

The Evolving e-Governance Curriculum: A Worldwide mapping of Education Programs

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ABSTRACT

From the demand side, the need to build e-Governance capacities and expertise is increasing and requires more and more sophisticated knowledge and competencies to fulfil the stakeholders' needs. The e-Governance profession and skills needs are also becoming more diverse and more specialized. From the supply side, we can also witness a growing interest in the e-Governance learning and programs worldwide at different level. However the programs offered are often not well aligned adapting neither to the government's, nor to the public service needs. The e-Governance curriculum is a key success factor to reduce the gap. It serves as a base of knowledge for a large number of graduates that participate in government digital transformation activities. Within academic and practitioners' communities, there have been constant discussions about the content of the e-Governance curriculum. The objective of this research is to identify and analyse the current situation in e-Governance training worldwide and provide a path forward for future e-Governance program relative curriculum development. For this purpose, the authors applied a systematic secondary data review method to examine the existing e-Governance programs and draw an e-Governance education mapping worldwide. The research establishes the current baseline of e-Governance curricula and describes their fundamental aspects and challenges. Information provided in this article should be valuable to the e-Governance educators and

curriculum designers, as well as to the e-Governance practitioners, to better understand the foundational knowledge transmitted to e-Governance graduates.

CCS CONCEPTS

• **Applied computing** → **Computers in other domains** → Computing in government → *E-government*
Social and professional topics → Professional topics → Computing education

KEYWORDS

e-Government, Training, Education, Program, Public Administration

ACM Reference format:

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1. INTRODUCTION

Societies have been affected by the introduction of new information technologies and digital governance. When analyzing the electronic governance (e-Governance) concept, we start with the governance definition that encompasses both the relationship among government and citizens and related interaction processes [1]. Electronic or smart governance is therefore defined as the initiatives carried out by the governments to integrate Information and Communication Technologies (ICT) in their operations, processes and interaction with other stakeholders [2]. Although the use of ICT in government has been growing exponentially around the world [3, 4], the complexity and risk of e-Governance may result in a limited transformational impact of digital government initiatives [5, 6]. Therefore, the development of e-Governance requires appropriately training qualified professionals in this field [7] and calls for a change in the competencies needed from civil servants [4].

According to Janowski, Estevez and Ojo [6], this challenging arrangement of e-Governance demands a specialization of the roles and consequently professionalization of the responsible personnel to understand and address the needs of the citizens and create public value when delivering public services and information. Conceptual foundations for e-Governance education are critical in order to build the required competencies for the new emerging roles [6], as well as an interdisciplinary approach linking different domains such as IT, law and public sector [7]. According to Augustinaitis and Petrauskas [8], the interdisciplinary nature of e-Governance allows integrating a broad range of specialized knowledge for instance public administration, legal background, information technologies, communication, management and political sciences.

Although some studies have identified the main competencies for e-Governance, their focus were limited to European public administration [4], or comparative between specific countries [9] or even addressing specifically local level [5]. A recent study has analyzed education programs but with focus on public administration and public policy [10] and conceptualizing electronic governance education [6] but not including publications of the last 6 years, which makes a big difference considering the dynamicity of the field.

In this sense, this paper aims to establish the current baseline of e-Governance curricula and describe their fundamental aspects. The authors applied a systematic secondary data review method to examine the existing e-Governance programs and draw an e-Governance education mapping worldwide.

The remainder of this paper is structured as follows. In the next section we review the related research literature in e-Government curricula. Then, we describe the research approach adopted, followed by the presentation and discussion of the results on the existing training programs in e-Governance area, categorized according to the search fields. In the concluding section, we provide a summary of the work done, as well as limitations and areas for future research.

2. LITERATURE REVIEW

High-quality e-Government training increases e-Government readiness, which is one indicator of a society's technology use ability [11, 12]. Educational institutions focus their efforts to the increasing importance of e-Government research, practice, and education. A limited number of studies have tried to analyze training programs, in various countries, which include e-Government courses and they have investigated their contents.

