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An E-Government Implementation Model for Peruvian State Companies Based on COBIT 5.0: Definition and Goals of the Model

M. Bruzza, M. Tupia, F. Rodríguez

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***Abstract*—**As part of the regulatory compliance process and the streamlining of public administration, the Peruvian government has implemented the National E-Government Plan in all state institutions with the aim of providing citizens with solid services based on the use of Information and Communications Technologies (ICT). As part of the regulations, the requisites to be met by public institutions have been submitted. However, the lack of an implementation model was detected, one that can serve as a guide to such institutions in order to materialize the organizational and technological structures needed, which allow them to provide the required digital services. This paper develops an implementation model of electronic government (e-government) for Peru's state institutions, in compliance with current regulations based on a COBIT 5.0 framework. Furthermore, the paper introduces phase 1 of this model: business and IT goals, the goals cascade and the future model of processes.

***Keywords*—**E-government, implementation, model, COBIT 5.0, digital services, u-government, m-government.

I. Introduction

AS happens with any implementation of governmental organizational structures (or governance), implementing an e-government includes, but is not limited to modifying, increasing and/or eliminating business processes, while orienting them to citizens who will take advantage of their outputs (services), establishing quality and safety policies along with risk strategies, making the most of technology to achieve integration and interoperability of all services rendered.

The model developed in this thesis project seeks to integrate good practices of models including, but not limited to COBIT 5.0, ITIL 2011, and ISO 20000-1, to help lead the implementation process. The first stage of this doctoral research introduces the goals of the model, the results expected from its application and basic tools on which the model will be based.

M. Bruzza is doctoral student in Postgraduate School, Engineering program, Pontificia Universidad Catolica del Peru, Lima, Lima 32, Peru (e-mail: a20146472@pucp.pe).

M. Tupia is with Department of Engineering, Pontificia Universidad Catolica del Peru, Lima, Lima 32, Peru (corresponding author, phone: 511-626-2000, fax: 511-626-2851, e-mail: tupia.mf@pucp.edu.pe).

F. Rodriguez is with CENTRUM Business School Pontificia Universidad Catolica del Peru, Lima, Lima 32, Peru (e-mail: frodriguez@pucp.edu.pe).

II. Model Objectives

A. General Objective

The model aims at developing a mechanism for the implementation of the e-government (hereinafter, MIGE) in state institutions, in compliance with current regulations concerning government, risks and compliance (GRC) issues and in accordance with strategic plans of state organizations as well as national e-government plans.

B. Specific Objectives

The following specific goals (SG) have been identified:

1) SG1: Implement guidelines and instructions to establish an organizational structure of electronic government due to the lack of methodological guide and frameworks supporting their implementation, being mandatory the governmental implementation for the Peruvian public organizations.
2) SG2: Set up specific procedures for implementing e-government, based on good management and government practices and information technologies for the operation of e-government services to maintain high quality, efficiency and efficacy standards so that they are truly useful to citizens.
3) SG3: Meet the needs of citizens and companies on transparency and reliability of ICT-based e-services provided by the State.
4) SG4: Offer mechanisms to optimize management processes and re-engineering of information technology processes in public administration by using IT as a support mechanism for business processes exploring that information.

C. Expected Outcomes

For each specific goal, the following results are expected:

TABLE I
Expected Results

Model goals	Expected Results
SG 1	Implementation guide of e-government
SG 2	Strategic plan of e-government
SG 3	Information and Communication Technology Program
SG 4	Measurement mechanism of maturity level of e-government

III. Used Tools

This section introduces the main tools used for structuring MIGE. In introducing each tool, the rationale of its use and

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aspects that are important for the model will also be specified.

A. COBIT 5.0

For this model, the recognized good-practice framework, COBIT 5.0 is taken as a reference. This leading framework will provide a set of good practices to implement the said model within any public or private institution.

COBIT 5.0 has been adapted to the Peruvian case through the goal cascade, bringing a list of goals commonly applied to a public institution and a list of IT goals, both defined through the Balance Scorecard perspective, and then relates each of them to the government objectives. In this case, the goals will be those of the National E-Government Plan and then will identify the metrics for the Company's Balance Scorecard.

