Applicability of the Maturity Model for IT Service Outsourcing in Higher Education Institutions

Victoriano Valencia García
Computer Management Technician
and Researcher at Alcalá University
Madrid, Spain

Dr. Eugenio J. Fernández Vicente
Professor at Computer Science Dept.
Alcalá University
Madrid, Spain

Dr. Luis Usero Aragonés
Professor at Computer Science Dept.
Alcalá University
Madrid, Spain

Abstract—Outsourcing is a strategic option which complements IT services provided internally in organizations. This study proposes the applicability of a new holistic maturity model based on standards ISO/IEC 20000 and ISO/IEC 38500, and the frameworks and best practices of ITIL and COBIT, with a specific focus on IT outsourcing.

This model allows independent validation and practical application in the field of higher education. In addition, this study allows to achieve an effective transition to a model of good governance and management of outsourced IT services which, aligned with the core business of universities, affect the effectiveness and efficiency of its management, optimizes its value and minimizes risks.

Keywords—*IT governance; IT management; Outsourcing; IT services; Maturity model; Maturity measurement*

I. INTRODUCTION

One thing to change about ICT at university level is the deeply rooted approach which exists, or which used to exist, called infrastructure management. This kind of management has evolved into a governance and management model more in line with the times, which is a professional management of services offered to the university community [6]. It is for this reason that in recent years a set of methodologies, best practices and standards, such as ITIL, ISO 20000, ISO 38500 and COBIT, have been developed to facilitate ICT governance and management in a more effective and efficient way.

These methodologies, which are appropriate and necessary to move from infrastructure management to service management, see a lack of academic research. For that reason it is inadvisable to use these frameworks on their own, and it is advisable to consider other existing frameworks in order to extract the best from each for university level [6].

ICT or IT services have implications for business and innovation processes and may be a determinant in their evolution. The organization of these services, their status within the organization of the university, and their relationships with other management departments and new technologies is therefore vital. At present, the degree of involvement, the volume of services offered, and the participation or external alliances with partner companies through outsourcing, that Gottschalk and Solli-Saether [7] defined as the "practice of turning over all or part of an organization's IT function to an IT vendor", are of special interest.

Currently, and in the years to come, organizations that achieve success are and will be those who recognize the benefits of information technology and make use of it to boost their core businesses in an effective strategic alignment, where delivery of value, technology, risk management, resource management, and performance measurement of resources are the pillars of success.

It is necessary to apply the above-mentioned practices through a framework and process to present the activities in a manageable and logical structure. Good practice should be more strongly focused on control and less on execution. They should help optimize IT investments and ensure optimal service delivery. IT best practices have become significant due to a number of factors, according to COBIT [10]:

- Business managers and boards demanding a better return from IT investments;

- Concern over the generally increasing level of IT expenditure;

- The need to meet regulatory requirements for IT controls in areas such as privacy and financial reporting, and in specific sectors such as finance, pharmaceutical and healthcare;

- The selection of service providers and the management of service outsourcing and acquisition;

- Increasingly complex IT-related risks, such as network security;

- IT governance initiatives that include the adoption of control frameworks and good practices to help monitor and improve critical IT activities to increase business value and reduce business risk;

- The need to optimise costs by following, where possible, standardised, rather than specially developed, approaches;

- The growing maturity and consequent acceptance of well-regarded frameworks, such as COBIT, IT Infrastructure Library (ITIL), ISO 27000 series on information security-related standards, ISO 9001:2000 Quality Management Systems—Requirements Capability Maturity Model ® Integration (CMMI), Projects in Controlled Environments 2 (PRINCE2) and

A Guide to the Project Management Body of Knowledge (PMBOK); and

- The need for organizations to assess how they are performing against generally accepted standards and their peers (benchmarking)

Clearly ICTs have become ubiquitous in almost all organizations, institutions and companies, regardless of the sector to which they belong. Hence, effective and efficient ICT management to facilitate optimal results is necessarily essential.