Anohina-Naumea et al [13] highlight the lack of learning courses on interoperability in the European countries. Interoperability related courses drive delivery of cross-border and cross-sectoral public sector services. Such courses are useful for decision makers responsible for the process of legislating in the field of e-Government, public administration staff who are users of public services, and technical staff who is involved in developing and delivering public services.

In Italy, e-Government courses are conducted by different types of organizations (e.g. public/private institutions, public authorities, universities) [14]. An example of a teaching module for training the public servants deals with general concepts of the XML language. Master degrees concentrate on the most relevant legal and practical issues of the electronic public administration system, focusing especially on the new technologies and integrated public services (e.g. e-Decisions or cooperation models among local authorities, digital signature, digital identity card, e-Services, relations between citizens and private firms, e-Procurement). Masters' on public administration (PA) and information technology organized by public administration schools, concentrate on technological issues (information systems, communication networks, tools and methodologies for public communication) and on legal instances of technological innovation in the PA (security, information technology law, internet law etc.).

In Turkey instructors who have already been researching e-Government topics are the ones who usually offer e-Government courses [15]. Graduate departments and instructors have relatively higher levels of power and autonomy in determining the courses and curricula compared to undergraduate ones which offer introductory e-Government courses. In e-Government courses relative initiatives are analyzed, providing the students of public administration the chance to observe and evaluate public management ideas in action. Public administration classes which combine theoretical and practical aspects increase the awareness of public administration employees and practitioners about the technological transformation that society in general and government in particular are experiencing. Yildiz et al [15] suggest the engagement of public servants as instructors of e-Government courses. An additional issue that should be addressed is the lack of adequate textbooks in native language.

Ganapati and Reddick [16] suggest that e-Government topics are not given adequate importance in the US public administration curriculum. In a survey of Master in Public Administration (MPA) programs, approximately a quarter of respondents indicated that they integrated e-Government topics in other courses. Therefore, e-Government is not a high priority compared to other subjects.

About half of respondents indicated that an e-Government course, when offered, was taught by tenured or tenure-track faculty. The public administration curriculum needs to incorporate the bindings between information technology, organizational efficiency, transformation, and connecting with citizens. Consideration of information technology as a foundation stone requires some rethinking of the core competencies. The competencies need to acknowledge, the swiftly evolving technologies that affect daily needs as well as governance operations. e-Government students should get some sense of how to deal with the management issues that arise in the technological world. The public administration curriculum should clearly recognize both technological aspects and public administration needs and provide adequate exposure to e-Government topics so that students are prepared to deal with the digital environment.

In Germany, it becomes evident that curricula with their main focus on e-Government are usually programs of information science, supplemented by distinct courses on public management, law or politics [17]. In these cases, e-Government is mainly considered from a technical perspective. In contrast to that, programs of administrative science or public management focus more on strategies, e-Government legal aspects or potential benefits of new technologies, especially regarding new ways of citizen participation or reducing administrative burdens. Public administration and information technology education programs do not provide an interdisciplinary approach in which technical, organizational, managerial and administrative issues are linked with each other to identify and analyze public sector aspects or to propose solutions for administrative reforms and a digital transformation.

After Tomasz Janowski et al. [6] applied their conceptual framework in seven e-Government graduate university programs they concluded that 29% of the programs train political leaders, 57% of them train government leaders, project managers and management staff, and 43% of the programs train technical staff. Regarding the addressed roles, 29% of the programs focus on only one role, while most of them 71%, address more than one role, and none addresses all roles. Design and implementation are considered in 86% and 71% of cases respectively. The provided knowledge areas and skills, differ between programs unless they target the same roles. For instance, policy related programs teach public policy and legal issues, while design-related programs teach organizational design and strategy. Regarding the teaching approach most programs (86%) apply a blended approach (courses, thesis, practicum, project and field trips). Training programs are delivered by a variety of unit types (e.g. Department of Government, Sociology and Social Work, Faculty of Science, School of Government, School of Social Sciences, College of Management of Technology). All programs require a university degree – bachelor or equivalent, one requires degree in a specific field (computer science or engineering), and 5 require professional experience from mid to senior and executive levels, with required years of experience from 2 to 7.

