

## GET INTO THE CLUB: POSITIONING A DEVELOPING COUNTRY IN THE INTERNATIONAL E-GOV RESEARCH<sup>1</sup>

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### ABSTRACT

The aim of this paper is to suggest alternatives for positioning a developing country in the international eGov research. We conducted a literature review, examining both Brazilian and international publications. We analyzed the domain of collaboration in the field through a social network analysis of authors, institutions and countries. Our study identified that the discussions concerning eGov are predominant; there is more intense collaboration in the network of institutions than of authors; the co-authorship network reflects the existence of a select number of central authors and, not surprisingly, the study of eGov is centralized in the USA and UK. This study complements previous studies and provides further understanding on how authors, institutions and countries cooperate. The findings of the study are not limited to Brazil, other countries that have barriers to internalization of research can benefit from the data.

**Keywords:** electronic government; bibliometric study; social network analysis; international eGov research; Brazil

### 1. INTRODUCTION

Since the 1990s, e-government (eGov) initiatives have been put into practice at the municipal and other government levels in Brazil and in the world. Attempting to understand these initiatives has become an attractive field of study, gaining space in journals and at a number of conferences for the study of eGov (Heeks and Bailur, 2007; Rose and Grant, 2010; Torres et al., 2005). In this field, many papers look at eGov in industrialized countries, while other researchers study the process in developing countries (Grönlund and Horan, 2004). These studies are being conducted in many countries around the world. Furthermore, in many cases, involve groups of researchers from a several countries (Coelho et al., 2016).

In this study, we intend to identify how Brazil can contribute to the field and improve its position in terms of participation in eGov research. The improvement of scientific production of Information Systems in a developing country is expected to collaborate to local practice and sees its researchers becoming more involved in the international community, on the one hand contributing to the production of world knowledge and on the other accelerating its local spread. Aspects of the local relevance of international research may also be raised.

Our first approach to the problem was to further our knowledge of the field, which was facilitated by the availability of a series of literature reviews focusing on eGov (Andersen and Henriksen, 2005; Erman and Todorovski, 2009, Grönlund, 2005; Grönlund, 2010; Heeks and Bailur, 2007; Norris and Lloyd, 2006; Przybilowicz et al., 2014; Rana et al., 2011). An effective review can make a considerable contribution to quickening knowledge building in the field of study and can also propel theory (Webster and Watson,

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2002). Different findings from these studies attracted our attention. When Heeks and Bailur researched eGov publications in 2005, they pointed out the weak contribution of studies to the building of knowledge or practical guidance for electronic government. They also showed that there was a lack of clarity and rigor concerning the research methods, along with poor handling and generalization. Furthermore, eGov studies normally made use of theories to study the phenomenon, and were more concerned with conceptualizing electronic government (Andersen and Henriksen, 2005; Grölund, 2005). Generic explanations for eGov continue to be used a great deal among researchers (Rana et al., 2011) and they are particularly common in Brazil (Przybilowicz et al., 2014). Concerning collaboration networks, Erman and Todorovsk (2009) analyzed the co-authorship network of those who collaborated on papers published in seven proceedings of the International Conference on eGovernment (eGOV), between 2002 and 2008. The authors identified most of the central authors of eGov and the research topics in which the papers at the conference were most focused. When we familiarized ourselves with the reviews on the field of eGov in the perspective of our research interest, we noted a lack of studies addressing the international arrangements between researchers, institutions and countries.

This gap in the literature, Brazil's incentive to participate in international collaboration networks and our desire to provide suggestions to Brazilian researchers concerning the internationalization of their work are the context in which the following research question was defined: what approaches should be taken to internationalize eGov research in Brazil? We perceived that the study could go further and provide insights to researchers from other developing countries. To answer our question, we analyzed some topics, identifying:

- Which themes, theories and methodologies have been used in Brazilian publications on eGov and how are the collaboration networks of co-authors and Brazilian institutions structured.
- Which themes, theories and methodologies have been used in international publications on eGov.
- Which social structure can be identified in collaborations between co-authors, countries and institutions that research eGov.
- Suggestions on how to internationalize eGov research conducted in a developing country

With the support of Social Network Analysis, we describe and analyze the field of international and Brazilian eGov and analyze the networks of researchers, countries and institutions that have been created for collaboration. By doing this, our first contribution is to reveal a new panorama of the field: we expose the collaboration networks of researchers, institutions and countries. We show which institutions are at the center of collaborative eGov research. The study differs from previous works that have studied the field by charting collaboration in eGov in Brazil and internationally. The second contribution is for researchers in Brazil and other developing countries who seek better international ranking. We propose some alternatives for channeling their efforts when it comes to participating in international research networks. We make suggestions that might result in greater academic production adapted to international standards.

We presented the reasons for the study and the research questions in this introduction. The following sections look at the concepts of eGov, the method used in the study and the social network analysis. After, the presentation and analysis of the data and a description of the social network structure of authors, institutions and countries. By the end, the conclusions, which offer some final considerations and recommendations for future studies.

## 2. E-GOV AND BRAZILIAN CONTEXT

The term eGov (Electronic Government or Electronic Governance) arose in the 1990s as a context of sharing experiences between professionals (Grönlund and Horan, 2004), but the literature on IT in government can be traced back to the 1970s, with the computerization of government institutions (Kraemer, et al, 1978, Danziger and Andersen, 2002). Until the 1990s, the focus of the studies was the internal use of information and communications technology (ICT) in government (Grönlund and Horan, 2004). The focus then shifted to its external use, e.g., government relations with the public and e-services.

There is no single, universally accepted definition for eGov. In general, eGov refers to the use of ICT by different government agencies to improve efficiency, effectiveness, transparency and accounting (Kraemer and King, 2006). The definition of the term has evolved in that the scope of electronic government capacities has grown (Rose and Grant, 2010). Therefore, eGov is no longer seen merely as how to provide information or services using ICT, but also as a way of transforming how the public and government interact, improving the social, political and economic relations between these agents, empowering citizens and democratizing access to government information (Bwalya, 2009; Cunha, 2010; Löfstedt, 2007; Luna-Reyes and Gil-Garcia Romero, 2012; Torres et al., 2005). The findings of Rana et al. (2011) show that studies on eGov are conducted in many countries around the world.

Brazil is a country with a population of over two hundred million and the seventh largest economy in the world. The country suffers from social inequality, with different levels of access to healthcare, income and education, and the provision of public services, as shown by government statistics (Ibge, 2010). Brazil has a series of characteristics such as its diversified economy, complexity of organizations and multifaceted culture which make the country especially attractive to researchers (Bertero et al., 2012; Pozzebon et al., 2011). Brazil has particularly made innovative use of ICT in fields such as government and public administration, digital inclusion, use of mobile technology and e-democracy (Picazo-Vela et al., 2012). Research data on the use of ICT from the Internet Steering Committee in Brazil (CGI, 2014) show that 68% of Brazilians use eGov for consulting documents, declaring income tax, obtaining information about payment of taxes or duties and other services. The data emphasize that there is a potential for the study of IT in combination with specific public sector policies in Brazil that could offer new concepts, insight and even theories to contribute to the field of international eGov. These provide opportunities for researchers who study the social implications of ICT.