Furthermore, in this environment of total ICT dependency in organizations using ICTs for the management, development and communication of intangible assets, such as information and knowledge [16], organizations become successful if these assets are reliable, accurate, safe and delivered to the right person at the right time and place, according to ITGI [10]. Also, knowledge integration mechanisms are important in helping knowledge utilization in client firms [18].

In short, Fernández [6] proposes that the proper administration of ICT will add value to the organization, regardless of its sector (whether social, economic or academic) and will assist it in achieving its objectives and minimizing risk.

Given the importance of proper management of ICT, the search for solutions to the alignment of ICT with the core business of organizations has accelerated in recent years. The use of suitable metrics or indicators for measurement and valuation, generate confidence in the management teams. This will ensure that investment in ICTs generates the corresponding business value with minimal risk [6].

The above solutions are models of good practice, metrics, standards and methodologies that enable organizations to properly manage ICTs. And public universities are not outside these organizations, though they are not ahead. In addition, interest in adopting models of governance and management of appropriate ICTs is not as high as it should be.

Two of the factors through which IT best practices have become important is, the selection of appropriate service providers and the management of outsourcing and procurement of IT services.

IT outsourcing has brought potential benefits in addition to many examples of the great organizational losses associated with this practice. Even with awareness of the potential for failure, the IT outsourcing industry continues to grow, as organizations communicate their desire to engage in IT outsourcing and their determination to decipher a method that enables successful IT outsourcing relationships [17].

In addition, a maturity model is a method for judging whether the processes used, and the way they are used, are characteristic of a mature organization [4].

Models by phases or levels allow us to understand how IT management strategies based on computing evolve over time [11]. According to these models, organizations progress through a number of identifiable stages. Each stage or phase reflects a particular level of maturity in terms of IT use and management in the organization.

There are many maturity models in the literature, and they are applied to various fields, such as project management, data management, help desk, systems safety engineering. Most of them refer to either Nolan's original model [14] or the Capability Maturity Model of Software Engineering Institute (Carnegie Mellon Software Engineering Institute). The latter model describes the principles and practices underlying software processes, and is intended to help software organizations evolve from ad-hoc, chaotic processes to mature, disciplined software processes.

Nolan was the first to design a descriptive stage theory for planning, organizing and controlling activities associated with managing the computational resources of organizations. His research was motivated by the theoretical need for the management and use of computers in organizations. From 1973 until today, technology and the way it is used has changed a lot, but Nolan's original idea is still valid, and it will remain as long as the quality of services provided internally in organizations, or by external suppliers, is essential.

II. Literature Review on Maturity Models for It Outsourcing and Comparison Chart

Very few models or frameworks of IT outsourcing can be found in the literature, either from the point of view of the client or outsourcer. The few models or frameworks that exist are varied. After a thorough literature review, and taking into account the point of view of the customer, the following models have been found to be relevant:

- [M1] Managing Complex IT Outsourcing – Partnerships (2002) [2];

- [M2] Information Technology Outsourcing (ITO) Governance: An Examination of the Outsourcing Management Maturity Model (2004) [4];

- [M3] A Unified Framework for Outsourcing Governance (2007) [5];

- [M4] IT Outsourcing Maturity Model (2004) [1];

- [M5] Outsourcing Management Framework Based on ITIL v3 Framework (2011) [12];

- [M6] Multisourcing Maturity Model (2011) [6];

- [M7] Maturity model for IT outsourcing relationships (2006) [8];

- [M8] IT Governance Maturity and IT Outsourcing Degree: An Exploratory Study (2007) [3]; and

- [M9] Global Multisourcing Strategy: Integrating Learning From Manufacturing Into IT Service Outsourcing (2011) [13]

The following table shows the maturity models and frameworks above, along with the key areas or determinants that they are based on. All key areas shown in Table I form the basis of the maturity model designed for IT service outsourcing.