3. METHODOLOGY

The methodology applied in the present research includes three sections: the definition of the research keywords regarding the data collection of existing training programs in the e-Governance area, the definition of the geographical search areas, and the specification of a training programs metadata scheme.

3.1. Research Keywords and Data Sources

The first steps includes the definition of a list of keyword terms and combinations of them (e.g., e-Government Training, e-Governance Program, Digital Government MSc, etc.), to search for training programs worldwide. The search terms have been selected to identify existing e-Governance programs from the international context, offered from different types of institutes. Researchers, speakers of different languages, participated in the search, so that a wide range of educational programs, and not only English, could be covered. Information regarding the educational programs has been collected through the institutions' webpages around the world. The search combines two types of terms. The first type covered the subject (e.g., e-Governance) and the second type covered training/educational degrees (e.g., MSc). The search combined one term of the subject group and one of the training/educational group (e.g., Electronic Governance AND MSc).

The terms for search by subject are: Digital Governance, Digital Government, Electronic Governance (e-Governance, eGovernment), Electronic Government (e-Government, eGovernment), Public Administration Information Systems, Digital Transformation, Public Sector Innovation, Digital Government Transformation, Public Sector Digital Transformation.

The terms for search by institutional/educational degree are: Bachelor, Capacity Building, Certificate, Continuing Professional Education, Diploma, Education, Executive Masters, Graduate, Higher Education, Masters, MSc, PhD, Program, Specialization, Training, Undergraduate, Joint Master, MOOC.

Google search engine was the main search source. Not English speakers have been encouraged to use the search engines they consider appropriate. Websites of higher education organizations (public and private) and institutes have been analyzed.

3.2. Geographical Regions Allocation

Seven different groups of researchers conducted systematic desktop research to collect data regarding training programs in e-Governance worldwide. In order to share the amount of search effort, the task of training programs search for has been allocated to them based on geographical regions (as defined by the United Nations): Western European and Others Group (WEOG) except USA and Canada, USA and Canada, Asia-Pacific Group except China, African Group, Latin American and Caribbean Group (GRULAC), Eastern European Group, China.

3.3. e-Governance Training Programs Metadata

The main objective of the present step was to define the mechanism to retrieve and evaluate information of existing e-Governance training/education programs. In order to gather and analyze the necessary information regarding the current situation in e-Governance training, a Training Program Description Worksheet (TPDW) has been constructed, containing all the training program-related information, facilitating data processing by researchers. Using the classification provided by the TPDW, a comprehensive view of training programs on the world level has been obtained, including various educational aspects, such as the academic level of a program, the program name and the institutional type. The (TPDW), which is outlined in the following paragraphs, also dives into details, such as the aims of the program and/or learning goals, the area of program specialization, the admission requirements, and the provided courses. The descriptors were defined in the light of the information available at the institutions' websites as well as on the respective programs.

There are four identified groups of characteristics for a training program, which have the purpose of describing specific aspects of a program in a methodological and coherent way that facilitates the organization of the existing e-Governance training programs into a taxonomy. The objective of this taxonomy is twofold: i) to provide the means – based on its structure – for the systematic analysis of the existing programs in order to deduct conclusions regarding, for example, the type of provided courses and the targeted participants; ii) and to facilitate the identification of possible training gaps with the use of specified e-Governance training needs. To this end, each characteristic that has been identified describes in a straightforward way certain defining features of the training program, specifically:

The Program Description group represents the generic view of the training program. It includes fields, such as the program name, the academic level, the aims of the program and/or learning goals, the area of program specialization, the program overview and the admission requirements.

The Program Content group provides details regarding the courses provided within the program. It consists of the following fields: the course code, the course name, the course type, the course description, the course credits, the learning outcome/goals, the course supporting material, the course URL and the comment.

The Program Administration group contains some additional information about the programs. It includes the degree title, the credits-ECTS, the teaching method, the program cost, the program duration, the language and the program URL.

