

# Reference Model and Method of Evaluation for Smart Cities in Government Portals: a study of the Portuguese and Brazilian reality

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## ABSTRACT

The urban issue is currently of great interest. The cities and its multiple socio-cultural and political manifestations have been acquiring, from the technological changes of Information Society, new instruments for ensuring the quality of the future life of most of the world population, and this subject has been named in doctrine as Smart Cities. According to this, several organizations have been gathering efforts in order to monitoring the different dimensions of smart cities. It is thus of utmost importance to analyse the main (inter)national metrics and indicators for evaluating the levels of smartness of cities, with special focus in governance. For this, and based in bibliographic revision and realization of conceptual proof, it is proposed an evaluation method that expresses the variables capable of enhancing the intelligent governance in Government portals. From the research undertaken, it may be verified that studies in this field are still incipient. On the other side, in spite of the knowledge of the limits of such approach, this method will serve as a new focus on the fiability of the communication process between government and society and as source of consultation and evaluation of the intelligent governance. Finally, it is believed that the periodical application of this method will allow, besides the monitoring and control of public policies, also the opening up of new ways of citizen's participation.

## CCS Concepts

- **Social and professional topics**~Governmental regulations
- **Applied computing**~Law, social and behavioral sciences

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## Keywords

Smart cities; smart governance; indicators; government portals; Brazil; Portugal;

## 1. INTRODUCTION

Data from the United Nations (UN) indicates that more than 70% of the world population will live in cities until 2050.

In face of this scenario, it becomes evident the importance of a quick and efficient action in order to identify, understand and work on the several problematic issues concerning the quality of urban life. Thus being, and considering the emergence of the New Technologies of Information and Communication – ICTs, as auxiliary tools for the monitoring, control and decision making towards these problems, this subject has been evolving for consolidating urban management based in ICTs, namely the Smart Cities.

The policy of Smart Cities has been gaining consideration in the (inter)national arena, being considered as part of the main agenda of Governments, since it assimilates new conceptions, technologies and management practices.

For the purposes of this study, it becomes specially relevant the relation of ICTs in the field of popular participation, specially the focus falls on the dynamics of the contemporary Democratic State of Law and on the possibilities of online interaction between Governmental Institutions / agents and citizens. It is well known that there are different theoretical lines, some supporting and others criticizing the use of ICTs as tools for the enhancement of the democratic systems. However, the current debate is no longer defined by the discourse of good and evil, but by the potentiality of digital environments for the re-ovation of the right of political participation and of the right of access to information.

It is with reference to this debate that the main concern of the current study arises, mainly in the aspects of popular participation and information made available by the State in Government Portals. From this point of departure, the question must be formulated: if ICTs are incorporated by Cities for the improvement of several segments, including governance (right of participation, right of information) what kind of action is being undertaken or may be practiced by the States? Which principles

must be observed in government portals, true interfaces State / Citizen for ensuring the accomplishment of the constitutional and democratic requirements?

From this approach, for the political deciders to formulate/implement public policies for smart cities, in a sense of amelioration of democracy it is necessary to understand the reality of Smart Cities applications (dimension of governance) in the government portals of the States.

Based on these requirements, context and problem, the aims of this study are: to understand the practices of smart cities (dimension of governance) in government portals, from the construction of a reference model (that defines the best practices of governance for smart cities; as well as the construction of an Evaluation method (allowing to evaluate whether these practices are implemented and to what level).

It must also be observed that, in spite of the existence of significative (inter)national studies, reports and rankings using indicators to measure the degree of development of smart cities in Portugal, such tools are missing in the Brazilian scenario. Furthermore, when the focus falls on the analysis of digital interfaces it is noticed a complete lack of studies, both for the Portuguese as for the Brazilian scenarios.

For that reason, and with the aim of hitting the proposed aims, this study was structured in four items. The first one is aimed at identifying the viability of metrics on the degree of development of smart cities; then, the study is directed towards the issues concerning the indicators; in the third item it is done a survey of the main Reference Models for the evaluation and ranking of smart cities; finally, and based in the specificities of the reference models (on the dimension of governance of smart cities) it is proposed an evaluation method adequate for the reality of both Portugal and Brazil, for the evaluation of government portals concerning participation and information in a Democratic State of Law.

## 2. IS IT POSSIBLE TO MEASURE SMART CITIES?

Before trying to measure the degree of development of smart cities, it must be clarified the state of the art for the debate. And it must be referred the subjects: Informational Society, Electronic Governance and Open Government.

