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**UNU-EGOV**

# SmartEGOV

## Harnessing EGOV for Smart Governance (Foundations, Methods, Tools)

**NORTE-01-0145-FEDER-000037**

**FINAL REPORT**  
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**DOCUMENT**

**SHORT DESCRIPTION**

SmartEGOV Final Report

Final Report for SmartEGOV - NORTE-01-0145-FEDER-000037 project.

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# 1. Introduction

## 1.1 Objectives

The SmartEGOV project aims at harnessing ICT and EGOV technologies and processes to promote effective, secure and integrated smart governance structures at all levels of Administration. In particular, it aims at congregating synergies between major players --- government, academia, private sector, civil society --- to build a research and innovation laboratory for designing and testing new smart (e-)governance solutions, as well as an internationally renowned think-tank for inter-sectoral and multi-level public administration problems.

Those objectives are pursued in strong articulation with the newly established **Operational Unit of the United Nations University on Policy-driven Electronic Governance (UNU-EGOV)**, hosted by the University of Minho and in the fulfilment of the bilateral agreements between the UNU and the Portuguese Republic signed on 23 May 2014. SmartEGOV boosts such a unique opportunity to consolidate in the North region a pole of excellence in EGOV research and innovation, building a global brand with a clear regional, national and international impact.

The project is structured around three complementary levels, each of them corresponding to a specific Research Line extended horizontally along the 3 years of project development.

### **RL1 - A Laboratory for EGOV Research-Innovation**

Aims at implementing a multidisciplinary research-innovation laboratory for Smart Governance.

### **RL2 - Smart Governance Innovative Frameworks**

Aims at developing 3 frameworks for Smart Governance frameworks corresponding to the three stages of the smart governance process (design, healing and monitoring). At each of them a specific problem will be addressed: law quality, modelling and verification; administrative burden reduction and evaluation and monitoring of local EGOV initiatives.

### **RL3 - EGOV for Context-specific Public Service Deliver**

Aims at developing the foundations, methods and tools for context-aware public service delivery, addressing a single research-innovation area, identified in the literature as a priority in smart governance research.

## 1.2 Achievements and Assessment

The project was signed in April 2016. Since January, however, the team has started structuring the project and establishing its operational links with UNU-EGOV, which plays a key role in achieving the objectives proposed. The project was reprogrammed and extended in time in 2018 and 2019.

It is fair to note that the objectives proposed were fully met, namely in what concerns the main project deliverables: the publication of research papers in international, relevant journals and conferences.

The project achievements, detailed in the following sections (with specific references to each of the three Research Lines), can be summarized as follows

- **Publications:** 136 research papers of which 45 are policy-oriented (i.e. bridging between academic research and public policies and/or policies case studies). Of these 136 papers, 23 are journal papers, 6 book chapters, and 107 international, refereed conference papers. Additionally, 15 policy-driven, applied research publications, in the form of SmartEGOV Technical Reports with high dissemination among the UN system and worldwide.
- Several **proof-of-concept, prototype implementations of repositories and tools**, created along the different research lines.
- **14 PhD thesis initiated** during the project (5 already concluded).
- Support to the realization of 5 top **International Conferences** in the area, and to the edition of 5 Books of proceedings, published by Springer Verlag, ACM and IOS, respectively, and several research and dissemination seminars.
- Several **other internationalization initiatives**, including fostering a consortium for a EU Research project approved: E+ KA2: Cooperation for innovation and the exchange of good practices - Knowledge Alliances ERASMUS+ Call: EAC/A03/2016; and an intensive cooperation with the Community of Portuguese Speaking Countries (CPLP) and several Governments. In particular, the project lead the elaboration of the National Strategy for Digital Governance of São Tomé e Príncipe.
- Jointly with UNU-EGOV, the project formally joined the Advisory Working Group for the UN eGovernment Index, published by UN DESA, the most important international index in the area. The project initiated a new component in the survey devoted to assessment of EGOV at the local level. A study of 40 different cities in 40 different countries was conducted for the 2018 survey, later lifted to 100 cities and 100 countries for the 2020 survey. This was assessed as an important recognition of our impact among the relevant international players in the area.
- The development of a **capacity building portfolio** with 7 executive training short courses (1.5 ECTS each) and 12 regular courses (from 2.5 to 3 ECTS each) on the main project themes, distributed over the three Research Lines. Some of these courses were already tested in different contexts and countries, including Portugal, Angola, Indonesia, Mozambique, East Timor, Cabo Verde, S. Tomé e Príncipe and Georgia.

### 1.3 Report Structure

The following three sections detail the project achievements per each of the three Research Lines. For each one, specific sub-sections i) recall the RL objectives; ii) highlights major achievements and activities; iii) report on eventual deviations; iv)

enumerates all the publications produced; and v) checks the number of PhD thesis initiated within the SmartEGOV.

## 2. RL 1 - A Laboratory for EGOV Research-Innovation

Principal Investigator (Line Coordinator): *Luis Soares Barbosa*

### 2.1 Summary of objectives

RL1 aims at developing multidisciplinary research on EGOV with innovative, cross-level and cross sectorial contributions to different domains of Smart Governance.

The objectives of this RL are:

- O1 - To foster research, policy, technology and innovation in highly-demanded areas, some of them related to emergent societal challenges, including but not limited to the efficiency of administrative processes, sustainable solutions for process dematerialisation, institutional transparency, accountability and open government, inclusion and participation, etc.
- O2 - To identify, develop and package remarkable experience and achievements of Portugal in this area, and share and promote this experience internationally.
- O3 - To become a trustworthy partner and a key player for research, consultancy, executive training and capacity building at all levels of public administration in Portugal, the European Union and in other countries, with a particular focus on the Portuguese-speaking countries

### 2.2 Activities and Achievements

The basic research activities developed in RL1 are documented in the 41 refereed publications (in journals and international conferences) enumerated below. Almost half of them are devoted to the translation of research findings into relevant policy instruments, a main characteristic orthogonal to all three Research Lines of SmartEGOV.

The activities of RL1 were carefully planned to achieve the classes of results announced in the proposal. Three such classes (R1 to R3) were listed in the original proposal. For each of them we highlight one of the major achievements. Thus,

***R1. New results on harnessing emerging ICT methods, tools and techniques for addressing current and future EGOV challenges.***

A main highlight in this class focus on development of new methods and prototype-tools for dependable, inclusive, and responsible identification systems. These are most relevant to increase access to finance, healthcare, education, and other critical services, as well as to improve efficiency and enable innovation for public- and private-sector services, such as greater efficiency in the delivery of social safety nets

and facilitating the development of digital economies. Results were obtained in the following areas: i) infrastructure-level technologies; ii) secured cryptography-based storages and communication protocols; iii) best practices for mobile applications to provide the best trade-of between dependability and usability while exploiting different assumptions the operating environment.

As a complementary activity, the team developed a capacity building portfolio with a number of executive training courses (from 1.5 to 3 ECTS each) on the main themes on this Research Line (namely, *Open Data and Data Analytics; Information Security; e-Transformation Change Management; Mobile Government Applications; e State Digital Certification Platforms*)

***R2. Proof-of-concept implementations and pilot platform tests of specific applications of these results in concrete EGOV scenarios.***

Several prototype-level implementations for responsible identification systems, already mentioned above, were developed and tested by different partner organizations. In particular, the project participated with INCM and AMA in the development of a Mobile Driving License service encompassing a number of mobile apps and a blockchain-based distributed storage (backed with PKI). Other prototypes of digital identity solutions for Mozambique's academia were also developed in the context of project outreaching activities.