The Institution group states the main characteristics of the organization that offers the training program. It includes, the name of the institution, the country of institution, the institution type, the department of the program and the comment.

In regard to the collection of information about the e-Governance training programs, they were selected on the basis of existing programs related to e-Governance taking into account the key information presented in the above-mentioned groups. The criteria used involved selecting existing programs (diploma, bachelor, certificate, specialization, masters, short courses, etc.)

from the international context and programs that are currently developed at educational institutes. Finally, the aggregated results have been used to concretize the specific challenges in the development of e-Government programs and they are presented in the discussion section.

4. E-GOVERNMENT EDUCATION MAPPING

Through detailed desktop research on official webpages of universities and training providers, a list of programs was identified, using the Training Program Description Worksheets (TPDW) metadata. Thereinafter, the features of the training programs are illustrated following the facets that have been defined in TPDW. These include general information (country, institution and department offering a program), information about the form of programs (duration, effort required to complete a program, teaching method), accessibility of programs (admission requirements, cost) and the content (courses offered within the programs). The aim of the description in this section is to provide a broad overview of the programs offered in the domain of e-Government.

Since education programs that focus exclusively on e-Governance are limited, it was considered appropriate to include programs that cover or are strongly related to e-Governance aspects. 291 training programs have been classified in the following four clusters (Numbers in parenthesis: number of total programs, number of undergraduate programs, number of postgraduate programs):

1. e-Governance related (56, 23, 33): Programs that are strictly focused on e-Governance area, combining public administration and technological aspects.

2. Governance related (127, 48, 79): Programs that are focused on aspects of governance, like public Administration and public policy.

3. Other Technical (37, 12, 25): Programs that are focused on technological aspects like information systems, digital transformation, software engineering, digital security and include in their programs e-Governance features.

4. Other Non-Technical (73, 38, 35): Programs that are focused on non-technological aspects like accounting, leadership, change management, strategic management, management, project Management, IT management and include in their programs e-Governance features.

4.1. Program Name

administration analytics arts bachelor business
certificate degree development digital diploma
e-government egovernment electronic european executive global
governance graduate implementation information
innovation international leaders leadership ma management
master mpa msc municipal performance phd planning policy political
postgraduate professional program programme public science
sector service state strategic studies systems technology
transformation

Figure 1: Word cloud of program name

The names for the identified training programs vary widely around the world (Figure 1). The terms usually given to them depend on the specialization area: The most used ones are the following: public 119, master 80, administration 73, governance 72, management 71, digital 43, e-Government 26 and policy 25.

4.2. Country of Institutions

The present review identified 291 education programs, from 60 countries (Figure 2). South Africa provides the most education programs (37). Tanzania provides a large number of short courses (21). UK with 18 and USA with 17 programs follow on the list. Russia, Poland, Portugal, Italy, Uganda, Denmark, Greece, China, Germany, Kenya, Romania, Mexico and Netherlands offer more than 5 training programs.



Figure 2: Programs allocated in countries

4.3. Aims and learning goals of the program

The aims and the learning goals of the programs vary and have been classified in 6 clusters, according to the revised version of Bloom’s taxonomy [18]. There are six major categories of cognitive processes, starting from the simplest to the most complex (Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation). The allocation of the identified programs to different categories is the following: Knowledge (34%), Comprehension (19%), Application (23%), Analysis (5%), Synthesis (15%) and Evaluation (4%).

4.4. Program Specialisation Area

Each program concentrates on (a) specific area(s) of knowledge. The allocation of training programs in areas of knowledge is the following: Technology (14%), Information Systems (19%), Public Administration (32%), Management (6%), e-Government (9%), Social Sciences (6%), Business Administration (8%) and Economics and Political Science (6%).

4.5. Degree Title

The certificate types that the different e-Governance related programs award can be classified in four main categories:

Undergraduate (12%), Postgraduate-Academic (41%), Postgraduate-Executive (12%), Other (35%).