In Brazil, the term eGov arose in association with reform movements and the offer of services to the public using ICT and the expansion of the internet (Cunha, 2010; Cunha and Miranda, 2013; Diniz et al., 2009; Rana et al., 2012). The use of IT in the Brazilian government began in the 1960s, although it only began to reach more widespread use with the eGov initiatives of the 1990s and beyond (Diniz et al., 2009), attracting academic researchers as time went by.

Brazilian works on the use of ICT in the public sector in Brazil have emerged from various fields of knowledge, such as Management, Public Administration, Urban Planning, Information Technology, Law, Political Science, Social Sciences and Information Science. The pioneer nature of Brazilian studies on eGov that occurred in the field of Management has made this a robust set of production. In the Brazilian structure, IS is a subfield of Management and Computing. In general, in the teaching and research institutions of the country, there is no specific department of Information Systems, but there is a reasonable contingent of authors in IS. At the Brazilian Academy of Management (ANPAD - Associação dos Programas de Pós-graduação em Administração), which includes Management, Public Administration and Accounting, there is a strongly instituted area for research and production

in IS (ADI – Administration of Information). The annual event, from 1994 to 2014, included works from over 1500 different authors, of whom approximately 95% were Brazilian (Freitas, Becker and Marcolin, 2014). The authors, and therefore the works they produce, are greatly influenced by international production in IS and it is not unusual for the community to participate in international events promoted by or affiliated to the AIS (Association of Information Systems) such as the ICIS, ECIS, AMCIS and Conf-IRM. Since the 1990s, there have been works in Brazil on the use of information technology in government. Since the early 2000s, at meetings in this academic field, there have been studies on eGov addressing electronic governance or government, including those of Castor and José (2001), Ruediger (2002, 2003), Frey (2003), Ramos and Ramos (2003), and e-democracy, including Dornelas and Hoppen (2001), Akutsu and Pinho (2001, 2002), Frey (2003), Cunha and Cruz (2003) and Cunha and Miranda (2013). In the following years, production on the theme has continued. More recently, study on eGov research in Brazil (Authors, 2014) show that in the period from 2007 to 2012 the most studies topics were: eGov, e-governance, digital inclusion, e-participation and e-governance. But it was not possible to identify a trend of growth or decline in publications on eGov since the variation in the volume of annual publications was not uniform. There were identified 241 authors publishing on eGov in that period. This does not mean constantly work on the subject and not the existence of cohesive collaboration networks between authors. There were identified 84 different institutions and the University of São Paulo the most important link in this network.

Egov research as an international domain draws from both IS research in general and from ICT4D research, as a particular domain. Studies on eGov conducted in Brazil are also influenced by studies published in IS journals and, more recently, those dedicated to ICT4D. Thus, the studies inherit characteristics of international production in IS, but also from their field of knowledge in Brazil. In international terms, a decade ago Gregor (2006) emphasized that the calls continue for “good theory” in IS (Watson, 2001) and the development of “our own theory” (Weber, 2003). The main journals in the field of IS determine that research should ground its work in theory, e.g., the main journal in the field, MIS Quarterly, includes this instruction in its recommendations to authors (<http://www.misq.org/categories>). Despite this effort, the field of ICT4D as a subdomain “has been a bias to action, not a bias to knowledge. We are changing the world without interpreting or understanding it. Most of the ICT4D research being produced is therefore descriptive not analytical” (Heeks, 2006, pg. 1). Furthermore, in Brazilian production, the theoretical grounding of works in administration is a challenge in general (Bertero et al., 2012), particularly in works on IS (Pozzebon et al., 2011; Luciano and Macadar, 2014), and works in the subdomain of eGov (Przybilowicz et al., 2014; Luciano et al., 2015).

Another important characteristic in the Brazilian research context is the effort to improve the quality of scientific studies conducted in the country. To achieve this, one of the strategies is the internationalization of research. In Brazil, the two major research-funding agencies at the national level are the National Council for Scientific and Technological Development (CNPq) which promotes Science, Technology and Innovation and works on the formulation of their policies. Moreover, the Higher Education Personnel Improvement Coordination (CAPES) is the agency engaged in the expansion and consolidation of post-graduate studies. CNPq, CAPES and other local development agencies are leading efforts to increase the presence of Brazilians in international networks. One of the reasons for establishing this strategy is the example of the field of Business, Management and Accounting. From 1996 to 2013, Brazil increased the number of articles published in the field by 442%, evolving more than Spain (345%), Mexico (291%) and South Africa (144%). However, in 1996, the country shared the leadership in citations in this group with Spain (31%), well above Mexico and South Africa (19%). However, in 2013 it had only 18% of the

citations, having been overtaken by Spain (35%), South Africa (27%) and Mexico (20%). Mexico and South Africa were the most cited, publishing far less than Brazil. A possible explanation may be found in the evolution of the international collaboration indices. In 1996, Brazil, Spain and Mexico were equal, with 27% of their articles being the fruit of international collaboration. In South Africa, which had recently emerged from the Apartheid regime, 19% of the articles were the result of international collaboration. In 2013, 42% of the articles from Spain and South Africa were the result of international collaboration, with Mexico close behind at 38%, while Brazil remained stationary at 28% (Diniz, 2015). These Brazilian efforts for a strong presence in international journals by participating in international collaboration networks attracted our attention to the use of the lenses of Social Network Analysis.

### **3. SOCIAL NETWORK ANALYSIS**

Social network analysis is inherently an interdisciplinary effort (Wasserman and Faust, 1994). The pioneers of social network analysis came from the field of sociology and social psychology (e.g., Bavelas, 1948; Moreno, 1934) and anthropology (e.g., Barabási et al., 2002; Mitchell, 1969). According to Wasserman and Faust (1994), many people attribute the first use of the term “social network” to Barnes (Barabási et al., 2002). The notion of a relationship network that connects social entities or links between these units that emanate through society was broadly adopted throughout the field of social sciences (Wasserman and Faust, 1994). Social network analysis is dedicated to exploring the relationship matrix of social actors (Galaskiewicz and Wasserman, 1993) and it could be described as a set of methods for analyzing social structures in various parts of the social environment in which, there are interacting units (Wasserman and Faust, 1994). The main goal of social network is detecting and interpreting the social ties among actors (Nooy et al., 2011).

In this sense, interest in scientific collaboration has increased in recent years, both in terms of nature and scale (Acedo et al., 2006). Social network analysis studies that look at co-authorship have taken two different approaches. The first seeks to analyze the reasons why authors collaborate and the consequences of this decision (Laband and Tollison, 2009). The second is based on the idea that co-authorship creates a social network of researchers (Barabási et al., 2002; Moody, 2004; Newman, 2001). In the present study, we conducted an exploratory analysis of co-authors, institutions and countries following the line of the second approach. We examined the scientific community as a social network made up of individual actors, in which each person (and each institution and country) occupies a special place that enables the subject in question to benefit from several opportunities (Acedo et al., 2006). The patterns of these relationships reflect an underlying social structure that affects the production and diffusion of knowledge (Piette and Ross, 1992).