The expression “Informational Society” was introduced by Manuel Castells, signifying that, in front of the current technological development, a “new society” is emerging, whose axis of productivity and power is based on the production, processing and transmission of information [1].

It has to be referred that the first attempt to measure the degree of informatization of Society occurred in the 60s and 70s of past century, arising out of Japanese research. [2].

Specifically for the Portuguese and Brazilian reality it is worth mentioning the following agencies created in January 2005: - UMIC - “Agência para a Sociedade do Conhecimento, IP” (Agency for the Knowledge Society), the Portuguese public organism having the mission to coordinate the policies for information society and “Núcleo de Informação e Coordenação do Ponto BR” - NIC.br (Group of Information and Coordination of BR point), created for implementing the decisions and projects of “Comitê Gestor da Internet no Brasil” - CGI.br (Committee for the Management of Internet in Brazil), which is responsible for

the coordination and integration of the initiatives and services of Internet in Brazil.

Another expression that deserves our attention in this study is referred to the issue of Electronic Governance, also titled as e-governance or digital governance, which refers to the use of ICTs by the State in order to ameliorate its governing capacity and to formulate public policies, being thus also defined as: “the use in the public sector of innovative information and communication Technologies, such as Internet, to provide quality services, reliable information and more knowledge to citizens, aiming at making it easier for the citizens the access to government processes and to enhance participation” [3].

More recently appeared the expression Open Government, deepening issues concerning electronic governance, with particular focus on digital democracy and the participation of citizens, based on the notion of co-production of the public welfare [4].

So, as it may be extracted from the notion of open government, the technological revolution means a revolution of integration and participation among people and institutions.

Strategies for thinking Technologies for the improvement of life in cities get the name of smart cities; these got their first declaration with the Protocol of Kyoto, in the middle of the 90’s in the past century, which pruned the creation and implementation of innovative urban policies within the administration [5] and, since then, these issues have been evolving towards meaning ways of urban management based upon ICTs.

The Smart Cities are thus the focus of this study, however its definition is quite complex, since a dialog must be established with different domains of knowledge: technology, sociology, law, architecture, health sciences, economy, environmental sciences, among others.

Regardless of the broad conceptual approach found in the literature [6], including digital, Intelligence, smart, eco-city variants [7], in this study it is adopted the concept of smart city established in EU: “working definition of a Smart City is ‘a city seeking to address public issues via ICT-based solutions on the basis of a multistakeholder, municipally based partnership” [8].

Currently, the great debate around Smart Cities is directed towards the construction of indicators and instruments that allow to measure the dimensions of such systems and, mainly, to evaluate the level of development of the provided services and popular interaction provided by the administration and, from that, to direct the action of public policies.

Concerning the rankings for Smart Cities, it is to refer the studies of [9]. In the same direction, it is to refer the following indicators: Smart Cities Study Spain [10]; Mapping Smart Cities in EU [8] and Portugal Analytical Cities [11].

It becomes thus important to make a re-view of the methodological aspects of the main metrics, indicators and international reports that try to measure, particularly, the recent phenomenon of Smart Cities, a subject that will be developed in the following items.

## 3. SMART CITIES AND INDICATORS

In this topic, we will discuss aspects related to the indicators for smart cities. Firstly, it will be approached conceptual issues on the development of indicators, besides of its characterizing elements and critical factors of success. Next, we will make a brief analysis

of some indicator's models and structures that were found and, for which it was recognized a specific connection to the measurement of the phenomenon of Smart Cities.

### **3.1 Indicators: structuring elements and critical factors of success**

In a general conception, the indicators may be translated into concrete measures of the dimensions and concepts [12] e [13].

For that, the teachings of [14] are present-ed, defining social indicators such as: "a measure generally quantitative, with substantive social significance, used to re-place, quantify or operate an abstract social concept of theoretical interest (for academic research) or programatic (for the formulation of policies)".

Besides the representation of the dimen-sions and, reflexively, of a concept, the indicators may be defined by their func-tions: (...) serve to describe the state of society and the efficacy of the social poli-cies [13].

Among the above referred functionalities it may be emphasized the state of society ( e.g. to help in knowing the characteristics and specificities of the economic, social and environmental issues in urban centres) nd the efficacy of public policies ( e.g. information for managers on the need of policies and plans for improving the quali-ty of life of the population).

Besides this, the indicators may be classi-fied according to the interest for the for-mulation of public policies, being that these may, according to [14] be oriented towards three aspects: - "Indicators for the evaluation of efficiency of the tools and resources used; for evaluation of the effi-cacy in the accomplishment of the defined targets and for the evaluation of the social effectivity of the program (...) in broader terms, of the well being of society". In this classification, an urban public policy may have its social effectivity evaluated by the level of participation and social cohesion.