TABLE I.   EXISTING MATURITY MODELS AND FRAMEWORKS ON IT OUTSOURCING

Key areas or determinants	Maturity models and frameworks about IT outsourcing								
	M1	M2	M3	M4	M5	M6	M7	M8	M9
Formal Agreement	X			X		X	X		X
Service Measurement		X	X		X	X		X	
Quality Management		X					X		
Monitoring and Adjustments		X	X		X	X		X	
Alignment IT-Business	X	X	X					X	
IT Governance Structure	X		X					X	
Service Level Agreement (SLA)	X	X		X	X		X		
IT Service Registration									
Incident and Problem Management				X	X				
Changes					X				
Testing and Deployment									
Control of External Providers	X	X			X	X	X	X	X
Business Risk		X	X		X			X	
Financial Management					X	X	X	X	X
Legislation			X			X			
Demand and Capacity Management									
Formal Agreement Management	X								X
Knowledge Management	X		X				X		
Guidelines on outsourcing an IT service (life cicle)									

Taking into account all key areas shown in Table I, a holistic maturity model (henceforth MM) has been designed with a specific focus on IT outsourcing governance and IT service management. The model establishes where organizations involved in the study are in relation to the following control criteria and information requirements according to Cobit: effectiveness; efficiency; confidentiality; integrity; availability; compliance; and reliability. Other criteria, from the perspective of managing critical IT resources, are the following: applications; information; infrastructure; and people.

With regard to IT governance, standard ISO/IEC 38500:2008, published in 2008, aims to provide a framework of principles for directors of different organizations in order to manage, evaluate, and monitor the efficient, effective and acceptable use of information and communication technologies. The direction, according to ISO / IEC 38500, must govern IT in three main areas:

- Management. Direct the preparation and implementation of strategic plans and policies, assigning responsibilities. Ensure smooth transition of projects to production, considering the impacts on the operation, the business and infrastructure. Foster a culture of good governance of IT in the organization.

- Evaluation. Examine and judge the current and future use of IT, including strategies, proposals and supply agreements (both internal and external).

- Monitoring. Monitor IT performance measuring systems in order to ensure that they fit as planned.

According to the results of the "IT Governance Study 2007" [19][20], reasons compelling governments to create an IT structure in the university include: aligning IT objectives with strategic objectives; promoting institutional vision of IT; ensuring transparency in decision-making; cost reduction; increased efficiency; and regulation and compliance audits.

On service management, MM takes into account ISO/IEC 20000 and ITIL v3, but it is customized to integrate governance and management into a single model. The model moves towards an integration that facilitates the joint use of frameworks efficiently. Thus, the MM designed consists of five levels, with each level having a number of general and specific characteristics that define it. These are determined by the selection of general concepts that underpin the MM (see first column in Table I). The selection is always justified and countersigned by ISO 20000 and ISO 38500 standards and ITIL and COBIT best practice methodologies.

III.   MATURITY MODEL PROPOSED

In order to design the proposed maturity model, we studied in detail every reference on the provision of IT services that there is in the ISO 20000 and ISO 38500 standards and ITIL v3 and COBIT methodologies. In addition, we investigated the relevant literature and failed to find any maturity model that brings together the previous methodologies with a specific focus on IT outsourcing. As a result, a number of concepts and subconcepts were categorized to form the basis of the maturity model.

The MM follows a stage structure and has two major components: maturity level and concept. Each maturity level is determined by a number of concepts common to all levels.

Each concept is defined by a number of features that specify the key practices which, when performed, can help organizations meet the objectives of a particular maturity level. These characteristics become indicators, which, when measured, determine the maturity level.

The MM defines five maturity levels: initial or improvised; repeatable or intuitive; defined; managed and measurable; and optimized.

The model proposes that organizations under study should ascend from one level of maturity to the next without skipping any intermediate level. In practice, organizations can accomplish specific practices in upper levels. However, this does not mean they can skip levels, since optimum results are unlikely if practices in lower levels go unfulfilled.