A network consists of a graph and additional information on the vertices or lines of the graph (Nooy et al., 2011). A network is composed of some important elements such as: a vertex (representing an actor); a line (a link between two vertices in a network, which can be any social relation); an arc (a directed line); and an edge (an undirected line). Thus, there are direct and indirect social and academic links in networks (Acedo et al., 2006). A network model suggests that researchers can interact directly exchanging ideas, questions and methods (Friedkin, 1998). Indirectly through the network, researchers gain access to other researchers that were previously unknown to them (Acedo et al., 2006). These indirect links aid contact between researchers and facilitate the sharing of information in the network (Katz and Martin, 1997).

There are several possible ways of analyzing a network to provide formal declarations and measures of social properties, e.g., an index that measures the centrality of a vertex. Networks of relationships (actors and their defined relationship or relationships), relational

ties (linkage between a pair of actors, which might characterize a formal relationship, an association between actors, a physical connection), roles and social position (such as the centrality or prestige of an actor and his role in the network), popularity (meaning the number of connections of an actor in the network), relevance and other factors are definitions that are arrived at through social network analysis (Wasserman and Faust, 1994). By analyzing a network, it is possible to identify many particularities regarding the actors within. By examining the interconnections between actors, it is possible to observe the historical and sociological processes in the network. It is also possible to identify the most popular actors, i.e., those with the highest number of connections and the highest impact. It can also be the starting point for unravelling some scientific myths or identifying certain abnormalities (Garfield, 1970) and explaining why they occur.

To achieve our goal in this study, it was necessary to know the role of the authors, institutions and countries in the collaboration network. For this purpose, we chose the measures density, degree, betweenness and visual inspection as analysis parameters. According to Nooy et al. (2011), exploring network structure by calculating is much more concise and accurate, although at times they are abstract structural indices that are difficult to interpret. The authors suggest using the calculation of structural indices to analyze network structure and combine it with a visual inspection of the network. The density indicates the relationship between the number of real links and all possible links in the network (Acedo et al., 2006). Meanwhile, degree is an indicator of the importance of influence and an actor's capacity for access in the network (Acedo et al., 2006; Freeman, 1979). It reveals the number of people, institutions or countries whose researcher has collaborated. Betweenness is defined as the total number of shortest paths between pairs of actors that pass through actor and this reflected the capacity of an author to connect other authors within the network (Acedo et al., 2006; Freeman, 1979). A visual analysis can facilitate an intuitive understanding of the concepts of network (Nooy et al., 2011).

#### **4. METHODOLOGICAL APPROACH**

We used a bibliometric and sociometric approach to identify, collect and analyze publications on eGov that are relevant to achieving the specific aims of the study. According to Macias-Chapula (1998), a bibliometric study aims to "study the quantitative aspects of the production, dissemination and use of registered information". Bibliometrics is a technique that centers on measuring indexes regarding the production and dissemination of scientific knowledge (Fonseca, 1986). A commonly used definition of bibliometrics is that of Pritchard (1969): bibliometrics is all processes that seek to quantify processes of written communication, i.e., it is a statistical tool that was developed to enable different indicators to handle the management of information and knowledge, especially using technological information and communications systems based on scientific premises in order to pinpoint productivity indexes, which are necessary for planning, evaluating and managing scientific production in a specific community (Guedes and Borschiver, 2005). These indicators enable an analysis of a given scientific field in order to identify characteristics such as the chronological growth of scientific production, the productivity of authors and institutions, collaboration between researchers and institutions and the spread of scientific production between different sources (Bufrem and Prates, 2005). The bibliometric approach was used to identify the themes, theories and methodologies used by Brazilian and international researchers on eGov publications.

A sociometric approach studies interpersonal relations (Moreno, 1934). Sociometry is a method for measuring social relationships and to analyze the matrix of relationships between social actors (Galaskiewicz and Wasserman, 1993). In sociometry, social choices are the most important expression of social relations (Nooy, Mrvar and Batagelj, 2011). In this

study, we used the sociometric approach to trace a network of social ties among actors and to analyze the social network identifying collaborations between co-authors, countries and institutions that research eGov.

First, we compiled a list of all the papers from the EGRL (EGovernment Reference Library) version 8.5 database at the University of Washington hosted by Hans Jochen Scholl for 2010, 2011 and 2012. The University of Washington has maintained the EGRL database since 2005 and currently has over 6000 references, representing over 90% of peer-reviewed literature in English concerning eGov. We closed the three-year period in question because it was the time with the highest volume of publications since the beginning of the 2000s, with the largest number of publications appearing in 2011 (Table 1). All told, we found 838 papers.

**Table 1: Number of papers published in journals from 2000 to 2012**

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
35	68	92	132	178	213	155	157	174	239	285	292	261

From the total of 838, we analyzed the papers which were published in journals classified with Journal Citation Reports (JCR) above 0.5, and the Google h5 index above 15. In Brazil, these metrics include the two highest levels of journals' national classification, A1 and A2. CAPES is the Brazilian national institution that establishes the classification criteria of the journals, taking into account the number of citations as a reference, equivalent to the JCR. CAPES sets the official ranking of journals in which Brazilian researchers publish, named Qualis-Capes. We also included on the list, papers published in the Electronic Journal of e-Government and the International Journal of Electronic Government Research that are not classified as A2 but are dedicated to the study of eGov. At the end, 490 papers were analyzed. After selecting the papers, we proceeded with the analysis, which allowed us to become familiar with the international publications. All the abstracts of the selected papers were read in an attempt to identify the methodology of the study, the use of a conceptual model or theory and the subject of each paper. In addition to content analysis, we used descriptive statistics to analyze the content.

The publications and collaboration networks of authors and Brazilian institutions were analyzed by Authors (2014). They analyzed one hundred and twenty-four papers published in the journals classified by CAPES. The classification ranges in descending order from A1 to A2, B1, B2, B3, B4, B5 and C. The papers published in the A2, B1 and B2 level journals were used - there are no A1 journals on Brazil. They also used papers from proceedings of Brazilian conferences that have exclusive sections for debating the theme (EnANPAD, EnADI, EnAPG and Contecsi). The period of publications under study ranged from 2007 to 2012. From this study, we extracted knowledge of Brazilian publications to prepare proposals for Brazil to develop a larger role in international research.

The collaboration networks were identified with the help of UCINET® 6 software. To analyze the data, we prepared the matrixes of authors and co-authors, institutions and countries of origin of the papers and ran them through the software to form the respective networks. The strategy applied was to identify the role of each one actor within network, which allowed a better understanding of the complete social structure. For example, to form the co-authors network, each of the authors was linked to all who had a co-authored paper published. The institutions and Countries networks was formed linking each of institution or Country declared by each author who had co-authors. To satisfy the objective of understanding the social structure of the collaborations, we used measurements of density, degree and betweenness in the network as analysis parameters. The measures help to understand the collaboration within the network, to identify the main authors and the linking

between them. Also they were used to analyze the position that some actor occupied in the network that can be an indicative of an author's importance, of his/her influence or of his/her capacity to connect to others elements within the network. Degree reveals the number of authors, institutions or countries with whom any one researcher has collaborated. The betweenness indicates the potential roles as intermediaries in connecting relatively isolated parts of the network. The software calculated the measures of density, degree and betweenness.