The variety and complexity of the issues concerning urban centres, make of cities a promising field for the use and develop-ment of indicators. Actually, from the 90s, several municipalities went on to ask the agencies for implementation and planning of public policies, for indicators. This was asked with the aim of subsidizing the elaboration of the local and participative planning [14].

The issue of smart cities is insered in this context, since among the positive aspects of the indicators it may be foreseen that these may subsidize the elaboration of public policies for urban planning; to allow the evaluation of the impacts arising out of the implementation of smart cities programs; to justify the transfer of gov-ernamental sums; to assist in the imple-mentation of normative precepts ( e.g. laws that prioritize the access to infor-mation and opening of data by public administration) and even the improvement of popular participation in the discussion of urban planning and participative bud-get.

Once the indicators selected, it must not be forgotten the critical factors of success, meaning that its use in the diagnosis of a reality or in the analysis of a social change is related to the accomplishment of mini-mal properties, such as: inteligibility (plainness both for the agents and for public-target of the policies); reliability (possibility of obtaining consistent results in successive measurements of one phe-nomenon / event) and Validity (capacity of adequately representing the theoretical concept that is being measured) [14]; [12].

Besides these limits, it should be remem-bered that some elements have influence in the results of social indicators, as the subjective links of the process of formula-tion and implementation of public poli-cies, starting with the obvious fact that, in most cases, public sector planning is not a tottaly neutral activity, but rather it must be seen as "partial and biased portraits of reality, mirroring what the world vision and the theoretical background of plan-ning technicals allow or prioritize to see". [14].

Furthermore, the indicators are not imune to changes alongside the political cycles, since they carry along the role of public officers responsible for enhancing or restricting its effectivation [2].

The study of Social Indicators is a promis-ing field for the development of urban indicators (e.g. Smart Cities), since the different town services comprise the elab-oration of public policies implemented through different phases: Phase 1 (Per-ception and definition of problems); Phase 2 (Insertion in political agenda); Phse 3 (Formulation of the public policy); Phase 4 (Implementation); Phase 5 (Evaluation) [15].

As one may notice, to measure and to evaluate are essential instruments to in-crease the efficiency of the services pro-vided to citizens and, hopefully, the satis-faction of citizens with the provided ser-vices. However, as referred, the efficacy of such metrics is conditioned to the su-peration of some critical factors. In the same way, different structures or models may be used for the construction of these systems. A brief review of these models, as well of its practiical application, will be made in the next section.

## **4. LITERATURE REVIEW: REFERENCE MODELS AND ANALYSIS OF INDICATORS OF DEVELOPED GOVERNANCE FOR MEASURING THE SMARTNESS OF CITIES**

The development of indicators in the con-text of smart cities is the focus of the survey undertaken in this section. Thus, in the sequence, it will be presented the methodlogical procedures developed by different international rankings and two International Standardization Organiza-tions.

### **4.1 Reference Models: Rankings and International Norms of Standardization**

According to [16] for the construction of a reference model it must be initially select-ed the approach of construction, among the four more referred in Literature: (i) speciallization, with the meaning of deriva-tion of a new model from an original; (ii) analogy, with the meaning of the use of an existing model to guide the creation of a resulting model analogy; (iii) aggregation, with the meaning of the combination of one or more reference models for generat-ing a new model; or (iv) integration, with the meaning of creation of a new model from the integration of one or more exist-ing models.

In this sense, in order to keep attained to the scope of this research and to identify concrete initiatives of measuring the phe-nomen of Smart Cities, the approach of construction of the reference model was based in analogy, meaning that the rank-ings and norms below referred will serve as guidelines for the creation of a model adequate to the reality of both Portugal and Brazil. With this purpose, the method-ological strategy used was divided in two

moments. Firstly, it was undertaken a literature review, in order to identify the subject “Indicators for Smart Cities” and, next, it was proposed a summary of evidences through the application of methods of critical appreciation and synthesis of the information.

In this sense, the research that was done used online sources referred in relevant literature, being then selected four rankings and two ISOs.