B. Balance Scorecard

To incorporate e-government into individual plans of each public institution, it is required to expand the use of management tools, such as the Balance Scorecard (BSC), which will serve to relate the e-government goals to the individual goals of each public institution, as provided by COBIT 5 in the company's goals cascade [1]. Likewise, performance management tools, such as the BSC, are being analyzed and used by several national and local governments, as well as other public organizations. The aim is to implement business strategies and assess the organization's performance, reaching a huge potential success in the always-difficult task of managing the assets and public services [2]. Hence, the BSC is generally composed of four perspectives [3], [4]:

Financial Perspective: In public organizations, the financial perspective reinforces an efficient role in allocating resources, optimizing the public institution image, complying with the regulatory framework and financial transparency. This perspective enhances the costs efficiency as well. The private sector's goals and those of the public sector from the financial perspective are clearly different, since the private sector seeks financial surpluses and the growth of the company's value in the market, whereas the public sector aims at achieving financial balance and maximizing citizens' wellbeing [1].

Clients' Perspective: This perspective embraces aspects such as the organization skills to deliver citizen-oriented e-government services, the effectiveness of the delivery of services and above all their continuity and availability. In this perspective, we must determine whether there exists a culture oriented to the concept of public servant and focused on the citizen.

Internal Process Perspective: This perspective is based on the institutions' operations and activities, the best practices of e- government, and the design of the services offered – also known as "the way to-do-something." Its aim is to optimize those processes that increase the citizen's value perception that e-government services fulfill its expectations. This perspective is also closely linked to the concept of efficiency, which does not differ greatly from the private sector.

Learning and Development Perspective: This perspective is oriented to the training and skill improvement of public servants, and the innovation of technology structure in public institutions. Processes will only succeed if trained and motivated officials are in charge, as they are capable of taking on new responsibilities and learning new skills.

IV. Model Components

Following the COBIT 5.0 proposal, below are the first components:

1) Business goals.
2) IT goals.
3) Indicators aligned to both types of metrics.

A. Public Institutions Goals

For each of the BSC perspectives, the standardized goals for public institutions are listed below. Table II lists such proposed goals.

TABLE II
PUBLIC INSTITUTIONS GOALS

BSC Dimensions	Public Institutions Goals
Financial	1) Maximize added value of e-government services. 2) Achieve efficiency in the allocation of resources for the delivery of e-government services. 3) Comply with external laws and regulations concerning e-government. 4) Contribute to the financial transparency of e-government services for citizens and stakeholders.
Client	5) Provide citizen-oriented e-government services. 6) Achieve a sustained optimization of the public institution image. 7) Optimize costs in the delivery of e-government services to citizens. 8) Minimize response time of e-government services. 9) Maintain continuity and availability of e-government services.
Internal	10) Use best practices in the delivery of e-government services. 11) Develop digital social inclusion and social and environmental responsibility in e-government structures. 12) Establish continued improvement mechanisms of the quality of e-government services. 13) Optimize e-government services design. 14) Comply with internal policies regulating quality, security, capacity and scope of delivery of e-government services. 15) Optimize information management involved in the delivery of e-government services.
Learning and growth	16) Implement and maintain a technological prospective culture applied to e-government. 17) Count with trained and motivated personnel. 18) Implement and maintain an innovation service culture oriented to e-government services.

Financial Perspective

1) Maximize added value of e-government services: The improvement of public services quality does not only refer to the convenience of having access to governmental information and services 24-hours a day, 7-days a week (that is in high availability), but also to the fact of adding a substantial value to the products offered, the processes to be conducted and the citizens attention, and thus, meeting their specific requirements. According to [5], the close connection between the source of the e-government and the added value resulting from the incorporation of

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information technologies into the public services provision, along with the optimal allocation of resources, is a crucial factor to achieve an agile, flexible, efficient and, above all, transparent management. This implies a close coordination work between business areas and technical areas.