***R3. New results on the translation of specific research findings into relevant policy instruments.***

This was a main concern in this RL (as well in the whole project) as witnessed by the number of specifically oriented publications. Cooperation with international think tanks and global institutions was also promoted. As a recent example, SmartEGOV participated in an Expert Group Meeting promoted by UN DESA on harnessing disruptive technologies for public administration (2018), and in the definition of the Digital Agenda for CPLP countries (2017). A number of seminars for dissemination of results and exploring them in real contexts occurred (Trinity college, Dublin; PASP Cooperation Forum in Praia, Universidad Diego Portalles, Santiago de Chile; Peking University, Beijing, Government of S. Tomé e Príncipe, Government of Brazil, etc.)

A strong collaboration with CPLP should be pointed out at this stage. Some highlights of this cooperation are i) Edition of a book on a case-study on EGOV Research and Innovation: "The EGOV experience on CPLP countries", currently under publication by INCM; ii) the coordination of an Expert Group Meeting devoted to the digital agenda in different contexts (2007); iii) a one-month long executive training for 24 senior administrative officers from Angola, Cabo Verde, Guiné-Bissau, Moçambique, S. Tomé e Príncipe and Timor Leste, held in Couros from 30 October to 24 November 2016.

## 2.3 Deviations

No specific deviations from the original proposal occurred. Note that, differently from the remaining research lines (RL2 and RL3), each of which focus on a specific, challenging problem domain, RL1 was expected to provide a basic conceptual infrastructure for cross-fertilizing research between i) emerging ICT methods, tools and techniques; ii) local, national and sectorial administrative problems; and iii) policy relevant translations of scientific findings.

## 2.4 Publications<sup>1</sup>

- **Publications (refereed scientific papers in journals and international conferences) [24/12]**
  - *Development Impacts of Free Public Wi-Fi in Johannesburg* - Backhouse, Judy and Chauke, Hlelo. In Handbook of Research on Managing Information Systems in Developing Economies, Hershey: IGI Global, pp. 374-395, 2020.
  - *An Assessment of Open Government Data Benchmarks* - Kawashita, Ilka, Baptista, A., and Soares, Delfina. In Proceedings of the EGOV-CeDEM-ePART 2020, Lidingö, Sweden, 2020 (in print).
  - *E-government maturity models: more of the same?* - Kawashita, Ilka, Baptista, A., and Soares, Delfina, Proceedings of the 7th International Conference on eDemocracy & eGovernment (ICEDEG 2020). Buenos Aires, Argentina, 2020 (in print).
  - *Evidence-based research for Intelligent Governments: Lessons learned from the Justice system* - Lameiras, Mariana, Ben Dhaou, Soumaya and Soares, Delfina. Proceedings of the 21st International Conference on Digital Government Research (dg.o 2020), Seoul, 2020 (in print).
  - *A complex network analysis of in-land port connectivity of Bangladesh* - Zaber, Moinul. In IEEE Technology for Impactful Sustainable Development (TENSYP2020), Dhaka, Bangladesh, 2020.
  - *A Taxonomy of Measures for Smart Cities* - Backhouse, Judy. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020), 2020 (in print).
  - *Mobile Applications in Central Government of Brazil and Portugal* - Dutra, Débora; Soares, Delfina. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019), Melbourne, Australia. New York: ACM Press, 2019.
  - *Analysing e-Government Research: Current Areas and Dimensions* - Sarantis, Demetrios. In Proceedings of the 18th International Conference on WWW/Internet, Cagliari 2019.
  - *A Cybersecurity Model for Electronic Governance and Open Society* - Lopes, Nuno; Faria, José. In Proceedings of the 5th Electronic Governance and Open Society: Challenges in Eurasia (EGOSE 2018). 14-

<sup>1</sup> For each category of countable deliverables annotation [x/y] means that x deliverables of that type have been produced out of a total of y stipulated for the whole Project time span. Please note that some of the papers produced within the project only appeared in 2020.



- 16/11/2018, Saint Petersburg, Russia. Basel: Springer Nature Switzerland AG, pp. 92-107, 2018.
- *Communities of Practice as a tool to support the GCIO function* - Paulo Santos, Luís; Nuno Barbosa, Luís; Bessa, Diogo; Martins, Lúcia; Barbosa, Luís Soares. Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 118-126, 2018.
  - *An Overview of the Current State of M-Government Research* - Dutra, D., and Soares, D.. In Proceedings of the 6th European Conference on Digital Government (ECDG 2018), pp 57-76. 25-26/10/2018, Santiago de Compostela, Spain. ACPI Publishers, 2018.
  - *A Decade of International Conference on Theory and Practice of Electronic Governance* - Carvalho, Nuno; Nielsen, Morten Meyerhoff; Rohman, Ibrahim. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 230-235, 2018.
  - *An ideal IoT solution for real-time web monitoring* - Diogo, Pedro; Lopes, Nuno; Reis, Luís. Cluster Computing, 20(3), pp. 2193-2209, 2017.
  - *Smart Cities with Emerging Technologies* - Nuno Lopes, Soumaya Ben Dhaou, João Álvaro Carvalho (6 pp), Erasmus Energy Forum 2017 (Rotterdam, Netherlands, 28-29.06.2017).
  - *Data Analytics Tool for Smart Cities* - Nuno Lopes, Sara Coelho, Recent Advances in Communications and Networking Technology, 6(2), pp. 84-92, 2017.
  - *Categorization of e-government capabilities: Lessons learned from a Canadian public organization* - Soumaya Ben Dhaou, Laurent Renard (13 pp), IBIMA 2017 (Vienna, Austria, 03-04.05.2017), pp 1-14, 2017.
  - *Smart Governance: A Key Factor for Smart Cities Implementation* - Nuno Lopes. ICST 2017 (Tokyo, Japan, 13-17.03.2017), pp 277-282, 2017.
  - *Characteristics of Media Governance* - Mariana Lameiras, In Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance (ICEGOV2017). 07-09/03/2017, New Delhi, India. New York: ACM Press, pp. 578-579, 2017.
  - *Composing Families of Timed Automata* - Guillermina Cledou, José Proença, Luis Soares Barbosa, in Proc 7th International Conference FSEN (Fundamentals of Software Engineering), Tehran, Iran, April 26-28, 2017, Revised Selected Papers. Springer Lecture Notes Computer Science (10522), pp 51-66, 2017.
  - *A Framework for Certification of Large-Scale Component-Based Parallel Computing Systems in a Cloud Computing Platform for HPC Services* - Allberson Dantas, Francisco Heron de Carvalho Junior, Luis Soares Barbosa, CLOSER 2017: 7th International Conference on Cloud Computing and Services Science, 24-26 Apr, SciTePress, pp 201-212, 2017, 2017.
  - *Modeling Families of Public Licensing Services: A Case Study* - Guillermina Cledou, Luis Soares Barbosa, in Proc 5th FormaliSE-ICSE (IEEE/ACM International FME Workshop on Formal Methods in Software Engineering), Buenos Aires, Argentina, May 27, 2017, IEEE, pp 37-43, 2017.