4.6. Institution Type

The education programs are provided from different types of institutions (Figure 3).

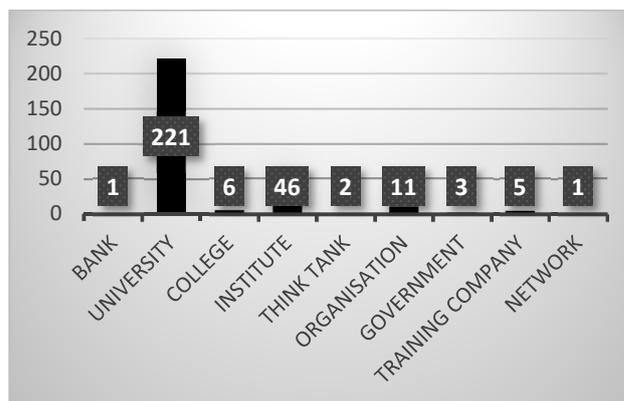


Figure 3: Institution Types

4.7. Department hosting the Program

Education programs are offered by different departments. 47% of all programs are offered from the departments of public management and governance. Management and IT & governance departments offer 9% of programs. Business, Commerce and Management studies departments together with Economics and Business departments offer 20% of study programs. Social sciences and Humanities departments are responsible for 12% of offered programs. In 3% of cases, a specific department of e-Government exists. Such distribution affects the content of the programs with management-related courses being prevalent across most of the programs.

4.8. Admission Requirements

A number of different admission requirements set by the program departments have been identified. The requirements can be classified into several categories: academic, work experience, knowledge, research interest and assessment requirements. Academic requirements indicate the need to possess a certain certificate (e.g. High School certificate) or degree (bachelor’s degree for postgraduate courses). Some programs require a specific bachelor’s degree or a certain average grade for admission. Similarly, assessment requirements include the possession of a specific certificate or proficiency test: often an English language proficiency certificate for programs in English. Work experience requirements include the need to have a specific amount of professional experience (e.g. have two years of work experience in public sector). Such requirements are more common for postgraduate level programs.

Research interest requirements (common for postgraduate level) include the need to define one's interest in the course by providing a research proposal or letter of interest.

Knowledge requirements are less formal and include the familiarity with a specific research field or business area (e.g. background in economics). Some courses list other requirements, like specific age limit or the need to provide references for the admission.

4.9. Teaching Method

The overwhelming majority of programs (91 of 119 providing the information) are taught in a class setting, where students have to be physically present during the course. Only some programs adopt online (13), long distance (5) or dual mode (3) teaching methods. Other teaching methods mentioned in the context of the programs were group discussions (3) and workshops (2) along the study program.

4.10. Program Duration and Cost

The duration of the undergraduate programs is predominantly between 3-4 years, while postgraduate programs last between 1-2 years. Apart from the nominal duration, ECTS (European Credit Transfer and Accumulation System) credits provide the measure of effort necessary to complete a program. They are indicated for the programs in the universities of the European Union and some other non-EU European countries using the system (e.g. Turkey, Serbia, Georgia and some others). One academic year corresponds to 60 ECTS credits and 1500-1800 hours of workload. For the collected programs there is some variation in the amount of allocated credits, which depends mostly on the duration of the program. For the courses for which the data are available, on the postgraduate level, 21 programs provide 120 ECTS credits, 11 programs provide 180 credits. 5 undergraduate programs allocate 120 ECTS credits, 7 programs provide 360 credits, 6 more programs provide different amount of credits in the 121-359 range. It should be noted that many other countries use a different type of credit system that were not analyzed in our research due to the time constraints.

The cost of the program depends on the country and the ownership of the university (public vs private). Some European countries traditionally have relatively low tuition fees especially on undergraduate level, while countries with weaker economies in the South America and Eastern Europe have comparatively lower fees. The costliest e-Government programs are offered at North American universities: with 76248 USD (€66700) for the 16-month MA in Technology Management at Columbia University in the US and 89000 CAD (€60000) for the 15-month MBA in Digital transformation at McMaster University in Canada. The information of estimations and descriptions of applied fees in the eGovernment programs is relative. It has to be used with care in reason of several parameters such as scholarships, grants, fees exemptions and agreements as well as exchanges programs that could change the classification and description presented here.