2) Achieve efficiency in the allocation of resources for the delivery of e-government services: This goal aims at improving the allocation of resources in such a way to avoid duplicity of efforts, conducting a proper segregation of duties and achieving higher efficiency in public spending. In [6], the author explains that public management is defined as processes allowing local government and citizens to operate effectively in a dynamic and complex environment "rationally using internal and external resources". As well as implementing proper decision making so as to create value, dealing with difficulties through significant governmental and social efforts, with the resulting transfer of resources and changes to the management [7].
3) Comply with external laws and regulations related to e-government: The compliance with a regulatory framework is vital to support the design, deploy, use and assessment of e-government services within the government and its relations with other social players. For [8], the services provided as part of IT management are also governed by regulatory frameworks. As with any existing product or service in the market, (organizational) e-government structures must respond to strategies, laws and regulations updated by central governments. Policies regulating its operation must be adopted if an e-government structure is set to provide citizens with several services (such as information, payments of taxes, fines, property taxes, etc.) [9].
4) Contribute to the financial transparency of e-government services for citizens and stakeholders: A suitable e-government structure may facilitate and foster the transparency of governmental works and accountability processes and promote a more efficient, effective and transparent administration by governments at all levels [10]. The e-government is a catalyst of the streamlining of public management that seeks to encourage transparency and accountability, among other things [11]. According to [12], the e-government has become a tool for upgrade that has made its way into public administrations to establish a dynamic communication with citizens.

Client Perspective

5) Provide citizen-oriented e-government services: The service culture must start within the institution and then reflect the service rendered to citizens. According to [13], the satisfaction of citizens' needs is a crucial element that will allow to capture and retain citizens. Against this background, it is important to pay attention to the service culture as the neural point that will allow for differentiation and will provide citizens with the added value they expect. The service culture must be sufficiently strong, consistent and permanent in the daily practice of each member (internal user). To this end, a change of culture transcending sub-cultures of public institutions and national culture of collaborators should be targeted.
6) Achieve a sustained optimization of the public institution image: The corporate image is a valuable and intangible asset that builds citizen confidence in public institutions. Thus, total high satisfaction rates are achieved based on the offer of high quality e-government services [14].
7) Optimize costs in the delivery of citizen-oriented e-government services: By taking advantage of all the ICT potentialities and optimizing the government's internal procedures and the interaction between the government and citizens, the purpose is to achieve significant cost reductions in said transactions [5]. According to [8], implementing automated services leads to reduced operational and administrative costs, since the portal processes citizens' requests. A well-designed and implemented e-government system coordinates internal activities among its institutions, collecting data necessary to process the requests made. The coordinated response of systems allows harmonically controlling the institutions involved and responding to the request made immediately.
8) Minimize response time of e-government services: The simplification of administrative activities and business/ government processes results in higher efficiency in the tasks of public administrations [15]. ICT's strategic use contributes to the achievement of an efficient government because it allows simplifying transactions, reducing costs and waiting times, etc. Technologies help achieve higher rates of attention capacity and availability of services, and thus, reducing the so-called digital gap of user-citizens [16].
9) Maintain continuity and availability of e-government services: As for the importance on the citizen protection in the delivery of e-government services, there exists a major concern with the elements defining the delivery such as quality and continuity [17]. Therefore, it is important to point out that public institutions rendering the service must guarantee a regular and undisturbed service over time. This requires the development of technological infrastructure guaranteeing continuity and maintenance, not only with the progression of time, but also with the quality in the delivery. Since the continuity goes hand in hand with the technological progress, it is pivotal to rely on an investment large enough to guarantee the adoption of new and better technologies [18].

Internal Process Perspective

10) Use best practices in the delivery of e-government services: Good practices are intended to secure a correct performance of the activities in any sector, including public administration. According to [7], planning and implementation methodologies, and reference frameworks of the technology management are useful tools. However, they are of a general nature and only respond to a specific

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model, i.e. a specific organizational reality. Their usefulness lies in their adaptation to the restrictions of the context where they will be applied. In [19], it is mentioned that a reference framework is required for the proper management of resources by governments and the promotion of a participatory society [20].