- *Networks of universities as a tool for GCIO education* - Luis Soares Barbosa, Luis Paulo Santos, In Proceedings of the 16th IFIP WG 8.5 International Conference, EGOV 2017. 04-07/09/2017, Saint Petersburg, Russia. Cham: Springer International Publishing AG, pp. 117-127, 2017.
  - *Applying the 3C Model to FLOSS Communities* - Sara Fernandes, Luis Soares Barbosa, 22nd International Conference on Collaboration and Technology (CRIWG'16, 19 Kanazawa, Japan, September 14-16, 2016. Springer, Lecture Notes in Computer Science (9848), pp 139-150, 2016.
  - *Collaborative Environments in Software Engineering Teaching: A FLOSS Approach* - Sara Fernandes, Luis Soares Barbosa, 15th European Conference on eLearning (ECEL16), Charles University, Prague, Czech Republic, 27th-28th October 2016, IEEE, 2016
- **Publications (refereed policy briefings and policy-oriented publications) [17/12]**
    - *Does electric prepaid meter intervention decrease payment delinquency?* - Zaber, Moinul. In IEEE Technology for Impactful Sustainable Development (TENSYP2020), Dhaka, Bangladesh, 2020.
    - *Regulatory challenges of 5G spectrum valuation at mmWave for Broadband Development Acceleration: A case study of Indonesia.* Zaber, Moinul. In International Telecommunications Society conference, 2020 (in print).
    - *What can Nighttime lights tell us about Bangladesh?*- Zaber, Moinul. In IEEE Technology for Impactful Sustainable Development (TENSYP2020), Dhaka, Bangladesh, 2020.
    - *Tackling identity management, service delivery, and social security challenges: technology trends and partnership models* - Nielsen, Morten Meyerhoff. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
    - *Mobile Applications in Central Government of Brazil and Portugal* - Dutra, D., and Soares, D.. Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
    - *Who is Measuring What and How in EGOV Domain?* - Carvalho, J., and Soares, D. Proceedings of the 17th IFIP WG 8.5 International Conference, EGOV 2018, pp 120-131 Krems, Austria, 2018.
    - *The Evolving e-Governance Curriculum: A worldwide mapping of Education Programs* - Sarantis, Demetrios; Ben Dhaou, Soumaya; Alexopoulos, Charalampos; Ronzhyn, Alexander; Viale Pereira, Gabriela; Charalabidis, Yannis. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
    - *Participatory Governance of Smart Cities: a study upon Portuguese and Brazilian government portals* - Bernardes, Marciele; Pacheco de Andrade, Francisco; Novais, Paulo; Lopes, Nuno. In Proceedings of the

- 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 526-536, 2018.
- *Analyzing e-governance assessment initiatives: an exploratory study* - Alarabiat, Ayman; Soares, Delfina; Ferreira, Luís; de Sá-Soares, Filipe. In Proceedings of the 19th Annual International Conference on Digital Government Research (dg.o 2018). 30-01/05-06/2018, Delft, The Netherlands. New York, ACM Press, 2018.
  - Qualification offer in EGOV competencies in PALOP-TL - Marco Silva, João; Felipe Ramos, Luís; Fonte, Vítor In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 308-311.
  - *Pakistan Smart Cities Context: Lahore and Multan* - Lopes, Nuno; Farooq, Shahid. In Proceedings of the International Conference EGOV-CeDEM-ePart 2018. 03-05/09/2018, Krems, Austria. Krems: Edition Donau-Universität Krems, pp. 207-213, 2018.
  - *The War on Corruption: The Role of Electronic Government* - Martins, João; Fernandes, B.; Rohman, Ibrahim; Veiga, Linda. Proceedings of the International Conference EGOV-CeDEM-ePart 2018. 03-05/09/2018, Krems, Austria. Krems: Edition Donau-Universität Krems, pp. 98-109. 2018.
  - *Improve cities resilience and sustainability through e-government assessment* - Lameiras, Mariana; Sarantis, Dimitrios; Soares, Delfina. In 2018 United Nations E-government Survey: Gearing e-Government to support transformation towards sustainable and resilient societies. United Nations: Nairobi, pp. 151-175, 2018.
  - *Electronic governance policy measurement, assessment and monitoring: a discussion* - Soares, Delfina; Araújo, Wagner; Carvalho, Joana. In TIC governo Eletrônico: pesquisa sobre o uso das tecnologias de informação e comunicação no setor público brasileiro. São Paulo: Núcleo de Informação e Coordenação do Ponto BR, pp. 173-182, 2018.
  - *Digital Governance for Sustainable Development* - Barbosa, Luís Soares. Proceedings of the 16th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society (I3E 2017). 21-23/11/2017, New Delhi, India. Cham: Springer, pp. 85-93, 2017.
  - *Citizens, Politics and Social Media - Trends, Impacts and Lessons Learnt* - Mariana Lameiras, ICEDEG 2017 (Quito, Ecuador, 19-21.04.2017, IEEE Computer Society), 2017.
  - *Electronic governance in Portugal: a silent pioneer* - Sara Fernandes, Luís Barbosa, In Proceedings of the International Conference on Electronic Governance and Open Society: Challenges in Eurasia, EGOSE 2016, St. Petersburg, Russia, 22-23.11.2017, pp 77-82, ACM Press, 2017.
- **Policy-driven, applied research study reports**
    - *Aumentar a resiliência e a sustentabilidade nas cidades através da avaliação do governo eletrônico* - Lameiras, Mariana; Sarantis, Dimitrios; Soares, Delfina, In Estudo sobre Governo Eletrônico da Organização das Nações Unidas 2018: Orientar o Governo Eletrônico

para apoiar a transformação rumo a sociedades sustentáveis e resilientes. Guimarães, Centro Juvenil de São José, pp. 157-181, 2019.

## 2.5 PhD Thesis

PhD thesis (initiated within RL1) [4/4]

- **Aleksandr Riabushko.** *The role of information technologies in creating the regional political leadership (on the example of the Ulyanovsk region)* - in cooperation with UNU and St. Petersburg University, Russia. [concluded 2019]
- **Sara Fernandes.** *Peer-Production and Technology-Enhanced Collaborative Teaching and Learning* - UNU and Universidade do Minho.
- **Leandro Gomes.** *Contracts on-demand* - UNU and Universidade do Minho.
- **Débora Dutra.** *Decision-Making Factors Influencing the Implementation of Mobile Government Applications* - Universidade do Minho

## 3. RL 2 - Smart Governance Innovative Frameworks

Principal Investigator (Line Coordinator): *Delfina Sá Soares*

### 3.1 Summary of objectives

The aim of this RL is to develop three innovative frameworks harnessing ICT and EGOV technologies for Smart Governance. The three frameworks aim at going beyond the state of the art in providing new solutions at three complementary levels of the smart governance process: design, healing and monitoring. Each of them will be addressed, not in a general, abstract way, but with a clear focus in an application area.

- O1 - At the first level (design), this RL will contribute with **methods and tools for modelling and validating normative and legal text** in a precise (mathematical) way. This aims at reducing potential administrative burden acting from the outset on one of its main sources: the design of legal and normative texts themselves.
- O2 - At the second level (healing) the RL will explore **how EGOV can be utilized as a tool for Administrative Burden Reduction (ABR)** imposed by different levels of public administration, often in incremental ways, on citizens, businesses and the administration itself.
- O3 - Finally, at the third level (monitoring), the RL will develop a **framework and tools for local EGOV measurement and monitoring**. This knowledge is fundamental for leading EGOV development in a country, namely for the definition of new EGOV strategies and action programs that are aligned with the needs of governments, public institutions, citizens and the society as a whole.

### 3.2 Activities and Achievements

Each objective gave rise to a specific Action Line. Please find in the next section an enumeration of the publications produced divided per Action Line (documented in the 43 refereed publications (in journals and international conferences) enumerated below. Other results rather than publications, also per Action Line, are highlighted below:

***AL1 (objective O1) - A framework for modelling and validation of normative and legal text.***

A number of tools, essentially focused on textual static analysis of normative text, visualisation and natural language processing, were built and combined into a suitable toolset. Several theoretical results on suitable logics for normative reasoning (capturing the structure of law and its invariants) were also developed. A pilot test

was conducted on the analysis of the Participatory Budget regulation for the Municipality of Guimarães.