Our choices of parameters express our analytical framework. The descriptive statistics will enable us to become familiar with Brazilian scientific production in the field of eGov and international production in eGov. A visual inspection of the collaboration networks and measurements of betweenness, degree and density support our understanding of the role of authors and institutions in the collaboration networks.

## 5. FINDINGS AND DISCUSSION

The presentation of the findings is written following the research questions. First, we seek to know the Brazilian publications in e-government. Second, the international field. After, the social structure of collaboration between co-authors, countries and institutions that research eGov. Finally we discuss how Brazil can be positioned in the international eGov research.

### 5.1 Knowing Brazilian Publications

Understanding how this eGov field is formed in developing countries, such as Brazil, is very interesting. Reports of improved resource management and government services and the growth of democracy are sometimes associated with improved social indicators in developing countries (Cunha and Miranda, 2013), although this matter remains controversial. Furthermore, the field of research has widened, with new themes being proposed or attention being drawn to dimensions such as national culture and innovation (Avgerou, 2008) that are not so often found in the international mainstream. When it comes to being familiar with publications in Brazil, the first question is to identify the themes, theories and methodologies that are used by Brazilian researchers and how authors and institutions collaborate in this country. To answer this question, we resorted to the analyses conducted by the Authors (2014), examining publications on eGov in Brazil from 2007 to 2012. The study provided information about collaboration between researchers and institutions that are attempting to arrive at a clear definition and a pattern for multiple approaches to the subject.

Wide-ranging discussions on eGov were predominant among Brazilian researchers. No subfield was identified in 33 of the 124 papers. There was also ongoing interest in e-Administration, digital divide, e-Governance and e-Participation. There was less regular interest in the other themes, demonstrating the diversity of subjects that can be approached in studies concerning the implications of ICT for society and how dynamic the field is. This may be due to the rapid technological changes that take place and the new uses that are found for these technologies.

Concerning the theoretical approach, researchers make little use of a specific approach to studying eGov. We noted the lack of a conceptual domain or a clear position regarding the theoretical domain, with discussions limited to the substantive domain. Our analysis showed that papers mostly tend not to use specific theories (81%). Researchers tend to anchor their studies on the concepts of eGov. As for papers that chose to use a theoretical approach, Institutional Theory and Intellectual Capital Theory were used twice, and were the most used approaches.

Regarding the methodology, the most used was the qualitative study. Around 76% of the papers (94) used the qualitative approach, while 24% (24 papers) used an exclusively quantitative approach and less than 1% (only 3 papers) used a mixed approach. As for the

method employed, the case study was used in 45 qualitative papers and a survey in 13 quantitative.

The social network analysis showed that authors who work with eGov have few relationships with one another. Our findings showed that researchers are dispersed and have only one network in formation and many authors publishing in closed groups. The centrality of co-authorships showed only one actor with considerable influence, followed by two that also have the potential to form connections.

As for collaboration between institutions, the analysis showed strong centrality at the University of São Paulo (USP). Other institutions had important links for forming a network, such as Pontifical Catholic University of Paraná (PUCPR), the Federal University of Paraná (UFPR), the Fundação Getulio Vargas (FGV), the Federal University of Paraíba (UFPB) and the University of Brasília (UnB). A relatively high number of institutions remain isolated, as shown in Figure 1.

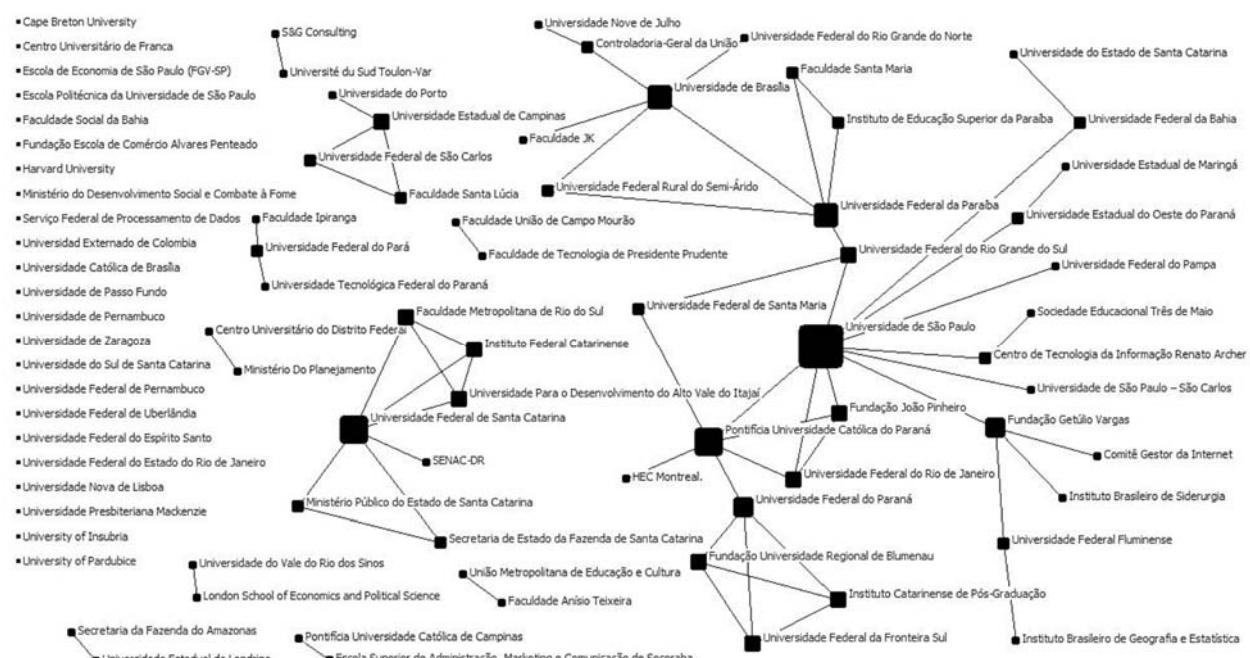


Figure 1: Brazilian Institutions Network  
Source: (Authors, 2014)

The Authors (2014) present an important discussion concerning the growth of Brazil in the international field of scientific publications. The country is becoming a large research laboratory, taking the first steps toward forming what could be called a Brazilian school of IS research. Furthermore, as a member of BRIC, Brazil can make interesting contributions because of its complex public administration. The country has a structure with three distinct spheres, at the federal, state and local level of public services.

## 5.2 Knowing International Publications

Our second question has to do with international publications. We wish to identify the themes, theories and methodologies used in publications on eGov. We identified the themes and theories used to guide the research and the methodologies that were chosen, as declared by the authors in their abstracts.