4.11. Courses

The courses offered within the education programs can be classified in 15 different clusters, depending on their content.

e-Governance: The courses in this category are specific to e-Government programs and deal with the topics such as: application of ICT for delivering government services, exchange of information, communication transactions, integration of various stand-alone systems and services between government and users, management of the public service transition to electronic government, smart city governance, etc.

Public Policy: The courses in this cluster focus on the systematic analysis of issues related to public policy and the associated decision processes. This includes courses on the role of economic and political factors in public decision-making and policy formulation; microeconomic analysis of policy options and issues; resource allocation and decision modelling; cost/benefit analysis; statistical methods; and various applications to specific public policy topics. Among the offered courses are: policy analysis, policy studies, public policy, political economy, urban planning, public administration, public affairs, public management, etc.

Governance: These courses deal with the processes of governing relating to a specific sphere of human social existence. Governance courses cover public sector, public organizations, and the concepts of leadership and governance, studying features of the political structures. Governance courses consider aspects such as: the political system and regime, state institutions, political parties, civil society, directions and problems of economic and social policy, the principles of good governance, effective governance of transition and governance ethics.

Project Management: This category includes the courses focused on managing the technology and innovation projects in public sector. The courses may be specific to an area of management: i.e. effort management, project portfolio management, program management, project risk management, financial management, project workforce management, etc.

Software Engineering: Software engineering courses consider the systematic application of scientific and technological knowledge, methods and experience to the design, development, testing, and documentation of software. They cover activities like computer programming, visualization, data engineering and systems analysis.

Information Systems: The courses in this cluster consider aspects such as management of information systems, design and development of information systems, systems analysis, systems design, data communications, database design, data mining, collection, organization, storage and communication of information.

Business Administration: Business administration courses deal with the functional aspects of an organization and their interconnection. They focus on the issues of overseeing and supervising business operations and related fields which contain accounting, finance and marketing. Business administration courses also consider the performance or management of operations and decision making, as well as the efficient

organization of people and other resources, to direct activities toward common goals and objectives.

Management: Management courses consider the administration of an organization, whether it is a business, a not-for-profit organization, or government body. Management includes the activities of setting the strategy of an organization and coordinating the efforts of its employees to accomplish its objectives through the application of available financial, natural, technological, and human resources.

Public Administration: Related to the previous cluster, Public Administration courses focus on the aspects, specific to the administration of public service organizations. They cover economic issues, public finance, quantitative research methods, policy analysis, ethics, public management, leadership, planning, program evaluation, performance measurement and human resources management.

Legal Issues: The courses in this category deal with legal aspects in governance. They include aspects such as understanding of the potential of e-Government, the policies, the required legal and institutional frameworks, and insights into an engaging e-Government involving different stakeholders.

Scientific Research: Scientific research courses concentrate on the fundamentals of research method and the theory of science, offered primarily, but not exclusively, at the postgraduate level. These courses provide an understanding of research methods and practice for academic and professional career.

Economy: Economy courses include: microeconomics, macroeconomics, econometrics, economic statistics, history of economic thought and political economy. These courses relate closely to the Business administration courses, however provide a higher level view of the economic issues.

Statistics: These courses are concerned with evidence-based reasoning, particularly with the analysis of data. Statistics courses study the collection, analysis, interpretation, and presentation of quantitative and qualitative data.

European Institutions: The courses in this cluster provide structured knowledge of EU fundamentals and focus on selected priority issues for an in-depth understanding and future-oriented approach to EU integration. These courses are often offered at the European Universities both at undergraduate and postgraduate levels.

Other: This cluster includes all the other courses that are part of the e-Government programs. These include practice-oriented courses like internship, project development courses as well as initial undergraduate courses like general ethics and English academic writing.