***AL2 (objective O2) - A framework for administrative burden reduction.***

Starting from a systematic research on innovative applications of EGOV to reduce administrative burden, covering a range of development and institutional contexts, this AL produced a repository of case studies on the relevant EGOV solutions worldwide. Typical examples recorded and analyzed include Uganda (Ministry of ICT), China (Beijing Information Resources Management Center), Georgia (Data Exchange Agency, Ministry of Justice), Madagascar (Coordination Office of Land Reform) and Russia (Office of the Affairs of the Ulyanovsk Region). Moreover, a close collaboration with the Governmental Fellowship Programme of UNU-EGOV (under which a total of 21 governmental officers worldwide visited the project for a 3-months period) enable the development of several pilot-studies on EGOV solutions for administrative burden reduction in different administrative contexts and countries (from China to Oman, Georgia to Ghana, Kenya to Russia, Uganda to Latvia and Macedonia, etc.). Finally, a portfolio with a number of executive training courses (from 1.5 to 3 ECTS each) on the main themes on this AL (namely, *Data and Infrastructures; Innovation in Public Policy and Governance; Smart Governance; Decision Support Systems for Smart Governance*).

***AL3 (objective O3) - A framework for local EGOV measurement and monitoring.***

A lot of effort was put in this AL in order to identify the set of relevant instruments to measure EGOV development in the local government context. Besides the usual research activities, this AL included i) a validated index of municipality's online presence to the 308 Portuguese municipalities (documented in two reports and public presentations in several municipalities); ii) the organization of several thematic workshops on this theme (namely during WISIS<sup>2</sup> 2017 and 2018; iii) an Expert Group Meeting on local EGOV measurement in February 2019 with several participants from different United Nations agencies, OECD, CAF, and EGOV national agencies from Portuguese-speaking countries.

A major highlight in this AL (and, in a sense, of the whole SmartEGOV project) was the participation of SmartEGOV in the United Nations e-Government Survey 2018, with responsibility for a new section of Local EGOV in which 40 cities in 40 different countries were analyzed. This report was recently translated for Portuguese (which never happened before) and was launched in a special event at UNU-EGOV / Palácio de Vila Flor, Guimarães in 25th February 2019.

This AL was reinforced on the occasion of the project Reprogramming Proposal approved by CCDRn in 2019. The objective was to launch a bridging activity building on the results already obtained both in RL2 and RL3 and intended to apply the knowledge produced to the digital transformation of Public Administration at the local level. The motivation was the recognized relevance of promoting EGOV development at a local level at the same pace and in alignment with EGOV development at a national level, as well as the serious obstacles found in practice, namely in what concerns lack of resources, capabilities, and competencies.

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<sup>2</sup> The World Summit on the Information Society, a major event organised by ITU in Geneva every year.

The re-programming of this AL focused on three activities which were carried out successfully:

- Worldwide local, urban EGOV development assessment which lifted the previous study from 40 to 100 municipalities worldwide, consolidating the project participation in UN e-Government survey. Actually, the extensive study reporting the results of the assessment was published as a chapter of the 2020 UN e-Government Survey published by UNDESA, a reference publication used by Governments worldwide as a tool for benchmarking and bench-learning within the EGOV domain.
- The development of an assessment instrument to calculate the IPIC (Índice de Presença na Internet das Câmaras Municipais - Municipality Internet Presence Index) and its application to to the 308 municipalities in Portugal. A new report on the Portuguese was prepared and launched by the end of 2019.
- The characterization of the ICT function in the Municipalities through the design, application and evaluation of a questionnaire with almost 100 questions directed to the Municipalities on the ways ICT is used by Municipalities to support their internal operations, service provision and interaction with citizens.

#### *AL4 (new objective) - Disruptive technologies for digital governance.*

The project Reprogramming Proposal mentioned above, launched a fourth Action Line for this Research Line with the objective of adding two new “frameworks for Smart Governance” to the three originally proposed. The aim was to cover new, cutting-of-edge developments in digital technology with impact on Smart Governance:

- *Distributed ledger technologies* (popularized under the designation of blockchain) in digital governance, and
- *quantum technologies* for solving and monitoring optimization and scheduling problems in the governance of smart cities.

This new AL took advantage of the current UMinho initiative on Quantum Technologies through a partnership with INL (the QuantaLab - [www.quantalab.org/](http://www.quantalab.org/)) which provided access to a quantum machine (IBM Q) with no costs for the SmartEGOV project. Given the current costs for this sort of access, this was indeed a very interesting opportunity for this project. A number of human resources were allocated to this Action Line, including several grants. The results were encouraging: three journal articles and four papers in international refereed conferences were published, and two MSc dissertations concluded on quantum technology application by SmartEGOV grant-holders. Two proof-of-concept tools, in the form of Qiskit libraries were delivered. A SmartEGOV team is leading the edition of a specific ITU book on Blockchain for Governance (to appear by the end of 2020); and a research seminar on quantum technologies for Smart Cities and Smart Governance was conducted at UNU-EGOV in May 2019.



### 3.3 Deviations

No specific deviations from the original proposal occurred, but for the elimination of a case-study in Colombia due to a difficulty in communicating with the corresponding national agency. This case study was replaced by a number of other case studies in different countries conducted by taking advantage of the UNU-EGOV Governmental Fellowship Programme as explained above.

As planned in the approved Reprogramming Proposal action AL2 was substantially reinforced, and a new strategic objective and corresponding Action Line (AL4) was launched in 2019.

### 3.4 Publications

- **Publications (refereed scientific papers in journals and international conferences) [37/16]**
  - **Action Line AL1**
    - *Better Access to Law by Codification and Consolidation of Legal Acts. the Case of the Hellenic Law Codification Portal* - Ch. Stasis, Antonios; Ntalakou, Vassiliki; Karakatsanis, Ilias; Demiri, Loukia; Valatsou, Georgia; Sarantis, Dimitrios. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020),2020 (in print).
    - *Towards a Register-Based Census in Oman* - Al-Lawati, Ali and Soares Barbosa, Luís. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020),2020 (in print).
    - *A Framework for Intelligent Policy Decision Making Based on a Government Data Hub* - Al-Lawati, Ali and Barbosa, Luis. In Proceedings of the 4th International Conference on Digital Transformation and Global Society (DTGS 2019), St. Petersburg, Russia, pp. 92-106, 2019.
    - *Deep Learning Powered Question-Answering Framework for Organizations Digital Transformation* - Carvalho, Nuno; Barbosa, Luís Soares. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
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- *A logic for the stepwise development of reactive systems* - A. Madeira, L. S. Barbosa, R. Hennicker, M. A. Martins. Theoretical Computer Science, Elsevier, 744, pp 78-96, 2018.
  - *Layered logics, coalgebraically* - Barbosa, Luís Soares. First International Workshop on Dynamic Logic: New Trends and Applications. 22/09/2018, Brasília, Brazil. Cham: Springer, pp. 55-63, 2018.
  - *Modernization of Greek Public Sector: Results from eGovernment Law application and next steps* - Demetrios Sarantis (9 pp), ECDG 2017 (Lisbon, Portugal, 12-13.06.2017), 2017.
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- *Key Indicators for Justice: Evidence-based Research for Policy-Making* - Lameiras, Mariana; Costa, Maria João; Ben Dhaou, Soumaya; Soares, Delfina. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020),2020 (in print).
  - *HSWA: A Health Sector Website Assessment Instrument* - Sarantis, Dimitrios; Soares, Delfina; Carvalho, Joana. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020),2020 (in print).
  - *Governance lessons from Denmark's digital transformation* - Meyerhoff Nielsen, Morten. In Proceedings of the 20th Annual International Conference on Digital Government Research (dg.o 2019), Dubai, 2019.
  - *Information Systems in schools: improving governance good-practices* - Santos, Luís; Soares, Delfina. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). Galway, Ireland. New York: ACM Press, pp. 709-711, 2018.
  - *Administrative Burden Reduction Over Time: Literature Review, Trends and Gap Analysis* - Morten Nielsen, Nuno Carvalho, Linda Veiga, Luís Barbosa, In Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance (ICEGOV2017). New Delhi, India. New York: ACM Press, pp. 140-148, 2017.
  - *Towards the Development of an eGovernment Capabilities Repository* - Soumaya Ben Dhaou, In Proceedings of the 16th IFIP WG 8.5 International Conference, EGOV 2017. Saint Petersburg, Russia. Cham: Springer International Publishing AG, pp. 154-165, 2017.
  - *Political budget cycles and media freedom* - Linda Veiga, Francisco José Veiga, Atsuyoshi Morozumi, Electoral Studies (Elsevier), 45, pp. 88-99, 2017.
  - *E-Government and the shadow economy: evidence from across the globe* - Linda Veiga, Ibrahim Rohman, In Proceedings of the 16th IFIP WG 8.5 International Conference, EGOV 2017. Saint Petersburg, Russia. Cham: Springer International Publishing AG, pp. 105-116, 2017.