IV. METRICS FOR MATURITY MEASUREMENT

We have designed an assessment tool along with the maturity model that allows independent validation and practical application of the model. Therefore, the maturity of an organization indicates how successfully all practices that characterize a certain maturity level have gone fulfilled. The questions used in the questionnaire form the basis of the assessment instrument. They were extracted from each of the indicators defining each of the general concepts and key areas of the maturity model.

These general concepts and defining characteristics have been extracted from the following standards and methodologies:

- Standard ISO/IEC 20000 and methodology of good practices ITIL v3. Both provide a systematic approach to the provision and management of quality IT services.

- Standard ISO/IEC 38500:2008 provides guiding principles for directors of different organizations to manage, evaluate, and monitor the use of information and communication technologies effectively and efficiently.

- Cobit business-oriented methodology provides good practice through a series of domains and processes, as well as metrics and maturity models in order to measure the achievement of the objectives pursued.

In addition, new indicators have been developed based on the proposed model in order to assess appropriate aspects not reflected either in previous methodologies and standards or in the existing literature (e.g. the inclusion of service performance in the SLA and the use of user-satisfaction surveys in IT-business alignment).

To evaluate the maturity model of an organization using the model and the measurement instruments proposed, it is necessary to obtain a series of data resulting from the responses to the questionnaire based on the indicators that define the general concepts of our maturity model.

Table II shows one of the nineteen key areas or concepts that are the basis of the MM. The first column of the table shows the level or levels corresponding to the indicator located in the second column. The second column shows the survey questions and indicators for each of the questions or part of the questions. Finally, the third column shows the source where the indicator or item has been extracted as a feature of the general concept or key area of the model.

TABLE II.   METRICS TABLE AND QUESTIONNAIRE

Level	Code – Indicator – Question of Questionnaire	Source
Concept: Service Level Agreement (SLA)		ISO 20000 & ITIL
2	**SLA1** - SLA - There is an SLA for each outsourced IT service provided by the service provider	ISO 20000 & ITIL
	SLA2 - Elements of SLA - SLAs include:	
2	**SLA2a** - Service availability	
5	**SLA2b** - Service performance	Myself
3	**SLA2c** - Penalties for breach of SLA	
2	**SLA2d** - Responsabilities of the parties	
3	**SLA2e** - Recovery Times	
4	**SLA2f** - Quality Levels	
4	**SLA2g** - Security requirements	
3	**SLA3** - Frequency reviewing of SLA - SLAs are reviewed periodically at predefined intervals	ISO 20000 & myself

Therefore, the maturity level of every higher education institution studied is measured by evaluating its development in each key area or concept, which is indicated by responses to items or indicators in metrics tables (see Table II). In order to qualify for a specific maturity level, the university surveyed must carry out all key practices of that level successfully.

V. OBJECTIVES OF THE MATURITY MODEL

The main purpose of the model is to fulfill as many requirements of an ideal maturity model for IT outsourcing in the governance and management of outsourced IT services as possible. With the identification and definition of some key concepts and an assessment tool, the model allows a systematic and structured assessment of organizations. Although the assessment instrument has a lot of qualitative responses, it also has quantitative responses, such as the degree of compliance with certain characteristics that define the maturity model (e.g. the degree of influence of the KPIs and KGIs in the penalties for breach of agreements).

The identification of key areas and concepts specifying its characteristics to constitute the underlying structure of the MM, complements the necessity to refer to governance and management concepts tested and backed by standards and methodologies. Moreover, the model advocates continuous learning and improvements in governance in IT outsourcing and good management of outsourced IT services, even when organizations have reached the maximum level (5).