Then, let us take a look at the international directives that were considered (in)directly associated to the measurement of the phenomenon of smart cities:

- European Union. Mapping Smart Cities In The EU. Policy department A: Economic and Scientific Policy .
- Spain. Smart Cities Study: Estudio Inter-nacional sobre la situación de las TICs, La innovación y el conocimiento em las Ciudades (International Study on the situation of ICTs, the innovation and the knowledge in the cities) .
- Analytical Cities. Accelerating the development of smart cities in Portugal
- Brazilian Network of Intelligent and Human Cities .
- GIFFINGER, Rudolf. Smart Cities. Ranking of European medium sized cities .
- PORTUGAL, Smart Cities, territorial governance and information and communication technologies .
- INTELI. Smart City Index Portugal. 2016 .
- ITM- (Portugal) Index of Municipal Transparency 2013 .
- Transforming our world: the 2030 Agenda for Sustainable Development- (ASD)

Mapping Smart Cities (MSC) is an index published in the context of European Union aiming at providing information to the State Members on the good practices of European Smart Cities and their mechanism of functioning, specially concerning the aims of EU 2020 [8].

Based on that, the authors made a survey of the state of the art on this subject and, once identified the broad conceptual approach, smart cities were defined based upon six axis/ dimensions: intelligent economy, intelligent mobility, intelligent environment, intelligent people, intelligent life, intelligent governance [8].

Smart Cities Study- (SCS) is a study on the situation of ICTs, innovation and knowledge that was elaborated in the spanish context in 2012, taking in consideration the aims assumed at the Summit of Bilbao of 2005 on the development of Information Society in its territories. SCS had as general aim to raise awareness of the situation of smart cities in different regions of the world in order to identify experiences and good practices [10].

In accordance with the study, the development of Information Society, associated with the use of ICTs allowed the development of a new model of city, the Smart City, defined as “A city that uses the new technologies for making the city more habitable, functional, competitive and modern through the use of the new technologies, the impulse of innovation and the management of knowledge” [10].

In this concept converge 6 dimensions: economy, mobility, environment, citizen-ship, quality of life and management, all allocated in three main axis: Technology, Knowledge and Innovation [10].

The Portuguese study Portugal Analytical Cities (PAC) is aligned with the model of sustainable cities 2020 and Portugal 2020, presenting urban solutions considering the axis of development: economic, social, environmental, cultural and of governance.

Among its aims are the optimization of resources and information management using ICTs for the improvement of governance and citizen’s participation.

The initiative was promoted by General Direction of the Territory, with the aim of developing in Portugal a project in the context of smart cities based in the use of technological tools for the recollection of data and support to the urban management, as well to the decision making [11].

Brazilian Network of Smart and Human Cities -(BNSHC) [17] appears as a Brazilian model arising out of the joint strengths of two private entities with the aim of developing smart cities in Brazil. The Indicators Project of RBCIH was launched in February 2017 and the publication presents a “tropicalized” method: this version of the document presents five relevant dimensions (Governance; Architecture, Urbanism and Anthropology; Technology; Education; Security ) for smart cities, with the possibility of its widening based on the demand of the stakeholders.

Smart Cities Ranking European (SCREN) [9] this study becomes timely, as it serves as a base for establishing a comparative framework, considering the Portuguese, Brazilian and others scenarios Eurasian region for example.

According to the authors, a smart city is a city with a good performance in six characteristics and factors, such as: economy (competitiveness), persons (human social capital), governance (participation), mobility (transports and ICTs), Environment (natural resources) and Life (quality of life).

The document Portugal Smart Cities, Territorial Governance and Information Technologies (SCTGIT) [18] is a result of the policies for cities within portuguese POLIS XXI program, that assumed for the period 2007-2013 the following aims: to discuss the role of ICTs in supporting governance and territorial management, for the administration to improve its governance performance. According to this document, a city is considered to be smart whenever it aggregates the following dimensions: Extern dimensions (Collection and divulgation of information, Network integration) and Intern dimensions (Governance, Urban and Social Environment and Entrepreneurial Environment).

Smart City Index Portugal (SCIP) [19] is a tool for the analysis of urban smartness, allowing to monitoring critical territorial indicators, and to propose recommendations for the improvement of performance of Portuguese cities and regions. It is based on a proprietary methodology of INTELI (private entity) that started activities of monitoring and ranking of portuguese municipalities in 2012 (encompassing 20 municipalities) and, already in the second edition in 2016, increased its universe of analysis to 36 municipalities.

For the evaluation of cities, the methodology Smart City Index integrates a set of key dimensions, as follows: Governance, Innovation, Sustainability Quality of Life and Connectivity.

The Index of Municipal Transparency - IMT- (Portugal), is a product of Transparency and Integrity Civil Association, measuring the levels of transparency of the municipality, in Portugal. It is to be noticed that this Index is not specifically aimed at evaluating smart cities, and does not even present a concept of smart city. However, it was considered relevant for the purposes of this study, since it deals with one of the key elements of the dimension governance in cities, which is transparency [20].