○ Action Line AL3

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- *The Effects of Amalgamations on Voter Turnout: Evidence from Sub-Municipal Governments in Portugal* - Rodrigues, Miguel and Tavares, António. In *Cities: The International Journal of Urban Policy and Planning*, 2020 (in print).
- *Municipalities E-Participation Initiatives Through Facebook: Citizens Perspective* - Alarabiat, Ayman; Soares, Delfina; Estevez, Elsa. In *Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020)*, 2020 (in print).
- *Local context, global benchmarks: Recommendations for an adapted approach using the UN E-Government Development Index as an example* - Millard, Jeremy and Meyerhoff Nielsen, Morten. In *Proceedings of the 21st International Conference on Digital Government Research (dg.o 2020)*, Seoul, 2020.
- *The Effects of Electoral Incentives on Fiscal Policy: Evidence from a Legislative Change at the Local Government Level* - Veiga, Linda and Veiga, Francisco José. In *The Journal of Law, Economics, and Organization*, 35(2), pp. 394-421, 2019.
- *'Trendy' Cities: Exploring the Adoption of Different Types of Social Media by Portuguese Municipalities* - Silva, Tiago, Tavares, António and Lameiras, Mariana. In *Proceedings of the 11th IFIP WG 8.5 International Conference on Electronic Participation (ePart 2019)*, San Benedetto Del Tronto, 2019.
- *Implanting IT Applications in Government Institutions: A Process Model Emerging from a Case Study in a Medium-Sized Municipality* - Reascos, Irving; Carvalho, João Álvaro, Bossano, Soni In *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019)*. Melbourne, Australia. New York: ACM Press, 2019.
- *Characterization of the IST function in Municipalities: A framework and an instrument* - Almeida, Inês; Soares, Delfina. In *Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018)*. Galway, Ireland. New York: ACM Press, pp. 715-717, 2017.
- *From a literature review to a conceptual framework for health sector websites' assessment* - Demetrios Sarantis, Delfina Soares, In *Proceedings of the 16th IFIP WG 8.5 International Conference, EGOV 2017. 04-07/09/2017*, Saint Petersburg, Russia. Cham: Springer International Publishing AG, pp. 128-141, 2017.
- *Literature on website evaluation in health sector* - Demetrios Sarantis, Delfina Soares, IS 2017 (Budapest, Hungary, 10-12.04.2017, IADIS Press), pp 93-100, 2017.
- *Assessment of Federal Government Websites* - Muhammad Arfeen, Syed Shah, Javed Iqbal, ECDG 2017 (Lisbon, Portugal, 12-13.06.2017), pp 29-33, 2017.

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- *Quantum Bayesian decision-making* - Oliveira, M. and Barbosa, L.. In Journal Foundations of Science, Springer, 2020 (in print).
- *Data governance: Organizing data for trustworthy Artificial Intelligence* - Marijn Janssen, Paul Brous, Elsa Estevez, Luís Soares Barbosa, Tomasz Janowski. In Gov. Inf. Q. 37(3): 101493, 2020.
- *A component-based framework for certification of components in a cloud of HPC services* - Dantas, A., Junior, F. and Barbosa, L.. In Sci. Comput. Program. 191: 102379, 2020.
- *Privacy and Data Protection Concerns Regarding the Use of Blockchains in Smart Cities* - M. Ramos, Luís Felipe and C. Silva, João Marco. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). Melbourne, Australia. New York: ACM Press, 2019.
- *Blockchain Technology and Value Creation for Government and Public Services* - Pires, Kerley and Ben Dhaou Soumaya. In Proceedings of the 11th IFIP WG 8.5 International Conference on Electronic Participation (ePart 2019), San Benedetto Del Tronto, 2019.
- *From start-ups to governments: challenges and opportunities of blockchain adoption in the MENA ecosystem* - Toufaily, Elissar, Tatiana, Zalan, and Soumaya Ben Dhaou. In Proceedings of the 2nd International Conference on Data Science, E-Learning and Information Systems (Data'19), Dubai, 2019.
- *Blockchain technology: State of the art* - Toufaily, Elissar, Ben Dhaou, Soumaya and Tatiana, Zalan. In Proceedings of the 2nd International Conference on Data Science, E-Learning and Information Systems (Data'19), Dubai, 2019.
- *Global Challenge of Identity: Blockchain E-ID System for a Sustainable Development and Good Governance* - Ben Dhaou, Soumaya; Rohman, Ibrahim. In Proceedings of the International Conference EGOV-CeDEM-ePart 2018. 03-05/09/2018, Krems, Austria. Krems: Edition Donau-Universität Krems, pp. 199-205, 2018.
- *Everything and its opposite: Socio-economic implications of Blockchain technology: Case of monetary policy* - Ben Dhaou, Soumaya; Rohman, Ibrahim. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 631-639, 2018.
- *Analysing the transformational Effects of Emerging Technologies on Smart Cities: Blockchain and IoT* - Ben Dhaou, Soumaya; Lopes, Nuno. In Proceedings of the 3rd International Conference on Smart and Sustainable Technologies (SpliTech 2018). 26-28/06/2018, Split, Croatia. Split: Institute of Electrical and Electronics Engineers, pp. 100-109, 2018.

