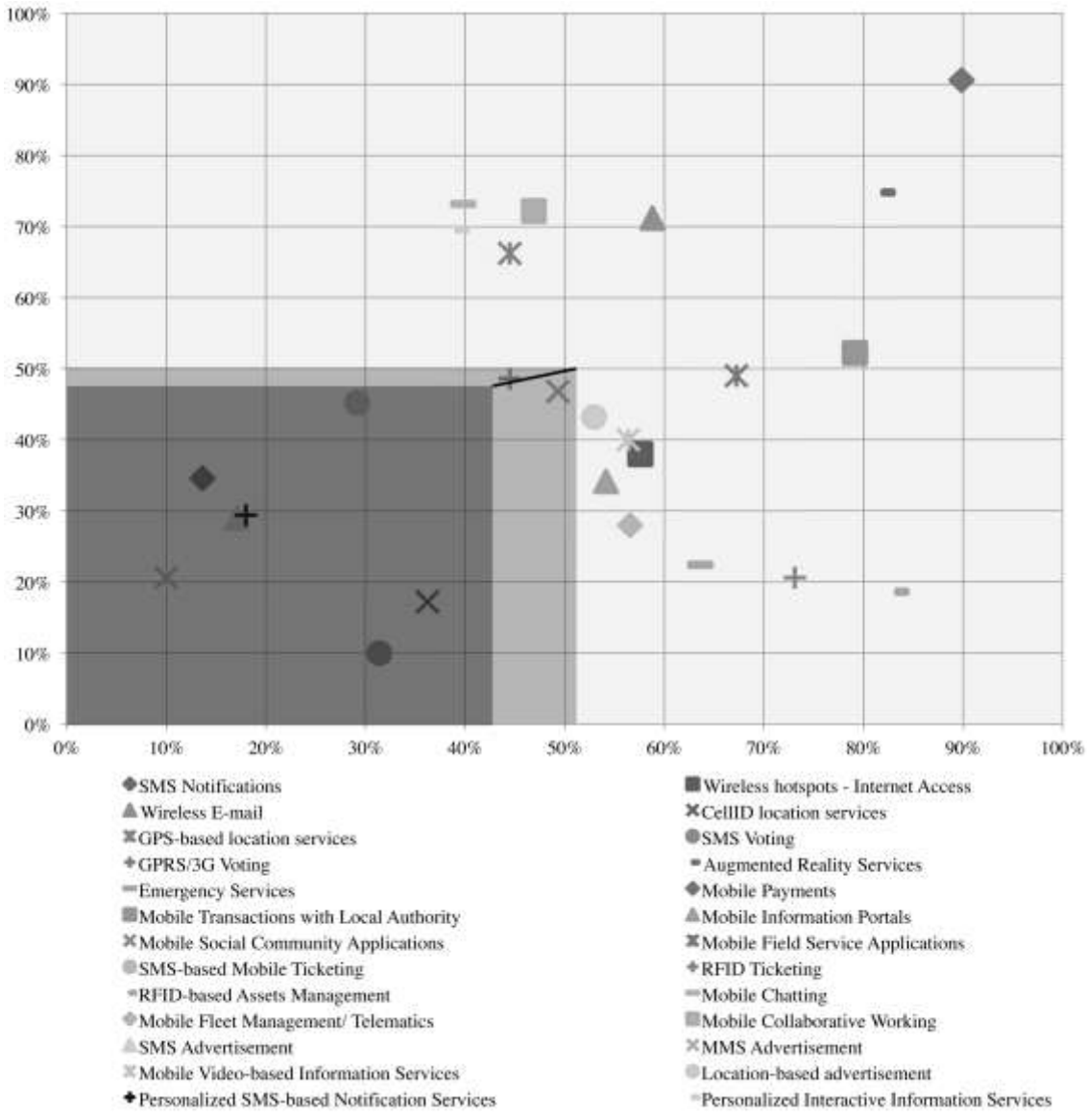

Figure 2 Application of the Operational Toolkit