Transforming our world: the 2030 Agenda for Sustainable Development- (ASD). In September 2015, UN approved a set of targets elaborated since 2012 in the context of the United Nations Confer-ence on Sustainable Development (Rio+20), the aims of sustainable devel-opment (Agenda 2030), in force since January 2016, containing 17 global aims and 169 targets for promoting social inclu-sion, sustainable development and demo-cratic governance all over the world be-tween 2016 and 2030 [21].

## 4.2 Other specific measurements

Besides the models and rankings referred in the previous section, there are other indicators idealized for measuring aspects of the Cities that are focused in some characteristics of smart cities, however without approaching the subject in a spe-cific way, as it happens with the referred rankings. It is the case of the International Organization for Standardization ISO, or International Organization for Standardiza-tion. In this study two ISOs were selected: ISO 18091:2014 “Guide for the applica-tion of the norm ISO 9001:2008 in local governments”[22] and ISO 37120:2014 “Sustainable Development in Communi-ties – Indicators for City Services and Quality of Life”[23].

ISO 18091 explains 39 qualitative indica-tors, being divided in: indicators of institu-tional development for good governance; indicators of sustainable economic devel-opment; of inclusive social development; of sustainable environmental devel-opment. Through these matrixes, it is possi-ble to measure the performance of local public administration and to determine key actions for its improvement.

On its side, ISO 37120-2014 presents indicators related to diverse domains, including Economy, Education, Energy, Environment, Finances, Governance and Health.

From the analysis of the above referred studies it was verified that there is no consensus on the dimensions for Smart Cities. It was identified from five to eight dimensions of Smart Cities, depending on the adopted concept.

Once presented the studies and their details, the work now follows to the analysis of the requirements that compose the dimension Governance of Smart Cities, which are detailed below:

**Table 01:** Reference Models (Dimension Governance)

Document	Indicators for Intelligent Governance
MSC	By Smart Governance we mean joined up within-city and across-city governance, including services and interactions which link and, where relevant, integrate public, private, civil and European Community organisations so the city can function efficiently and effectively as one organism. The main enabling tool to achieve this is ICT (infrastructures, hardware and software), enabled by smart processes and interoperability and fuelled by data. International, national and hinterland links are also important (beyond the city), given that a Smart City could be described as essentially a globally networked hub. This entails public, private and civil partnerships and collaboration with diferente stakeholders working together in pursuing smart objectives at city level. Smart objectives include transparency and open data by using ICT and e-government in participatory decision-making and co-created e-services, for example apps. Smart Governance, as a transversal factor, can also orchestrate and integrate some or all of the other smart characteristics

SCS	Expenses of Municipal Public Administration in ICTs Availability of Web page Strategic plans for the promotion of ICT in Administration, public services online Transparent Government, e-Democracy Promotion of ICTs and innovation
PAC	Online access to municipal expenses Level of integration of the administrative process and data sharing in back-office Urban digital planning Policy of Open Data and available Data Sets Existence of online participative budget Availability and quality of the portals for interaction with citizens Level of online contact with the municipal administration Online request of certificates
BNSHC	The indicators of the dimension governance englobe issues related to policies, public participation, public services, transparency, access to information, urban public policies, digital democracy, legislation, public and private partnerships, among others. The classification of the indicators follows the ISO 37120-2014 proposals or a new indicator proposed by this evaluation tool.
SCRE	Participation in decision-making Public and social services Transparent governance Political strategies & perspectives
SCTGIT	It allows a better efficiency in the intern functioning of the Administration (back-office); Makes it easier the provision of information to citizens and agents. It improves the interaction of Administration with citizens and agents (front -office and back office); It enhances the participation in the processes of definition of policies and decision making.
SCIP	The dimension Governance considers the way of articulation between public and private, social and economic actors, with a focus on the participation of the citizen either in the definition of the future of cities or in the innovation process associated to the resolution of urban problems. It integrates 25 indicators, divided in 4 sub-dimensions: <b>Public Policies</b> (strategy for the development in the domain of smart cities, team/department with functions in the domain of smart cities, monitoring system of the indicators – Dashboard). <b>Public Services</b> ( integrates 5 indicators concerning the interaction of the municipality with its citizens, municipal information system, online request of information service, space of easy access for citizen’s claims and suggestions). <b>Transparency</b> (9 indicators in the domain of local finances, local administration, and prevention of corruption, level of indebtteness and of financial independence, Plan for the prevention of risks of corruption and related infractions, publication of maps of budgetary execution (expenses and revenue, publication of activity’s report of the municipality, provision of the minutes of the Municipal Assembly, Code of Ethic and of Conduct), and <b>Open Governance</b> ( Participative Budget, other forms of participative democracy, open data portal with applications based in open data, Process of reporting of occurrences by the citizens.)
IMT	Information on the organization, social composition and functioning of the municipality (18 indicators); Plans and Planning ( 13 indicators); Taxes, fees, tariffs, prices and regulations (5 indicators); Relation with Society (8 indicators); Transparency in Public Procurement (10 indicators); Economic and Financial transparency (12 indicators); Transparency in the domain of Urbanism (10 indicators)