- **Publications (refereed policy briefings and policy-oriented publications) [16/16]**
  - *Understanding Responsiveness of E-Governance Platforms of Bangladesh* - Khan, Saima and Zaber, Moinul. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020), 2020 (in print).
  - *HSWAI: A Health Sector Website Assessment Instrument* - Sarantis, Dimitrios; Soares, Delfina; Carvalho, Joana. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020), 2020 (in print).
  - Discussing challenges and limitations of an experimental research design to test trust in local e-government - Lameiras, Mariana. In Proceedings of the 21st International Conference on Digital Government Research (dg.o 2020), Seoul, 2020.
  - *Developing Health Sector Website Assessment Instrument: Outcomes from Portuguese Hospitals* - Sarantis, Demetrios and Soares, Delfina. In Proceedings of the 6th International Conference on eDemocracy eGovernment (ICEDEG 2019), Quito, 2019.
  - *Data Security and Trustworthiness in Online Public Services: An Assessment of Portuguese Institutions* - Marco Silva, João; Fonte, Vítor. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). Melbourne, Australia. New York: ACM Press, 2019.
  - *Implanting IT Applications in Government Institutions: A Process Model Emerging from a Case Study in a Medium-Sized Municipality* - Reascos, Irving; Carvalho, João Álvaro, Bossano, Soni. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
  - *Mobile Applications in Central Government of Brazil and Portugal* - Dutra, Débora; Soares, Delfina. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance. 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
  - *Bridging between Policy-Making and Academic Research: A Within-Case Analysis of the International Rankings for Justice* - Ben Dhaou, Soumaya; Lameiras, Mariana; Soares, Delfina; Rohman, Ibrahim. In Proceedings of the International Conference EGOV-CeDEM-ePart 2018. 03-05/09/2018, Krems, Austria. Krems: Edition Donau-Universität Krems, pp. 243-250, 2018.
  - *Electronic Government and the Ease of Doing Business* - Martins, João; Veiga, Linda. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). Galway, Ireland. New York: ACM Press, pp. 584-587, 2018.
  - *Empirical analysis of the current digital divides since 2010* - Nielsen, Morten Meyerhoff; Rohman, Ibrahim; Lopes, Nuno. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance. 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 616-625, 2018.
  - *Against the Shadow: the Role of e-Government* - Ibrahim Rohman, Linda Veiga, In Proceedings of the 18th Annual International Conference on

- Digital Government Research (dg.o 2017). 07-09/06/2017, Staten Island, United States of America. New York, ACM Press, pp. 319-328, 2017.
- *Portugal: políticas de transparencia y reforma de los medios públicos* - Mariana Lameiras e Helena Sousa. In Isabel Fernández Alonso (Ed). *Austeridad e Clientelismo: Política audiovisual en España en el contexto mediterráneo y de la crisis financier*, Editorial Gedisa, Barcelona, 51-68 pp, 2017.
  - *Model for e-Government Implementation in Pakistan* - Muhammad Arfeen, Javed Iqbal, Muhammad Mushtaq, In Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance (ICEGOV2017). 07-09/03/2017, New Delhi, India. New York: ACM Press, pp. 57-61, 2017.
  - Knowledge Societies in China, Portugal, and Uganda - Nuno Lopes, Kenneth Bagarukayo, Jun Cheng, International Journal of Knowledge Society Research (IGI Global), 8(1), pp. 23-50, 2017.
  - *Inter-Municipal Cooperation and Austerity Policies: Obstacles or Opportunities?* - António Tavares, Ringa Raudla (24 pp.). In Filipe Teles e Pawel Swianiewicz (eds.). *Inter-Municipal Cooperation in Europe*: Basingstoke, Reino Unido, Basingstoke: Palgrave, pp. 17-41, 2018.
  - *Digital Government and Administrative Burden Reduction* - Linda Veiga, Tomasz Janowski, Luís Barbosa, ICEGOV2016 (Montevideo, Uruguay, 03-07.03.2016, ACM Press, 2016), 2016.
- **Policy-driven, applied research study reports**
    - *Local E-Government Development in Cities and Human Settlements* - Soares, Delfina; Sarantis, Demetrios; Lameiras, Mariana and Alarabiyat, Ayman. In 2020 United Nations E-government Survey: Digital Government in the Decade of Action for Sustainable Development ed. Aquaro, Vincenzo and Juwang Zhu. New York: United Nations, pp. 87-113, 2020.
    - *Caracterização da Função TIC/Informática nas Câmaras Municipais Portuguesas* - Soares, Delfina, Amaral, Luís, Ferreira, Luís and Lameiras, Mariana, UMinho & UNU-EGOV, 2019.
    - *Presença na Internet das Câmaras Municipais Portuguesas em 2019: Estudo sobre Local e-Government em Portugal* - Soares, Delfina, Amaral, Luís, Ferreira, Luís and Lameiras, Mariana, UMinho & UNU-EGOV, 2019.
    - *Método de Avaliação da Presença na Internet das Câmaras Municipais Portuguesas (Versão 5.0)* - Soares, Delfina, Amaral, Luís, Ferreira, Luís and Lameiras, Mariana, UMinho & UNU-EGOV, 2019.
    - *Presença na Internet das Câmaras Municipais Portuguesas em 2014* - Delfina Soares, Luís Amaral, Luís Miguel Ferreira, David Leal (146 pp), GÁVEA - Observatório da Sociedade da Informação, 2016.
    - *Presença na Internet das Câmaras Municipais Portuguesas em 2016* - Delfina Soares, Luís Amaral, Luís Miguel Ferreira (160 pp), GÁVEA - Observatório da Sociedade da Informação, 2017.
  - **Concluded MSc dissertations**
    - Michael Oliveira. *On Quantum Bayesian Networks*. Universidade do Minho, 2019.
    - Vitor Fernandes. *Integration of time in a quantum process algebra*. Universidade do Minho, 2019.

### 3.5 PhD Thesis

PhD thesis (initiated with RL2) [5/5]

- **João Martins.** *Socioeconomic effects of the electronic government* - UNU and Universidade do Minho.
- **Joana Carvalho.** *A tool for assessment and monitoring local EGOV policies and instruments* - UNU and Universidade do Minho.
- **Teófilo Júnior.** *Modelo para a Implantação da Computação em Nuvem na Administração Pública Municipal* --- Universidade do Minho.
- **Wagner Araújo.** *EGOV Rankings as determinants of EGOV strategies* - UNU and Universidade do Minho.
- **Rui Miguel Ribeiro Sampaio.** *Data analytics over local public administration.* - UNU and Universidade do Minho.



## 4. RL 3 - EGOV for Context-specific Public Service Delivery

Principal Investigator (Line Coordinator): *António Fernando Tavares*

### 4.1 Summary of objectives

Context-specific Public Service Delivery (PSD) considers the uniqueness of the national, local or sectoral context to achieve the best match between the circumstances where a public service is delivered, the needs of the target audience and the standard of PSD agreed across contexts. The focus of this RL is on digital innovation for context-specific PSD. The aim is to analyze the contribution of information and communication technologies for the development, implementation and evaluation of the use of context-aware and context-intelligent public services (CACI-PS), co-created with the beneficiaries, and smartly delivered to meet the specific needs of service recipients and to satisfy the conditions of the local context, in order to contribute to the identification and diagnosis of specific cases of vulnerable groups and social exclusion, offering solutions aimed at reducing such problems and increasing social cohesion.

#### Objectives

- O1 - Theoretical foundations for CACI-PS.
- O2 - ICT innovations for co-creating CACI-PS.
- O3 - ICT innovations for delivering CACI-PS.
- O4 - Toolbox for CACI-PS.

The main aim of O2 and O3 is to propose methodologies for the design and use of innovative ICT tools to deliver CACI-PS aimed at people affected by social exclusion. Objective O2 focus on comparative studies of the use of ICT tools for the co-creation (from O2) and delivery (from O3) of CACI-PS, as well as on synthesizing findings into policy recommendations and courseware.

### 4.2 Activities and Achievements

This RL produced a significant number of both academic papers and publications explicitly addressing public policy concerns and translating research findings in policy instruments. Besides publications, the RL developed a Knowledge Repository documenting and classifying EGOV innovations for Public Service Delivery implemented in specific contexts, including details about the context in which the solutions were deployed.

As planned, an intensive case study was conducted in the Portuguese context, being documented in the technical report:



- *Innovations in digital government as business facilitators: implications for Portugal*. Martins, João; Veiga, Linda. Gabinete de Estratégia e Estudos: GEE, (97), pp. 1-35, 2018.