11) Develop digital social inclusion and social and environmental responsibility in e-government structures: Digital inclusion initiatives by central governments must seek to "bring the State" to their citizens. In addition, e-government services may help guarantee citizen participation in the decision-making on issues regarding their community and the dialogue with stakeholders, and allows to maintain the highest ethical commitment and respect towards diversity and equal opportunities. This can be accomplished, for example, by achieving changes in public decision-making processes with an active role of citizens. IT solutions are the cornerstone for the sustainable growth of all the economy sectors. Smart ITs are greener technologies, more sustainable, with less energy consumption that help improve environmental performance and behavior of the society as a whole. Development and smart application of ITs, in pursuit of sustainability, have become the so-called Green IT [21], [22].
12) Set up continued improvement mechanisms of the quality of e-government services: In [23], it is noted that in the last year e-government has focused on the improvement of quality and attention to citizens who are provided with services and access to governmental information.
13) Optimize e-government services design: The appropriate design of technological strategies needed for the implementation of an on-line government with interoperability, infrastructure, legal and safety requirements on transactional services of e-government is the most important stage for a successful governmental ICTs project [5]. The service provision is the result of the process design that responds to an organizational purpose and fulfills clients' needs and expectations. Before, during and after the service provision an exchange of information takes place to define, execute and assess the service [24].
14) Comply with internal policies concerning quality, security, capacity and scope of the delivery of e-government services: The design of public policies aligned with current assumptions of e-government within the local sphere must include the particularities of local management, as well as public technology management [7]. The confidentiality and proper use of personal data, as well as secured transactions, must be guaranteed with the support of groups trained to cope with cyber insecurity. These factors must be taken into consideration in the design of technological services [23].
15) Optimize information management involved in the delivery of e-government services: From the viewpoint of [7], increasing public administration efficiency implies the re-thinking of the methodology used for the available technology, but above all, to position the society at the heart of the State's action. This aspect draws together all the initiatives that help make the State's administration more efficient by improving response times, eliminating useless or obsolete activities, reducing costs, cutting down superfluous consumption of resources, re-organizing them to avoid redundancies, and so on. The information management, according to [24], consists of acquiring, producing and transmitting, at the lowest possible cost, high quality, accurate and updated data and information enough to achieve the goals of the organization where people properly apply the information to correctly designed processes.

Learning and Growth Perspective

16) Implement and maintain a technological prospective culture applied to the e-government: The use of tools and techniques is crucial to streamline the service provision to citizens by the public administration. One example of these technologies is related to the inter-operability platform in electronic administration. The success of these ICTs and their gradual, orderly and logical introduction will be attained if, and only if, it is incorporated into a technological perspective culture deeply embedded into the strategy itself of the service provision. The prospective must be understood, as a future study of public administration's technological needs, how to solve cases regarding citizen attention, companies and other stakeholders, in an effort to make the most of the cutting-edge technology [25].
17) Count on trained and motivated personnel: Public institutions need more qualified personnel to deliver better services. According to [26] this is because human capital is related to knowledge, and that societies go through transition and change periods, where knowledge is, and will be, the main resource supported on key values such as productivity and innovation. In this regard and on the understanding that the organizations are the pillars of the development of any society, they must obtain competitive advantages built on the development of their human capital.
18) Implement and maintain an innovation culture of service oriented to e-government services: In conjunction with the technological prospective, the innovation concept from the point of view of [27] —including adaptive and incremental improvements and even radical and disruptive ones for products, services, processes or organizational and management improvements— must be taken into account in any e-government model [28].

B. IT Goals

Similarly as the proposed business goals and following the postulates of COBIT 5.0, the IT and MIGE goals are listed in Table III.

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TABLE III
IT GOALS

BSC Dimensions	IT Goals
Financial	1) Optimize the value given by e-government services. 2) Achieve a proper allocation of resources for the development of e-government services. 3) Assess and manage risks involved in the delivery of e-government services. 4) Comply with external laws and regulations related to IT technologies and services
Client	5) Steer the IT strategy towards the business strategy and IT services infrastructure to the e-government strategy. 6) Constantly simplify the citizen experience interacting with e-government services 7) Achieve higher citizen confidence levels in e-government services. 8) Improve the IT services quality ensuring the continuity and availability of the service.
Internal	9) Reach quality goals and achieve e-government service sustainability. 10) Ensure service quality. 11) Reach higher flexibility and facility rates to incorporate new e-government services 12) Regularly update the technological platform. 13) Promote citizen participation in the design of e-government services 14) Ensure the safety of e-government services 15) Ensure integrity, confidentiality of public information used in e-government services.
Learning and growth	16) Provide effective and innovative IT solutions through e-government services. 17) Maximize human and technological management capacity. 18) Strengthen innovation capacity.