<b>ASD</b>	Access to public spaces. Access to Justice. Accesses (denied) to the citizen's information system. Municipal Conferences, Municipal Councils, Data in open formats, spaces of deliberative participation, and public auctions in city. Civil servants under investigation due to corruption. Civil servants object of administrative action, persons using electronic government. Law on access to regulated information. Mechanisms of direct democracy. Women in charge of management functions in the municipal government. Women in command of Municipal Government Secretariat. Blackmen in charge of management functions in the government of municipalities. Executed budget decided in a participative way. Organs of Control and fight against corruption. Ombudsman, equality of gender in Municipal Councils. Participation of teenagers and youngsters in deliberative instances. Requirements replied in citizen's information service. Handicaped persons employed in municipal government. Regionalized public policies. Portal of Transparency. Councilwomen in Town Hall. Municipal procedures due to corruption. Program of targets, resources and claims registered in the citizen's information system. Systems of control and fight against corruption. Intelligent and Transparent systems of contracting and licitation. Internet users by type of electronic government service.
<b>ISO 18091</b>	Responsibility, planning and organization with a complete system of quality management, Associated, supportive and connected. Public Servants with competence and continuity. Participation of the community in the policies and public programmes. Fiscal responsibility .Promotion of Civil Defense and emergency services. Sistematic use of ICTs. Legal framework implemented and updated . State of law prevailing in the geographical area of the municipality. Transparency and access to information, integrity and social responsibility. Adequate financial management. Awareness of security.
<b>ISO 37120</b>	Voter participation in last municipal election (as a percentage of eligible voters) (core indicator) Women as a percentage of total elected to city-level office (core indicator) Percentage of women employed in the city government workforce (supporting indicator) Number of convictions for corruption and/or bribery by city officials per 100 000 population (supporting indicator) Citizens' representation: number of local officials elected to office per 100 000 population (supporting indicator) Number of registered voters as a percentage of the voting age population (supporting indicator)

Source: Elaborated by the authors

Based on the concept and indicators of governance, above referred, it may be inferred that the Administration may use ICTs in different ways in its relationship with the citizens. Thus being, according to [18] the types of relationship Administration / Citizen may present several levels, suggesting that the Administration knows how to identify the adequate level in order to reach the next level, until it gets to a level of inclusion and participation that may be called of "smart city". The authors identify four levels of relationship between Administration and Citizen towards smart cities, these being:

Level 1: Use of ICTs by Local/Regional Public Administration, in order to make accessible relevant information for citizens and socio-economic agents;

Level 2: Use of ICTs by Local / Regional Administration in the context of interactions and regular transactions established with citizens and socio-economic agents;

Level 3: Use of ICTs by Local / Regional Administration in order to receive and incorporate the opinion or proposals of citizens and socio-economic agents in the processes of formulation of policies / strategies of development and in the decision making process.

Level 4: Use of ICTs by Local /Regional Administration for empowering and stimulating the participation of citizens and

socio-economic agents in the formulation of the policies / strategies of development and in the decision making process. From the above survey it was verified that measuring cities is one of the greatest challenges of the projects of Smart Cities. With a correct measure it is possible to classify and ranking cities in accordance with its behaviour. However, it is difficult to identify what must be important in the context of Smart Cities. This difficulty is due to the fact that there are not so many consolidated academic studies on this domain and because this is a brand new subject in city management. However, the relevance of the above re-referred models and the researches of [26] refer that the development of indicators for Smart Cities is still incipient, mainly when the focus of the analysis falls on the provision of public services through electronic means.. Thus being, from the bibliographic survey that was done, it is presented a proposal of Evaluation Model for measuring the level of development of Smart Cities in Government Portals, within the following analysis.