The work done made possible to propose specific EGOV Framework for CACI-PS, packaged together with suitable courseware in a conceptual toolbox for Public Service Delivery. The courseware component of this toolbox included the design of a portfolio with a number of executive training courses (from 1.5 to 3 ECTS each) on *Public Digital Services and Smart Communities; E-participation, Digital Literacy and Community Empowerment; Innovation in Public Policy and Governance; Citizens' Engagement through Digital Media*). Some of these courses were tested with Public Administration officials from Indonesia, Georgia, and Portuguese-speaking countries.

The project proposal located mainly in this RL a major effort in dissemination and internationalization. Therefore, the project effort in hosting and organizing main international events in EGOV are listed below. They were largely conducted inside RL3, but their organization also involved, at a smaller extent, both RL1 and RL2.

- **IFIP EGOV International Conference (Guimarães, September 2016)**
  - Proceedings of the 8th IFIP WG 8.5 International Conference, EGOV 2016 (311 pp), Guimarães, Portugal (05.08-09.2016), Springer Verlag, Lecture Notes in Computer Science, volume 9820, 2016.
- **ePart International Conference (Guimarães, September 2016)**
  - Proceedings of the 8th IFIP WG 8.5 International Conference, ePart 2016 (188 pp), Guimarães, Portugal (05.08-09.2016), Springer Verlag, Lecture Notes in Computer Science, volume 9821, 2016.
  - Joint Proceedings of Ongoing Research, PhD Papers, Posters and Workshops of IFIP EGOV and ePart 2016 (414 pp), Guimarães, Portugal (05.08-09.2016), IOS Press, 2016.
- **ICEGOV'2017 - 10th International Conference on Theory and Practice of Electronic Governance (New Dehli, India, March, 2017)**
  - Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance (628 pp), New Delhi, India (07-09.03.2017), Baguma, Rehema; De', Rahul; Janowski, Tomasz (eds.), ACM Press, 2017.
- **ICEGOV'2018 - 11th International Conference on Theory and Practice of Electronic Governance (Galway, Ireland, April, 2018)**
  - Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (539 pp), Galway, Ireland (04-06.04.2018), Kankanhalli, Atreyi; Ojo, Adegboyega; Soares, Delfina (eds.), ACM Press, 2018.
- **ICEGOV'2019 - 12th International Conference on Theory and Practice of Electronic Governance (Melbourne, Australia, April, 2019)**
  - Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (512 pp), Melbourne, Australia (03-

05.04.2019), Ben Dhaou, Soumaya; Carter, Lemuria; Gregory, Mark (eds.), ACM Press, 2018.

This research line was reinforced at two stages along the project reprogramming proposals submitted approved by CCDRn, as follows.

The first project Reprogramming Proposal launched two additional activities devoted to technologies and instruments for co-creation and delivery of public services. The new elements introduced concerned:

- *digital certification of agents and transactions*, and its impact on process dematerialization, and
- *harnessing social media platforms and Web 2.0 and 3.0 tools for democratic (conventional and non-conventional) participation of citizens and communities in decision processes as well as in the assessment of public services.*

Both items benefitted of extra human resources, through short term grants. The first developed in close collaboration with the team at RL1 working on digital signatures. Joint publications are listed above in the RL1 section, to avoid repetition. The second lead to four new publications and the organization of an international workshop on *Rural EGOV and Smart Communities*, jointly promoted with UNU-EGOV and the World Bank, in Melbourne, Australia, in April 2019.

The second project Reprogramming Proposal introduced two other research activities which further extended the original scope of RL3. They are detailed in the sequel:

### **RL3-R1: Governance digital transformation strategies for developing countries**

This activity was aimed at defining a methodology for the development of nation-wide strategies for the digital transformation of the governance function and public service delivery within developing countries, thus providing a concrete ground to test the PDS frameworks previously designed in RL3. Its main deliverable was a concrete case-study in a small country --- São Tomé e Príncipe --- involving an exhaustive work in data collection, collaborative strategic thinking through local workshops, strategy design and implementation planning. This work culminated in the design of a National Strategy for Digital Governance for São Tomé e Príncipe which was published as Governmental Decree in early 2020.

### **RL3-R2: Digital literacy for successful EGOV implementation**

Along the development of RL3, digital literacy emerged as an essential asset for the successful implementation Public Services, and a critical challenge in developing countries. This activity took an holistic approach and a broad understanding of what digital literacy means, going far beyond the basic competences to handle ICT devices. Algorithmic reasoning, problem-solving capabilities, and precise (formal) communication, both written and oral, were aspects taken into account. This new activity developed a number of conceptual instruments for fostering literacy in such a broad sense, through a number of case studies conducted in strong cooperation with researchers for the Education area. A researcher from UMinho Instituto de Educação joined the SmartEGOV team to help with this activity.

### 4.3 Deviations

No specific deviations from the original proposal occurred. The previous section reported on the reinforcement activities introduced in RL3 through the project Reprogramming proposals.

### 4.4 Publications

- **Publications (refereed scientific papers in journals and international conferences) [30/12]**
  - *Undergraduate students' economic literacy, knowledge of the country's economic performance and opinions regarding appropriate economic policies* - Martins, João and Veiga, Linda. In *International Journal of Education Economics and Development*, 2020 (in print).
  - *Strategies, difficulties and written communication in solving a problem* - Martins, L. G., & Martinho, M. H.. In *Jour. Bolema*, 2020 (in print).
  - *A problem-solving experience: The teacher's perspective* - Martins, L. G., & Martinho, M. H.. In *Quadern di Ricerca in Didattica (Mathematics)*, 7, 319-324. 2020.
  - *Ensuring online usability and value added: A cross-country comparison of usability guides and governance models in DK, PT, UK* - Nielsen, Morten. In *Journal of Public Policy, Law and Management*, 2020 (in print).
  - *Electronic Participation in a Comparative Perspective: Institutional Determinants of Performance* - Tavares, António; Martins, João and Lameiras, Mariana. In *Achieving Active E-Public Participation through an Integrate Engagement Framework* ed. Bolívar, Rodríguez. IGI Global, 2020.
  - *Do Governance Arrangements Affect the Voluntary Adoption of Water Safety Plans? An Empirical Study of Water Utilities in Portugal* - Roeger, Alexandra and Tavares, António. In *Water Resources Management* 34, pp 1757-1772, 2019.
  - *The good, the bad and the ugly: Three faces of social media usage by local governments* - Silva, Patrícia, Tavares, António, Silva, Tiago and Lameiras, Mariana. In *Government Information Quarterly*, 36(3), pp. 469-479, 2019.
  - *Political Budget Cycles: Conditioning Factors and New Evidence* - Veiga, Linda; Efthyvoulou, Georgios and Morozumi, Atsuyoshi. In *The Oxford Handbook of Time and Politics*, ed. Klaus H. Goetz, Oxford: Oxford University Press, 2019.
  - *The Evolving e-Governance Curriculum: A Worldwide mapping of Education Programs* - Sarantis, Demetrios; Ben Dhaou, Soumaya; Alexopoulos, Charalampos; Ronzhyn, Alexander; Viale Pereira, Gabriela; Charalabidis, Yannis. *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019)*. Melbourne, Australia. New York: ACM Press. 2019.