When we investigated the theories used by international researchers, we found that little use was made of a theoretical approach. Only a tenth of the papers stated in their abstracts that a theoretical approach was used (53 papers). Most researchers only dealt with

the literature on eGov or use specific frameworks to discuss it. This characteristic was among the findings of Heeks and Bailur (2007). We were expecting a slightly different scenario, since the field of eGov has matured. The analysis also showed that the Technology Acceptance Model (TAM) was the most used model among eGov researchers (16 papers). This finding corroborates the results of Rana et al. (2011), in which the TAM was the most commonly used (Table 2).

**Table 2: Theories used in e-Government international research**

Theoretical approach	References
Technology Acceptance Model (TAM)	Al-Hujran et al. (2011); Azmi and Bee (2010); Bwalya and Healy (2010); Chen (2010); Dorasamy et al. (2010); Hu et al. (2011); Hussein et al. (2010, 2011); Lee and Rao (2012); Lin et al. (2011); Moynihan and Lavertu (2012); Orgeron and Goodman (2011); Shyu and Huang (2011); Sinawong et al. (2010); Sipior et al. (2011); Stamati and Martakos (2011)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Alryalat et al. (2012); Carter et al. (2011); Chan et al. (2010); Schaupp et al. (2010); Powell et al. (2012)
Institutional Theory	Luna-Reyes and Gil-Garcia (2011); Os (2011); de Guzman and Jones (2012); den Butter et al. (2012)
Actor Network Theory	Ochara-Muganda (2010); Hsieh et al. (2012); Ranerup (2012)
Collaborative Approach	Heidinger et al (2010); Ojo et al. (2011); Walsh et al. (2012)
Socio-technical Theory	Ulbrich (2010); Beynon-Davis (2010); Khan et al. (2011)
Resource-Based View (RBV)	Chan et al. (2011); Krishnan and Teo (2012)
Stakeholder Theory	Fedorowicz et al. (2010); Kamal et al. (2011)
Agency theory	Im (2011)
Contingency theory and RBV	Ifinedo and Singh (2011)
Critical Theory	Carty (2010)
Design Science	Fedorowicz and Dias (2010)
Diffusion of Innovations Theory	Twinomurinzi et al. (2012)
Expectation Confirmation Theory	Venkatesh et al. (2011)
Governance Theory	Dalakiouridou et al. (2012)
Grid and Group Cultural Theory	Seng et al. (2010)
Organizational Theory and Political theory	Jun and Weare (2011)
Queuing theory	Zato et al. (2012)
Rational Choice Theory and Institutional Theory	Williams and Fedorowicz (2012)
Stakeholder Theory and Genre Theory	Sæbø et al. (2011)
Structuration theory	Hossain et al. (2011)
Systems Thinking Approach	Berghmans and Van Roy (2011)
Theory of Planned Behavior (TPB)	Ozkan and Kanat (2011)

We have already argue that eGov research as an international domain draws from both IS research in general and from ICT4D research as a particular domain. The most popular theories in Egov research, TAM and UTAUT, as shown in Table 2, are taught principally in IS departments, and have been developed and used extensively in papers appearing in IS journals. This is true for many other theories in Table 2.

Concerning the method, there was a predominant preference for the qualitative approach. Half of the papers (246) used this approach, while 21% (104) used an exclusively quantitative, and 1% (6) used a mixed. In around one quarter of the papers, it was not possible to identify the approach used from the abstract. A wide assortment of methods was identified, including, in smaller numbers, a Delphi and Panel Data study and, in larger numbers, case studies and surveys.

Wide-ranging discussions concerning eGov are predominant in international publications. We did not identify the presence of a subset or subfield in 126 papers. We also noted that there is constant interest in e-Administration, e-Services, e-Participation and e-Democracy, as already shown by Rana et al. (2011). However, there were also subjects that had not been discussed before, such as open government, mentioned in 16 papers, freedom of Information (9 papers) and e-Transparency (9 papers). Another subject that interested researchers was social media. Discussions included the impact of social media on governments and the opportunities they offer (Bertot et al., 2010; Picazo-Vela et al., 2012), the use of Twitter (Cho and Park, 2012; Golbeck et al., 2010) and the impact of social media on political campaigns (Gilmore, 2012; Hong and Nadler, 2012). Issues such as interoperability and security of information were also found in the studies.

### 5.3 Collaboration Networks

To address our third topic, it was necessary to identify the collaboration network structure for worldwide research on eGov. In this, we will concentrate on the study of the co-authorship of papers, in which there is a connection between two researchers in the form of co-authorship of one or more papers. We also wished to see the collaboration networks that exist between institutions and countries to which these researchers belong. In our study, we constructed networks for co-authors, institutions and countries in order to identify who the authors are and the most active and central institutions and the countries of origin of the studies by identifying the institution to which they belong, as declared by the authors.

Our analysis identified 964 authors in the three years period under study (2010-2012), with 2420 ties. Of these, over 75% had at most three interactions in the network. 90 authors (9.5% of the sample) write on their own. Only 1% (10) have 10 or more interactions. In the co-authorship network, the most central author is one who is connected to many other authors in the same network, which means that this author is more active in collaboration than the others. The average degree of centrality was 3.51, well below that of the best placed authors in the network, Dwivedi and Weerakdy, whose maximum was 18. Table 3 shows the ranking of authors with 10 or more interactions.

**Table 3 - Top authors**

Author	Degree
Dwivedi, Yogesh K.	18
Weerakkody, Vishanth	18
Pardo, Theresa A.	16
El-Haddadeh, Ramzi	15
Janssen, Marijn	14
Chun, Soon Ae	13
Askounis, Dimitrios	12
Jaeger, Paul T.	12