## 5. METHOD FOR THE EVALUATION OF SMART CITIES IN GOVERNMENT PORTALS: STUDY OF THE PORTUGUESE AND BRAZILIAN REALITY

In this item it is intended to present an instrument created for the analysis of the level of development of Smart Cities (di-mension governance) from now on called Smart Cities Governance Index (SCGI), as well as to verify its concrete application to the Portuguese and Brazilian Government portals, in order to identify the existence of asymmetries between them that may serve as a model in what smart cities are concerned.

In this perspective, the comparative study is justified for trying to identify the state of the art in the analysed countries, in terms of use of the technological potential for the improvement of democratic models and implementation of the precepts of smart cities.

Furthermore, when we speak about the State, we mean the inclusion here of the sphere of the Executive Power, being that such institution was selected in detriment of the others (Legislative and Judiciary) due to its closer proximity with the civil sphere (where the popular sovereignty lies) and, from there, it is foreseen better possibilities of opening communication channels with the citizens.

For the pilot project two portals were selected, one Brazilian (Brasília) and the other Portuguese (Lisbon), being that the first criteria of choice was the geopolitical sphere of acting. Regardless of the differences in the forms of government of the analysed states, it was opted for the municipal sphere, for having more similarities but also for the proximity with citizens; next, it was selected the official portals of municipalities considered as "holders" of the municipal executive.

### 5.1 Evaluation Method: Tool for collection of data for Smart Cities Governance Indicators - SCGI

The option for the evaluation of Government portals arises out of the incorporation of ICTs in public administration in search of better efficiency and effectivity of the provided services, being that public administration are getting more sophisticated and

currently exhibit tools, functions, contents and new ways of communicating, not just for the internal improvement of the services provided by the administration but mainly having a look to the external requirements and requests of the citizens. Thus being, the government portals may be evaluated with different methods and different parameters. For instance, the existence of devices for transparency and popular participation, from technical norms internationally accepted, are relevant aspects that may be object of a specific study.

It is worth to mention that, although it is possible a technical evaluation of the government portals, the aim of this Evaluation Method is to analyse the objects primarily from qualitative parameters, through an oriented navigation to government portals.

In this sense, the proposal of SCGI searches to cover the gap existing in the portuguese and brazilian reality from the inexistence of monitoring on the development of Smart Cities, specifically concerning the accomplishment of the requirements of the dimension governance, being thus an innovative tool until then inexistent, since it compares the reality of different States.

For such purpose, it was used indicators collected in several rankings analysed in the previous item (see table 01), as well as the studies of [24] and [25]. However, in face of the objectives aimed by this study and the almost daily mutation of these portals, it was opted for another structure of questioning, harmonised in order to ensure the compatibility of the portuguese and brazilian realities.

It is well known that the method of evaluation must be constructed, being defined: (i) the domain, that is the field of application of the evaluation method in the perspective of the users; and for the purposes of this study these are the government portals (ii) the typology that may be: institutional (directed to the main aspects of the organization), functional (for a determined domain or function of the organization) or procedural (employed in a specific procedure; in the current case it is included in the institutional type, for it is directed to governmental institutions (iii) the indicators, that is the elements that express it what will be evaluated, how measurements will be performed and how information will be collected (for this item it must be considered, as starting point, the topics proposed in Table 02); (iv) the activities of evaluation, or the steps to be followed for making up the evaluation, according to the Reference Model; for this study we follow the technique of oriented navigation (v) the classification of the dimension, which means the indication of the scope of each indicator; such criteria are detailed in table 02 below.

It must be stated that usually the indicators are classified in management terms by their quality and excellency, IT management, governance and corporative control, among others.

In the context of this study it was selected Governance among the diverse dimensions of Smart Cities; (vi) the method of construction, meaning the method used which may be: deductive, based in formal logic and inference; or empirical, based in investigation of the real experience, resulting in better measurements; in this study it is followed the deductive method, from a general observation of the government portals it will be made the inferences on the requirements considered essential for the composition of the dimension governance in Smart Cities

In this sense, for advancing with the collection of data, the proposed Evaluation Method was based on a form to be applied

through online navigation. The referred matrix was based in twenty objective questions (closed), with fixed alternatives, in a way to make it easier the tabulation and analysis of the data. The instrument of collection was divided in eight sections: one corresponding to the identification of the government portal, another concerning the filling instructions and the remnant six concerning to the Index of Smart Cities. This way, it was followed from one extreme to the other, seven different levels, corresponding to the levels of popular participation provided by the internet infrastructure for a city to be considered as smart, in the dimension Governance.