- *Challenges and Opportunities in e-Government Education: e-Government Programs Curriculum* - Sarantis, Demetrios, Ben Dhaou, Soumaya, Alexopoulos, Charalampos and Loukis, Euripidis. Proceedings of the 13th International Conference on Digital Society and eGovernments (ICDS 2019), Athens, 2019.
- *Data Security and Trustworthiness in Online Public Services: An Assessment of Portuguese Institutions* - Marco Silva, João; Fonte, Vítor. Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). Melbourne, Australia. New York: ACM Press. 2019.
- *Tackling identity management, service delivery, and social security challenges: technology trends and partnership models* - Nielsen, Morten Meyerhoff. Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). Melbourne, Australia. New York: ACM Press. 2019.
- *Intuição na Resolução de Problemas* - Martins, L. G, & Martinho, M. H.. Actas II Conferência Internacional do Espaço Matemático em Língua Portuguesa, em Maputo, Moçambique. 2019.
- *Big Data Analytics and the temptation of Scoring: A cross-case analysis of legal and regulatory frameworks on the practice of 'social' scoring in influential jurisdictions* - Geoffroy-Terryn, Louis. Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press. 2019.
- *A taxonomy for planning and designing smart mobility services* - G. Cledou, E. Estevez, L. S. Barbosa. Government Information Quarterly, Elsevier, 35 (1), pp 61-76. 2018.
- *Social Media Activity and Local Civic Engagement in Poland* - Szmigiel-Rawska, Katarzyna; Łukomska, Julita; Tavares, António. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 279-287, 2018.
- *Estimating Weights for the Active Ageing Index (AAI) from Stated Preferences: Proposal for a Discrete Choice Experiment (DCE)* - Boehler, Christian; Helter, Timea; Rohman, Ibrahim; Abadie, Fabienne. in Building Evidence for Active Ageing Policies: Active Ageing Index and its Potential. Zaidi, Asghar; Harper, Sarah; Howse, Kenneth; Lamura, Giovanni; Perek-Białas, Jolanta (eds.). Singapore: Springer Nature, pp. 239-258, 2018.
- *Towards Health Sector Web Presence Assessment: Defining Criteria and Indicators* - Sarantis, Demetrios; Soares, Delfina. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 298-307, 2018.
- *The Impact of Broadband Penetration on the Student Performance in Primary and Secondary School in Malaysia* - Tajuddin, Megat; Rohman, Ibrahim. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 111-117, 2018.
- *Opportunities, Risks and Challenges of using Social Media to foster Smart Governance for Smart Cities* - Lopes, Nuno; Lameiras, Mariana. In Proceedings of the 2nd International Multidisciplinary Conference on

- Computer and Energy Science (SpliTech 2017). 12-14/07/2017, Split, Croatia, IEEE, pp 1-5, 2017.
- *Explaining the transparency of local government websites through a political market framework* - Tavares, António; Cruz, Nuno. *Government Information Quarterly*, pp. 1-13, 2017.
  - *eGovernance Frameworks for Successful Citizen Use of Online Services: A Danish-Japanese Comparative Analysis* - Nielsen, Morten Meyerhoff. *eJournal of eDemocracy and Open Government (JeDem)*, 9(2), pp. 68-109, 2017.
  - *Explaining Local Government Transparency: A Political Market Framework* - António Tavares, Nuno Ferreira da Cruz (27 pp), *Government Information Quarterly* (Elsevier), 2017.
  - *Policy of Delay: Evidence from a Bayesian Analysis of Metropolitan Land-Use Choices* - António Tavares, Aaron Deslatte, Richard C. Feiock (26 pp), *Policy Studies Journal* (Policy Studies Organization), 2017.
  - *eGovernance and Online Service Delivery in Estonia* - Morten Nielsen (10 pp), dg.o 2017 (New York, USA, 7-9.06.2017, ACM Press, 2017).
  - *Research Gaps on Public Service Delivery* - Nuno Lopes, Delfina Soares, Morten Nielsen, António Tavares, In *Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance (ICEGOV2017)*. 07-09/03/2017, New Delhi, India. New York: ACM Press, pp. 465-474, 2017.
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  - *Citizen use of government eServices: Comparing use, governance and cooperation models in Estonia and Georgia* - Morten Nielsen, 25th NISPACE (Kazan, Russia, 18-20.05.2017).
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- **Publications (refereed policy briefings and policy-oriented publications) [12/12]**
    - *Digital transformation, governance and coordination models: A comparative study of Australia, Denmark and the Republic of Korea* - Meyerhoff Nielsen, Morten and Jordanoski, Zoran. In *Proceedings of the 21st International Conference on Digital Government Research (dg.o 2020)*, Seoul, 2020 (in print).
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    - *Selecting Indicators for the Smart City Pilot in Knowledge Oasis Muscat (KOM), Sultanate of Oman* - Al Mahrooqi, Shaima and Backhouse. In



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- *How to Create an Ecosystem and Framework for Digital Public Sector Service Delivery* - Meyerhoff Nielsen, Morten. In Proceedings of the 6th International Conference on eDemocracy & eGovernment (ICEDEG 2019). 24-26/04/2019, Quito, Ecuador, 2019.
  - *Developing Health Sector Website Assessment Instrument: Outcomes from Portuguese Hospitals* - Sarantis, D., and Soares, D.. In Proceedings of the 6th International Conference on eDemocracy & eGovernment (ICEDEG 2019). 24-26/04/2019, Quito, Ecuador, 2019.
  - *Responding to the challenges and opportunities in the 4th Industrial revolution* - Manda, More; Ben Dhaou, Soumaya. In Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV2019). 03-05/04/2019, Melbourne, Australia. New York: ACM Press, 2019.
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  - *Public Service Delivery Framework: Case of Canada, China and Estonia* - Lopes, Nuno; Ben Dhaou, Soumaya. In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV2018). 04-06/04/2018, Galway, Ireland. New York: ACM Press, pp. 101-110, 2018.
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  - *Descentralização e autonomia em educação: uma contribuição para o debate na perspetiva da Economia* - Linda Veiga (24 pp), Seminário sobre Centralidade, Descentralização e Autonomia em Educação (Leiria, Portugal, 14.11.2016).
  - *Digital Public Service Innovation: Framework Proposal* - John Bertot, Elsa Estevez, Tomaz Janowski, ICEGOV2016 (Montevideo, Uruguay, 03-07.03.2016, ACM Press, 2016), pp 113-122, 2016.
- **Policy-driven, applied research study reports**
    - *Measuring the margins: A global framework for digital inclusion* - Digital Future Society. UMinho & UNU-EGOV, 2019.
    - *Developing the Most Significant and Suitable Smart City Indicators for Smart City Pilot in Knowledge Oasis Muscat* - Al-Mahrooqi, Shaima, UNU-EGOV, 2019.
    - *Smart City Applications Catalogue: Checklist and Suggestions* - Yuaca, Flavio. UMinho & UNU-EGOV, 2019.

- *Pre-Graduate Modules on ICT-enabled Governance* - Viale Pereira, Gabriela. European Commission, 2019.
- *Innovations in digital government as business facilitators: implications for Portugal*. Martins, João; Veiga, Linda. Gabinete de Estratégia e Estudos: GEE, (97), pp. 1-35, 2018.

## 4.5 PhD Thesis

PhD thesis (initiated with RL3) [5/4]

- **Morten Meyerhoff Nielsen.** *Role of Government Cooperation and Citizen Service Provision Online - in cooperation with UNU and Tallinn University of Technology, Estonia*. [Concluded in 2019]
- **Tiago Silva.** *Uninformative news or hollow campaigns?* - in cooperation with UNU and European University Institute, Italy. [Concluded in 2018]
- **Guillermina Cledou.** *A virtual factory for smart city service integration* - UNU and Universidade do Minho. [Concluded in 2018]
- **Ayman Alarabyiat.** *Electronic Participation Through Social Media: Citizens' Acceptance Factors at Local Government Level* -- Universidade do Minho. [Concluded in 2018]
- **Letícia Martins.** *Literacy and communication in education* -- Universidade do Minho.