5. DISCUSSION AND CONSIDERATIONS

Given the growing complexity of the field, the development and the review of the digital governance education program is an important need and a critical challenge in the education field. As stated in the findings section, e-Governance is closely related with ICT field. More specifically, ICT is the driving power of the digital governance evolution. International experience shows that taking advantage of these great capabilities offered by ICT is a complex

and interdisciplinary task, which requires the close collaboration of different scientific areas, in both technology and administration, inside and outside of the public sector (information technology businesses, consulting services, etc.). So far, the studies examining education development of the digital government field didn't integrate this complexity. Overall, the studies on the topic remains rare and more specifically most of the existent research in the domain focus either in a specific region or country [14], [15], [16], [17] or a specific domain of study and don't propose a holistic or a transdisciplinary perspective of the digital governance [13].

In this study based on the data collected from the existing training programs in e-Governance worldwide presented in the previous section, we have portrayed the current digital governance education programs and trainings and proposed a worldwide mapping. We realized a description of the existing programs by organizing them geographically to be able to observe the current situation of the formations and training of digital governance. This descriptive study allowed to determine the strengths and weaknesses to address the gaps with government and civil servants skills and competencies needs.

The development of digital government education programs is not new as we have seen it through the results presented previously. It has been presented in a different display for more than a decade now. The first programs implemented started by targeting mainly high responsible in the government to develop the role and responsibilities of Government Chief Information Officer (GCIO) [19] with program developed in United States and adopted later in European countries. Progressively, with the increasing demand and involvement they generalize the trainings targeting a different level and categories of public civil servants. We can also notice that the e-Government program initiatives are diverse in term of discipline and department providing the trainings formation. However the results and finding shown a strong concentration in the "Governance related programs" such as public management and governance departments (47%). We have also observed an important diversity regarding the level and the duration of e-Governance programs. Most of the programs identified and described are very generic, lack of specialization which is consistent with the fact that most the programs are concentrated in political sciences and public management field (32%). This also explain the absence of holistic programs in digital governance encompassing different disciplines relevant to a variety of roles and responsibilities. We can also notice that traditional teaching approach based on lectures, workshops and group discussion is dominant in e-Governance education programs. Practices and case-based approach are rarely presented as part of the teaching method. Regarding the content and the courses composing the curricula of digital government, we have organized them in clusters. We have also observed a majority of courses from political sciences, governance and public management courses and most of the existing programs don't include the emerging technologies and the data sciences. Finally we have also noticed a differentiation among the countries regarding the presence of digital governance programs and

trainings. Some countries probably don't have any programs or didn't integrate digital governance with other programs because they had not identified the need for it yet (fig. 2).

From these different findings and presentation of the current situation, we consider that the development of a relevant digital governance program should incorporate some elements. In this section we discuss these different considerations and we highlight specific challenges.

The first challenge is to define a vision of the type of roles and responsibilities, competence and skills that government at the different level will require in e-Governance fields [4, 6]. The identified competencies and training needs for specialized personnel concern the full spectrum of understanding and management of the multiple dimensions of programs and development tasks in digital governance such as administrative, legal, political and technological. In addition, the great percentage of students of such programs is primarily originated from these disciplines. The targeted audience could develop or create careers either in the public sector or in the private sector be part of consulting or development businesses operating in the domain of digital governance. This specialized personnel is extremely important in both the public and the private sector, since relevant markets that open in the area of digital governance for businesses of different areas are massive.

The second challenge concerns the existent dichotomy between a specialized program of e-Governance as we presented earlier in the findings section, there is a clear division between technical programs (14% technology; 19% Information systems) and non-technical programs including governance and social and political science as main emphasis Public Administration (32%), Management (6%), e-Government (9%), Social Sciences (6%), Business Administration (8%) and Economics and Political Science (6%).