**Table 02:** Form for collection of data of Smart Cities Governance Index (SCGI)

Section	Topics
Identification Data	Name of City, address of the portal, period of application (hour/day/month).
Instructions of fulfillment	1- for positive reply; 0- for negative reply
e-administration/ e-services	Institutional information on: e-mail, address, telephone, schedule of functioning. News and information on already decided issues, to be decided and historical of the News. Information on the provision of services. Possibility of obtention of services through online request. Possibility of issuing (download) of documents through the portal
Promotion of ICTs and Polls of Opinion	Information on Programs of Digital Inclusion. Services of instant citizen service: Listen to the Citizen and Speak to us. Polls of opinion with and without deliberative effect.
Transparency, Access to information and Social Responsibility	Active transparency, passive transparency, Bidding, Contracts, Information Services for the Citizen. Good practices of transparency.
Popular Participation in policies and public programs	Pre-legislation with potential for previous popular debate (EX: Municipal Directing Plan; Urban digital planning). Popular consultation, with deliberative character on infrastructures (Exemple Participative Budget). Forums for thematic debates. Complete operationalization of online services, exemple: download and upload of documents
Data Protection	Availability of information on policies of privacy and data protection
Open Data	Availability of archives and reports in open formats
Feedback	Time of reply to sent email with general and specific issues.

Source: Elaborated by the authors

As recommended in the methodology, the instrument of collection of data was submitted to a Conceptual Proof, in the month of April 2017, when the portals of the portuguese and brazilian capitals were evaluated. After the validation of the test, some of the variables were altered in order to improve the research allowing it, after that, to be replicated in other portuguese and brazilian cities

## 6. FINAL CONSIDERATIONS

The accelerated development of the urban centres challenges public management in a daily basis. In this sense, considering the emergency of ICTs, namely Internet, comes out of darkness the concept of smart cities.

As it has been studied, the concept of smart cities may be synthesized in the use of technology for improving the urban infrastructure and to make the urban centres more efficient and better for living. By using information and communication technologies, besides the rational use of resources, results in less energetic costs, and it is foreseen the improvement in the provision of services and increasing of popular participation and, consequently, better quality of life.

In this approach, this study had to deal with problem of the incorporation of ICTs – internet – in the cities and the use of these tools to improve the rights of participation and of information.

Considering this, this study proposes a Method of Evaluation of governance in the portals of the Cities Governments, which will serve as a guide for the municipalities that opened (or did not open) the way for a model of Smart Cities and, by that, serving as a basis for evaluating the adopted public policies and how its evolution must be looked at.

It must be registered that, regardless of the existence of Reference Models for Smart Cities, with indicators for the comparison of the performance of different countries, including Portugal, even though these are lacking the consideration of the specificities of this State and, furthermore, there are no official indexes to measure this reality in the Brazilian scenario, and to others scenarios for example, regions Eurasia.

Besides that, academic studies on the collection of data in Smart Cities, in Government Portals, are still in a phase of development. Due to this, several rankings still do not integrate the realities and specificities of the countries, besides the fact that information on some indicators are not available in all the countries. This way, the application of these models to the portuguese and brazilian realities might generate results not in accordance with the reality.

In face of this, and trying to avoid a model Top Down created for different contexts and realities, that, for such reason, quite often does not produce an useful effect, since they do not mirror the requests of each State, this study opted for the use of an approach Bottom Up, allying the specificities and requests of the portuguese and brazilian scenarios to the analytical rigor.

For this, the proposed evaluation tool aims to synthesize the knowledge of the academic world with the reality in which the institutions, with their government portals, live. Thus, this study includes validation phases of the Evaluation Method in which it was empirically tested this theoretical proposal, through the use of the tool for collection of data by oriented navigation in government portals.

So, starting with the premiss that it is possible to tabulate a tool for the identification of the accomplishment of precepts of the Democratic State of Law, it was built up indicators to assess on how the state institutions in their government portals are complying with the constitutional principles of popular participation and information.

From here, it is believed that the study of government portals here proposed points to new horizons arising out of the new technologic requests and contributes for (re)thinking the digital interfaces of the States from a system based in democratic pillars.

For the academic community this research offers an evaluation method of the intelligent governance of cities, with an instrument for collection of data validated for the practical application in public administration evaluation; as reference to the building

up of new instruments of collection of data useful for the evaluation of the reality of other countries and as source of inspiration for further and complementary researches.

Only through studies like this it will be possible to evaluate if the democratic requests are being complied with by the States and to allow that cities may be, as a fact, called with the adjective Smart.

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