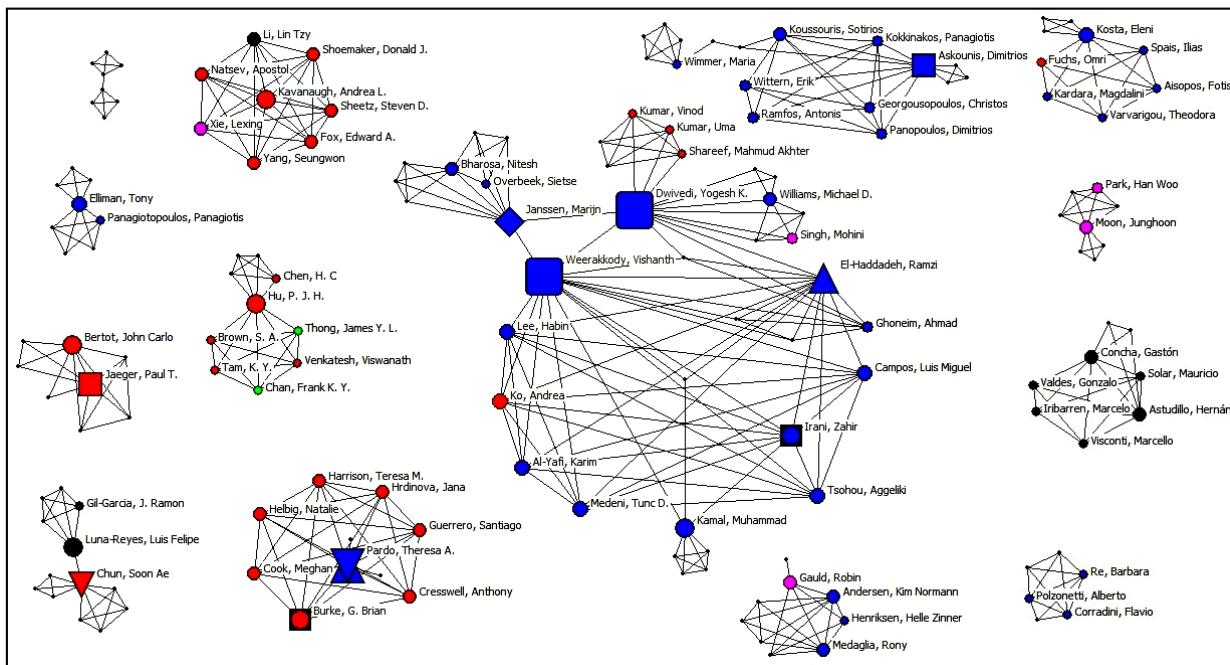
Burke, G. Brian	11
Irani, Zahir	11
Bertot, John Carlo	10
Gupta, M. P.	10
Hu, P. J. H.	10
Kamal, Muhammad	10
Kavanaugh, Andrea L.	10
Luna-Reyes, Luis Felipe	10

The co-authorship network shows that there is little collaboration between researchers. The researchers are dispersed and many of them work in closed groups. Figure 2 shows that the authors who work with eGov communicate little with one another and collaborate in separate groups. The co-authorship network reflects the existence of a select number of central authors. This shows that the network is composed by some subnets; the authors are not connected at a global level, but rather in a closed group. The visual inspection shows that there are authors who are important links in subnets. Luna-Reyes links authors who are not directly connect. Janssen, Kamal and Pardo also have a similar role in the network. During the assembly of the networks, we identified the countries by region of the world using different colors: dark blue for Africa; red for North America; dark green for Latin America and the Caribbean; lemon green for Asia; blue for Europe; pink for Oceania; and orange for the Middle-east.

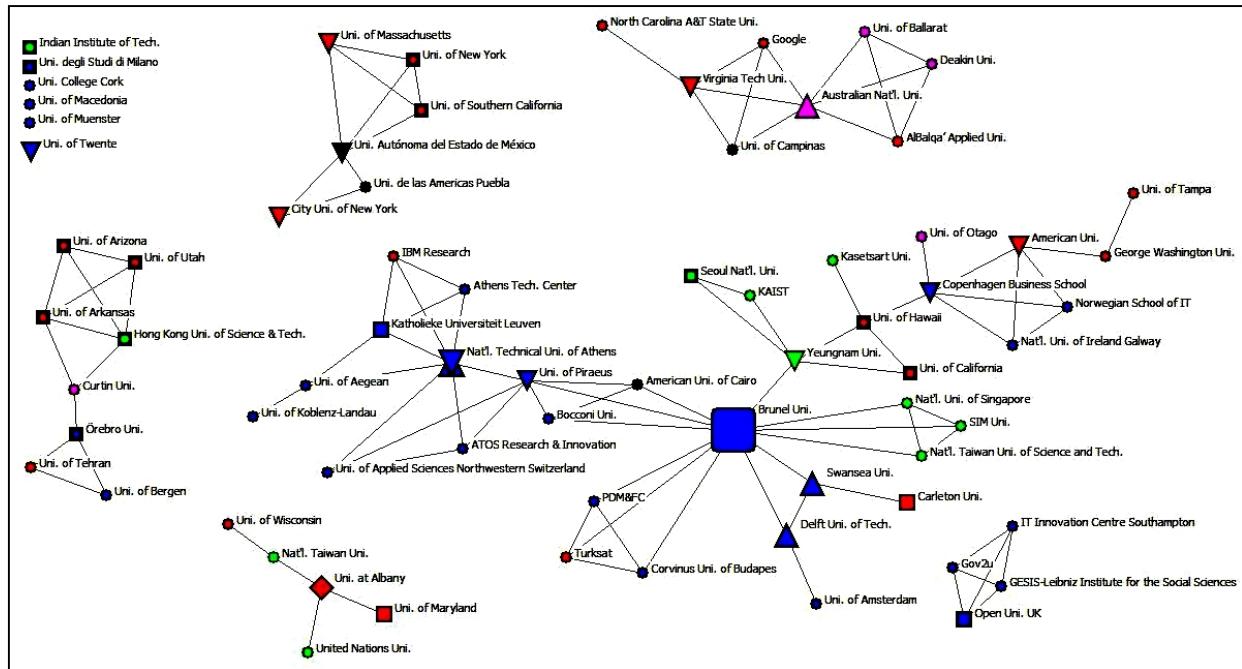
Unfortunately, it will not be possible to view the colors in this paper. Instead, geometric symbols such as triangles, squares and circles are used to identify the number of connections in the network, with the largest being the square and the smallest the circle, as shown in the legend. The size of the symbols shows the degree measures. The larger the symbol is, the higher its degree in the network.

The institutions network has more intense collaboration, with the formation of a more cohesive network. The network is composed of 460 institutions of origin of the authors of the papers, with 666 ties. The collaboration for institutions with three or more connections (Figure 3) shows that there are a considerable number of isolated institutions, with the highest degree of collaboration being that of Brunel University (16 degrees). This is followed by the Australian National University (10 degrees) and the National Technical University of Athens (9 degrees). There is no Brazilian institution with three or more links in the collaborations network.

As for the network of countries, we identified 59 countries involved in eGov research and collaborate a great deal among themselves. Table 4 shows the values found for the two parameters calculated for all the countries in the network. An analysis of the behavior of the countries in relation to centrality shows a lower concentration of actors under the network average.