Financial Perspective

1) Optimize the value given by e-government services: [19] thinks that the electronic accessibility to public services and its application to the Public Administration using IT, will facilitate the improvement of the State apparatus allowing to achieve higher rates of efficiency and effectiveness, replacing excessive transactions and several teller windows for only one teller window that may be of a virtual nature.
2) Achieve a proper allocation of resources for the development of e-government services: According to [5] the close relationship between the source of e-government and the added value resulting from the incorporation of information technologies into the public services provision, along with optimal allocation of resources, are pivotal factors to achieve an agile, flexible, efficient and above all transparent administration. All of this implies close and coordinated work between the business areas and the technical areas.
3) Assess and manage risks involved in the delivery of e-government services: In the opinion of [29] e-government requires the implementation of new technological channels that are added to the existing traditional media. Due to the high insertion of mobile devices or the so-called U-government, it is worth mentioning that these devices are also new channels of potential risks to the organization. These risks must be dealt with in due course [30].
4) Comply with external laws and regulations related to IT: The governments are not the only users of ICT, but also have the nominal capacity of creating technology as a part of the process of compliance with regulations, standards, laws and a body of rules supporting and promoting the implementation of projects within the e-government. Thus, an additional benefit of the e-government is precisely the creation of a regulatory framework that supports and sustains design, deployment, use and evaluation of information technologies and the communication involved as well as their relationships with other social players [16].

Client Perspective

5) Steer the IT strategy towards the business strategy and the IT service infrastructure to the e-government strategy: According to [31], in order to generate value for the organization, the IT projects must be consistent with the organization needs. The management and improvement of this connection is the alignment of business and IT. The fundamental factors are two: alignment and synchronization. This process is vital for the IT government to fulfill its main role of generating value for the benefit of stakeholders, while minimizing risks.
6) Constantly simplify the citizens' experience interacting with e-government services: e-government, as a strategy intended to manage the State with the use of ICTs, will improve the efficiency of governmental responses to citizens. In this sense, ICTs may serve as a tool for the local government to become more participatory and achieve higher transparency and interaction levels with citizen-oriented e-government services. This goal comprises the means for the bi-directional communication between citizens and the government, taking into consideration the rapidly changing users' preferences in communication tools. Likewise, these communication channels facilitate the surveys of the citizens needs, and thus citizens participate in the improvement process of services or in their design from "scratch" [16].
7) Achieve higher citizen confidence levels of e-government services: The biggest challenge that public institutions face is to remain up to date with new technologies, not only in their adoption but also in their utilization. In addition, a technical-political view must be included for the purpose of achieving maximum efficiency and reliability [32].
8) Improve the quality of IT services ensuring the continuity and availability of services: [33] note that in order to improve the quality of services, their continuity must be maintained within time frames consistent with their nature. Both control and preparation of recovery plans are required to mitigate the risks that could seriously affect ICT-based e-government services. For this purpose, defining strategies, policies and procedures is essential, as it can prevent a potential service disruption.

Internal Process Perspective

9) Reach quality goals and achieve e-government service

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sustainability: For [24], guaranteeing quality does not only imply the use of the best technology available but also that the information managed through this responds to the needs and expectations of citizens and institutions, which are the users of the e-government. To boost the demand, it is vital to count on more friendly services and achieve balance between usefulness, as well as guarantee, with the support of solid business processes and the application of good practices [34].

10) Ensure service quality: In relation to the improvement of services quality, a number of studies point out that the most influential factors on users' satisfaction of the e-administration are the following [35]:
- Usefulness (citizens appreciate that the information provided by public administration web pages and digitally provided services are useful and help them to achieve what they require).
- Accessibility (citizens especially appreciate the maneuverability of the webpage and its services and the assistance options they can count on).
- Completeness (citizens appreciate they can conduct the entire on-line procedure and obtain the information they were looking for).