At this stage, it seems relevant to bridge between different fields

[7, 8]. We have observed a specialization of the roles and responsibilities in the e-Governance professionalization. The majority of the existing programs is focusing on one domain per program. So far, we didn't identify a multidisciplinary program that is able to fulfil the competencies of the current e-Governance roles and responsibilities. The e-Government development and operation is becoming more and more complex, the utilization of e-Government services involves different stakeholders and not merely the citizen utilization, as well as well request different capabilities. This complexity calls for a more sophisticated set of knowledge and competencies. Coming from the analysis of the e-Government domain and its basic characteristics [6], it is evident that these different perspectives could be merged in order to develop a digital program aligned with these fast-growing changes in the e-Governance field and to reply on the new set of skills needed by the new roles and responsibilities, the training programs have to integrate more specialization and expertise than the generic studies observed in the majority of the current programs worldwide. A variety of learning opportunities could be integrated into the specialized field.

Another challenge is related to the fact that most of the programs are local or country-based [7]. As explained earlier a multidisciplinary perspective could certainly increase the relevance and the success of a program to fulfil the needs in knowledge, skills, and competencies. However, the ability to define and develop this type of program can be challenging regarding capabilities, costs, risks and performance to be adopted or developed by a single institution. The development of a joint program at the inter-regional or international level could contribute to the effectiveness of reaching this objective and facilitate the required sophistication. These can be realized through the partnerships between existing programs or by developing an e-Governance international/regional multidisciplinary program. And it will help to compensate and balance the discrepancies, observed between countries, given that different countries present different digital government development needs according to their level of maturity. Thus, a dedicated set of courses could be offered where a set of strength are identified in a specific country.

The last challenge is to keep the program constantly updated taking into consideration the emerging technologies in order to integrate them into the training programs. Courses clustering analysis showed a limited offer of courses and modules related to the disruptive and emerging technologies, as well as a limited integration of the data sciences field in the specialized programs. Emerging fields and technologies such as data science and big data, robotics, artificial intelligence, cyber-physical systems or quantum computing technology evolve e-Government which is moving through its third generation. As the domain of e-Government evolves, the required capabilities are evolving as well. It is crucial to follow the trends and the technology progression as well as benchmarking what are the adoption from the private sector and integrate the adequate modules and courses in the digital governance training programs for facing the future needs of the Government.

6. CONCLUSION

In the paper, a systematic data review was conducted, resulting in a comprehensive analysis of the e-Government courses worldwide. Compared to the previous papers [4, 5, 9, 10], the current research covered 291 programs offered in 60 countries. A broad amount of e-Government-related programs has been analyzed to identify the number of aspects related to the organization, duration and content of the programs.

The analysis highlighted a significant variety of the e-Government programs. Programs in e-Government are most often (in 47% of cases) offered by public management and governance departments, followed by business-related (20%) and social sciences (12%) departments. Despite the importance of the digital government in the national and international public strategies, only in 3% of all cases educational institutions have a separate department of e-Government.

Both undergraduate and postgraduate courses in e-Government are offered, with master-level courses typically having higher admission requirements regarding the professional

experience and academic qualifications. The overwhelming majority of courses (76%) use lecture method of teaching: students have to be present physically in class. Online learning or some kind of combination between distance learning and lecturing is more prevalent for shorter study programs.

The analysis allowed to identify the courses which form the e-Government programs and classify them into 15 different clusters depending on the content. Governance (both specifically electronic and more general), Public policy and management courses were found to form the core of the most of the e-Government program offerings.

Examining the results more in depth, different considerations raised about the multiplicity and the great variety of e-Governance programs. These considerations are discussed and transformed into challenges towards the development of a universal view and understanding of the e-Governance domain. Four specific challenges are disclosed:

- a) The proper definition of roles, responsibilities, competencies and skills to efficiently cover the e-Governance training needs [4, 6].
- b) The existence of a dichotomy between a specialized program of e-Governance or a multidisciplinary one that combines different fields [7, 8].
- c) The development of an e-Governance training program at an inter-regional or at an international level [7].
- d) The continuous updating of an e-Governance program taking into consideration the emerging technologies.

Next step of the research will be to identify the current educational needs in e-Governance area and comparing with the results of the present study to identify the training gaps that should be covered from e-Governance training curriculums.

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