**Figure 2 – Authors Network**

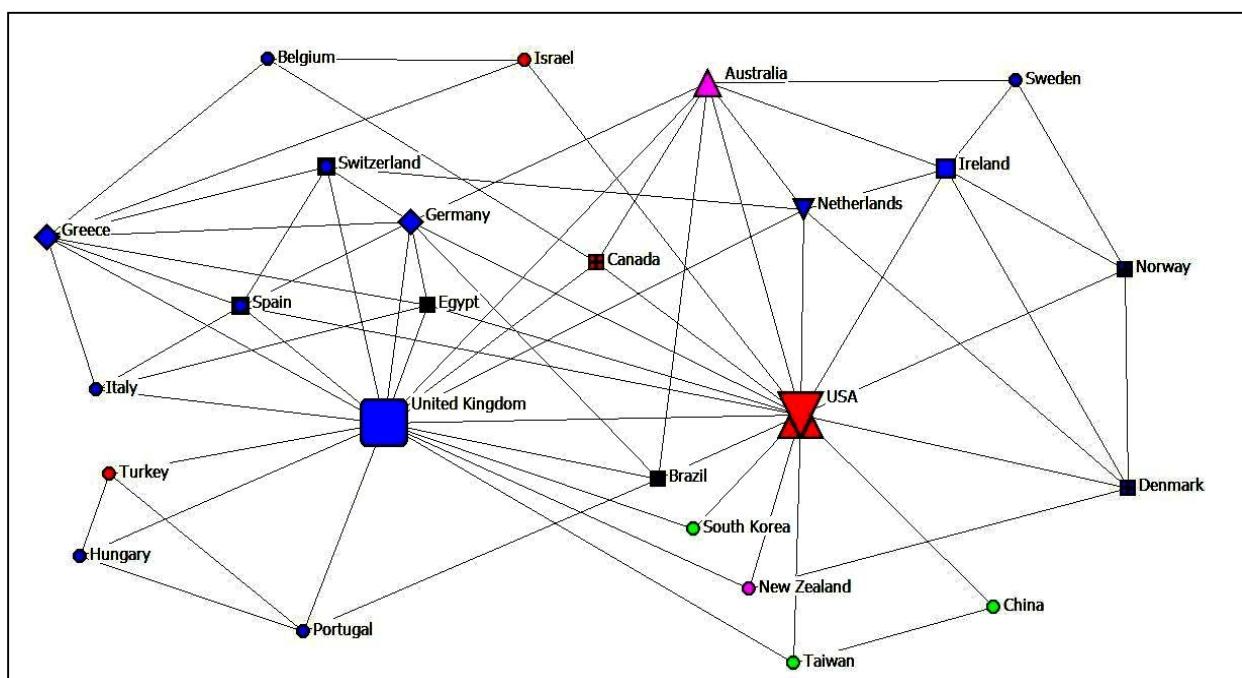
**Figure 3 – Institutions Network****Table 4: Top 15 countries (over 5 degrees of centrality)**

Country	Degree	Country	Betweenness
United Kingdom	23.000	USA	22.549
USA	22.000	United Kingdom	21.965
Australia	12.000	Australia	7.976
Germany	9.000	Ireland	3.103
Greece	9.000	Netherlands	2.959
Netherlands	8.000	Germany	2.642
Ireland	7.000	China	2.541
Spain	6.000	South Korea	2.541
Switzerland	6.000	Switzerland	2.191
Brazil	5.000	Norway	1.954
Canada	5.000	Greece	1.939
Denmark	5.000	Canada	1.767
Egypt	5.000	Taiwan	0.924
Norway	5.000	Sweden	0.875

The study of eGov is centralized in the United Kingdom (UK - 23 degrees) and United States (USA -22 degrees). Nineteen countries have a degree of centrality higher than three. Brazil is tenth in the ranking, with five ties. As for betweenness, which reflects the capacity of countries to connect with other countries with which they are not directly linked, the average for the network was 1.339, far below the maximum of 22.549 scored by the USA, which was the country that most intermediated eGov research in the world, followed by the United Kingdom (score of 21.965). These countries are important to the flow of information in the network. China and South Korea, despite their low degree (3), have high values of

betweenness, showing that these countries connect others countries within the network (Table 4).

Figure 4 shows the network for countries with at least three degrees of interaction. Brazil has five interactions, but is connected with the central countries of the eGov research community. The analysis shows that there is local collaboration between countries, and these with the two central countries of the network. Although not shown in the Figure (as it does not show countries with fewer than three interconnections) there is no link between Latin American countries. These are connected to countries in Asia, North America and Europe, but do not collaborate with each other. Brazil collaborates with some European countries, with the North Americans and countries in Oceania, but has no link with other Latin American countries.



**Figure 4 – Countries Network**

## 6. HOW TO INTERNATIONALIZE EGOV RESEARCH CONDUCTED IN A DEVELOPING COUNTRY

Our findings show similarities between Brazilian and international eGov publications, with both having a preference for general themes rather than a more in-depth subfield, and a preference for qualitative methods. The weak link in Brazilian studies is the lack of a theoretical approach to the phenomenon, which has roots in the field of IS and ICT4D in general, particularly in the Brazilian context of research in management, IS and eGov. However, this is not an obstacle to internationalization, as international publications have the same characteristics.

Our analyses helped us to suggest some ways to position Brazil in international eGov qualified research. First of all, this could be done by exploring themes that are being discussed internationally but have yet to attract Brazilian researchers. Topics such as open government and social media do not often appear in Brazilian periodicals. This could be due to a characteristic of the field, as these phenomena are constantly changing, but could also be seen as an opportunity for Brazilian researchers to become involved.

Research on the local manifestation of a phenomenon that is the subject of the international research agenda is also a possibility of positioning. Aspects of national culture or innovative uses due to local conditions could offer insights to other developing countries

and help to build global knowledge. In the case of Brazil, electronic voting, interoperability, digital participative budget, tax collecting and digital services might be interesting research topics.

Studies with a stronger theoretical basis are another opportunity to include Brazilian researchers in the international community. Both Brazilian and international publications fall short when it comes to using a theoretical approach. Few papers clearly present the use of a theory for analyzing the substantive domain. This may appear to be a contradiction, as we pointed out in the description of the eGov field in Brazil that it is influenced by the discipline and events and conferences in IS. More than a contradiction, this is a paradox and a challenge for the field of IS in Brazil and eGov in particular, as there is no tradition in the country for grounding the research works on theory. According to Pozzebon et al. (2011), the lack of a conceptual domain is an obstacle to strengthening research, but due to the characteristics of the field, it is not an obstacle that stands in the way of including Brazil in international eGov. As eGov research has now been ongoing for over 20 years, we suggest that Brazilian research could go beyond describing phenomena and begin to make a more solid contribution to the field. It is important to note that when researchers in the developing world participate in international collaboration networks, they are usually compelled to use theories developed in other contexts (generally “in the West”), and not rarely to explain phenomena in the developing world.

The appropriation of theories “developed in the West” is not exempt from criticism and has always led to debates in the field of management in Brazil (Bertero et al., 2005; Bertero et al., 2012) and, more recently, in the field of IS (Pozzebon et al., 2011; Cunha and Diniz, 2013). Brazilian researchers have systematically used theories that originated outside the country, especially those produced in Anglo-Saxon countries, and applied them to the local context. There is some value to be gained from this appropriation and application. They provide access to modern and robust theories to explain local phenomena and contribute to the advancement of theoretical knowledge, confirming or denying their validity in contexts other than those in which they were created. However, for a clearly defined and strategic choice of the theories to be used and applied consistently to the local reality, it is necessary to break away from the superficial appropriation of theories, practiced in the tropics, and effectively improve knowledge of the theoretical bodies that originated in other contexts (Bertero et al., 2012). Having broken through the barrier of understanding a theory, it is also difficult to apply it in a context that is very different and alien to the theory’s roots. This is not an easy challenge to face, but when it comes to international partnerships, it can mean a double opportunity.