11) Reach higher flexibility and facility rates to incorporate new e-government services: According to [23], citizens are the main recipients of electronic services and their contents at the Internet sites of e-government institutions since they make possible to conduct transactions through information tools (computers, networks, Internet, mobiles, handheld devices, etc.) with the correct exercise of their rights [36].
12) Regularly update the technological platform: For [37] ICT projects within the State are connected to huge transactional and processing volumes, which involve an enormous challenge when defining, designing and modeling associated technological platforms architectures. It is required to conduct regular updates to adapt new technological possibilities and new demands by citizens and companies. For this purpose, configuration management processes are required to maintain baselines of the entire infrastructure needed, for example, in the case of the delivery of e-government services.
13) Promote citizen participation in the design of e-government services: From the point of view of [33] in order to optimize the service quality and following the ITIL V3 perspective, the service strategy must be taken into account with a focus on the market study, identify the services to be provided to citizens, improvement possibilities, whether new or existing services. In addition to a clear emphasis on the service's lifecycle based on the satisfaction of citizens' requirements [34], digital public services must be designed from a digital native approach, not limited to the "translation" of today's services into digital format. Digital services must be designed from the start (digital by default), which gives a chance to re-think and re-organize public services. Digital public services must be envisioned with a focus on the usability by end-users who must take part in the design and application.
14) Ensure the safety of e-government services: From the view of [8], security is a vital factor when an e-government system goes on-line, and the State is responsible for securing the confidentiality of the data exposed on the Internet because of their sensitivity. When it comes to computer security, protection of the entire computer infrastructure, whether physical and logical, must be a top priority. An e-government system must be considered a matter of high priority, since the data of an entire nation are stored into governmental servers. Hence, the whole infrastructure is critical.
15) Ensure integrity, confidentiality of public information used in e-government services: For [29] implementing an e-government includes, but is not limited to, re-thinking, adding and/or eliminating processes, defining quality and security policies, analyzing business processes in each of the public services. These tasks will result in the integration and interoperability of these services. Total integration encompasses concepts such as interoperability of solutions offered, unification of procedures methods. This will prevent every institution from building their own solutions, but instead it will make them use the services offered at a global level.

Learning and Growth Perspective

16) Provide effective and innovative IT solutions through e-government services: According to [38], information and communication technologies (ICTs) have become vital for the modern and efficient administration. They help maintain internal and external control bringing transparency to the public sector, taking the government closer to citizens and facilitating citizens' participation. Many e-government initiatives improve the efficacy of the public sector and simplify governance systems for a sustainable development [39]. ICTs and the collaboration of stakeholders are pushing some local governments to bet/approach/into the path of Smart Cities. IT solutions generate great benefits that are essential for the streamlining and efficacy of the State, and help maintain internal and external control bringing transparency to the public sector, cutting down the public sector's expenses by sharing resources, fostering decentralization, bringing the government closer to citizens and facilitating citizen participation in the decision-making process [5].
17) Maximize human and technological management capacity: For [26], it is important that the head of the human management area of different public institutions follow up on the adoption of policies for human capital management, based on the individuals' viewpoint, to assess their effectiveness and make the adjustments necessary, aimed at improving human capital, while motivating them to work with commitment. It is worth mentioning that the human management area must constantly monitor changes to the environment related to new demands. In this way, manuals and positions

descriptions will be adapted to new competences required by human capital to carry out their corresponding duties safely.

18) Strengthen innovation capacity: According to [23], the technological innovation designed to deliver governmental services is the primary cause of the emergence of e-government and the transformation of citizen-public institutions relations. That is the reason why capital and human resources are being allocated during the evolution process. The development of electronic channels of communication with citizens must foster a bi-directional relationship enabling expression of opinions and delivery of public services. All of this will contribute to a steady improvement of public administration towards innovation and system upgrade offering professional e-government services tailored to citizens' demands.

V. What Next?

The next step in our research is the definition to the process reference model (PRM). In this model, we separate government activities from management activities, in the way COBIT 5.0 does. Similarly to COBIT, for all processes we defined the respective responsibilities matrix (RACI matrix), the respective indicators and metrics, and the other characteristics and objectives that are necessary.

In a third stage of this research, we will proceed to implement the model in a Peruvian public institution.

VI. Conclusions

The review of literature made in [40] permit us to conclude that there is no specific framework for the implementation of e-government, nor a methodological guide that allows implement organizational structures based on norms or standards of governance and management, such as COBIT or ISO 38500, covering the business goals and IT goals of Peruvian public institutions. The first part of the proposed model shows these objectives adapted to the current regulations on e-government. These approaches also allow us to build a series of processes of governance and management of IT that will enable the implementation of e-government and the corresponding regulatory compliance.

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