On the one hand, from an in-depth understanding of the perspective of the partners that are already using the theoretical concepts, the theory building can be supported by proving or denying the concepts or their relationship, even underlining aspects that the original theoretical body did not consider. At the same time, it can mean a better understanding (and even action) regarding local issues and problems (Bertero et al., 2012). Another alternative in the network is to introduce the partners to some Brazilian or Latin American authors who are well known in the field or in other fields of knowledge, such as Guerreiro Ramos (sociology), Darcy Ribeiro (anthropology, politics) and Paulo Freire (education), who can eventually be used to study a phenomena in the developing world. Although we have not observed it as an international trend, the use of design science or practice-oriented epistemological perspectives could also provide alternatives, given the lack of theoretical emphasis in Brazilian studies. There are fields of study and researchers that consider it important to develop something practical that can be used by society (Simon, 1996), and Design Science deserves to be mentioned (Fedorowicz and Dias, 2010). As a developing country, Brazil can study eGov in a way that helps governments to improve the

use of ICT in public administration to benefit the public. By doing this, they could make an important contribution to other developing countries.

Seeking to collaborate with more active authors and institutions around the world is another alternative for Brazil to improve its ranking in international eGov research. We did not identify any Brazilian authors and/or institutions in the international collaboration network, which shows how difficult it is to internationalize Brazilian research. Collaboration with more experienced actors is a healthy way to achieve this. In direct communication, researchers can interact, exchanging ideas and experiences (Friedkin, 1993). These relationships can be strengthened by collaborating with other authors, and further improved by partnerships between Brazilian institutions and those which are central in the field of eGov. This was the path taken by institutions and authors in other Latin American countries. The Universidad Autónoma del Estado de México has strong ties with American institutions, and Luna-Reyes is an author with a respectable position in the network. Brazil has a national public policy that seeks to provide large numbers of undergraduate, Master's Degree and Doctorate students with an opportunity to take part in international exchange programs. In the last four years, starting in 2011, Brazil has sent 105,000 students overseas (<http://www.cienciasemfronteiras.gov.br/>). This can help to improve the country's global position, but a special effort has to be made to include the country in a specific field such as eGov.

Brazilian research could also gain force by acting as a link between unconnected countries. In the networks, Brazil has little contact with countries that are not directly linked, with a betweenness rating that is below the average (0,507). Seeking to become a link between unconnected countries could strengthen Brazilian research. Indirect links improve contact and aid the sharing of information between researchers in a network (Katz and Martin, 1997). Asian countries such as South Korea and China are solidifying their studies by acting as a link between other countries, with low degree centrality, but high betweenness (see Table 2).

Brazilian research could benefit from collaboration with other Latin American countries, as there is little such collaboration. Strengthening the networks with these countries could spur further publications. Shared economic aspects can provide research opportunities that are more relevant to the study of eGov. Latin American countries are close to one another, we know each other well and we could follow the European example and work together. In Brazil, institutions and authors ought to take the initiative and connect with their neighbors. Brazil has the largest economy in the region, but in the UN eGov ranking (<http://unpan3.un.org/egovkb/>) it is behind other Latin American countries like Uruguay, Chile and Argentina. There are opportunities to learn theoretical approaches and experiment with methods make comparisons and practical applications in Brazil and elsewhere through collaboration. Forming a collaboration network with our neighbors could help us become more relevant internationally. Furthermore, studying the social implications of ICT in developing countries (all of Latin America) is especially interesting because it broadens the scope of the field. Subjects such as the use of IT for local development, social aspects, cultural aspects and innovations in eGov can be explored in collaboration with these countries, contributing to the mainstream research.

Finally, Brazilian research can be internationalized by strengthening the Brazilian scientific network. There is a need to improve and strengthen the collaboration network of Brazilian researchers. The authors have few relationships with each other and there are many closed networks. This could be a problem when it comes to the internationalization of eGov studies, since scientific research is a collaborative activity. Brazilians can explore highly relevant local issues. Particular Brazilian factors such as interoperability (Santos and

Reinhard, 2012) and strategies in the legal sector (Andrade and Joia, 2012) have already earned a place in international publications.

## **7. CONCLUSION**

The present study sought to include Brazil in the international eGov qualified research. To this end, we set out to become familiar with domestic and international publications by conducting a bibliometric study and analyzing the domain of collaboration in the field through a social network analysis of the authors, institutions and countries of origin of these publications.

Brazilian studies of eGov show little use of a conceptual domain or a clearly stated theoretical approach, with discussions being limited to the substantive domain, a legacy from the field of IS. Cooperation between authors remains limited to only a few networks. However, cooperation between institutions is more evident, with the formation of a large network with the USP as the central actor.

International eGov studies are lacking in the use of theories and well defined methods, and have not advanced much from the scenario presented almost 10 years ago by Bailur and Heeks (2007). Authors predominantly choose to explain the central phenomena of eGov, but subfields such as e-Participation, e-Services, open government and social media have emerged. As for collaboration, a number of authors are still not connected with the main actors, although this situation may have been caused by the number of periodicals selected. The network shows that there is a small group of authors with a high degree centrality. The predominant positions within the network are occupied by European authors and institutions, but there is also strong collaboration among North Americans. Brazil is 10th in the ranking among 59 countries, with 5 interactions. Although this is a good position, its degree is well below the most central countries: the UK and the USA.

In this scenario of eGov research, Brazil has the following alternatives: a) exploring topical themes in the international community, such as open government and social media; b) exploring local phenomena that are internationally relevant; c) structuring research with a more robust conceptual domain; d) collaborating with central authors in the world network; e) seeking to become a link between countries that are not directly connected; f) collaborating with Latin American countries; and g) strengthening the Brazilian scientific community.

This study complements previous studies on eGov (Erman and Todorovsk, 2009; Grönlund, 2010; Heeks and Bailur, 2007; Rana et al., 2011) and provides further understanding on how authors, institutions and countries cooperate. Its main contributions are the suggested alternatives for improving the ranking of Brazil in international eGov publications. However, the findings of the study are not limited to Brazil: other countries that have the same barriers to internalization of research can benefit from the data presented in this.

Finally, we can identify several opportunities to continue this work. We recognize the limitations of the study in terms of identifying trends. The three-year sample period was not sufficient for identifying the direction that studies on electronic government will take. Increasing the scope of the study would enable the identification of trends and allow comparisons to be drawn between one period and another. Another question that we faced was the reason for few connections and little interaction between authors, who prefer to collaborate in closed networks. Could it be that the geographical barrier, an obvious motive, is the only explanation? It would also be interesting to improve our understanding of why scientists collaborate in the field of eGov, and also analyze the relationships between scientists who combine several techniques, such as the analysis of citation and co-citation (Georgiou, 2014). This would enable more in-depth examinations of different types of scientific collaboration. Having reached the end of our study, we recognize that questions

might be asked regarding how the contextual difference between developed and developing countries creates opportunities or barriers when it comes to e-government initiatives. It might also be asked how these contextual differences emerge in internationally conducted studies. These are more questions to be addressed in future studies.

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