VI. RESEARCH METHODOLOGY

Both ISO 20000 and ISO 38500 standards, and ITIL v3 and COBIT methodologies of best practice in IT management and governance, are a good basis for the study and analysis of governance and management of the outsourced IT services in organizations. That is why they allow the design of a new maturity model that facilitates the achievement of an effective transition to a model of good governance and management of outsourced IT services that, aligned with the core business in organizations, impacts on the effectiveness and efficiency of its management, optimizes its value and minimizes risks.

A questionnaire (survey form) forms the basis of the quantitative study of the maturity model. The questionnaire is based on the attributes or indicators that define the different levels of the model. It contains standard and suitable questions, according to the nature of the research.

Questionnaire responses allow the obtaining or calculation of the level of maturity by applying the scale defined in the model. In addition, questionnaire responses, after being properly analysed, shed light on the current situation of the different organizations studied in governance and management of outsourced IT services.

This research also provides specific case studies carried out at some universities. These case studies put the model into practice in order to draw conclusions. The questions used in the questionnaire, completed by the universities studied, bring the design of a proposed improvement plan (see Table III) to allow a sequential growth by stages. The growth occurs as a hierarchical progression that should not be reversed, for the aforementioned reasons, and involve a broad range of organizational activities in governance and management of IT outsourcing.

Table III shows one of the five levels (there are five tables, one for each level) of the MM with the key areas or concepts to be improved in order to allow a sequential growth by stages. The first column of the table shows the concepts. The second column of the table shows the objectives to achieve corresponding to the concept in the first column. Finally, the third column shows the actions to accomplish in order to achieve the objectives set in the second column.

TABLE III.   IMPROVEMENT PLAN. LEVEL 2

Level 2 - Initial or improvised		
Concept	Improvement Objectives	Improvement Actions
Formal Agreement: Contract, agreement or similar (FA)	- The formal agreement includes services to be provided, SLA, costs and responsibilities - There are not any clear documented procedures in order to manage outsourced IT services. - There are not any clear processes in order to negotiate with providers	- IT Management must understand the necessity that every formal agreement of every outsourced IT service should include the following: services to provide, SLA, costs and responsibilities of the parties
Service Measurement (MED)	- Informal and reactive measurement (quality, performance and risks) of the IT services provided externally	- Measurement of quality, performance and risks of outsourced IT services is essential to meet the expectations and business needs. In addition, measurements help detect early potential problems. Therefore, it would be necessary to carry out this measurement, even if it is informal and reactive
Monitoring and adjustments of outsourcing (MON)	- Informal supervision of outsourced IT services, the associated risks and the provision of services - The process and the indicators used are not optimized - Indicators hardly affect penalties, contracting and negotiation of outsourced IT services	- Supervision of external service providers is essential for monitoring. It would be advisable to carry out the supervision of outsourced IT services, the associated risks and the provision of services, even if the supervision is informal - Organization must understand the necessity to make a process to supervise outsourced IT services, the provision of services and associated risks. In order to accomplish that, it is needed to use Key Performance Indicators (KPIs) and Key Goals Indicators (KGIs). Both process and indicators will be optimized as time goes by. Therefore, they are not optimized yet. - The results of KPIs and KGIs should begin to indicate the degree of compliance with the agreements signed. This fact should be quantified and organizations should turn it into sanctions or penalties based on the level of non-compliance with established agreements. Besides, IT governance members should start to be aware of the possibility of adjusting the process of procurement and monitoring of outsourced IT services, based on the results of KPIs and KGIs
Alignment IT-Business (ALI)	- The requirements of the outsourced IT services are hardly defined, implemented and aligned with business objectives	- Managers should begin to understand that it is necessary to define a clear IT strategy based on the business needs of the organization. Managers should begin to design an IT strategic plan in line with the organization, in order to achieve the objectives. Thus, alignment IT business is easier. A good start to achieve the objectives would be to define and implement gradually the requirements of the outsourced IT services in order to keep them aligned with the business objectives of organizations
IT Governance Structure (EOG)	- Organization starts to build an organizational structure of IT Government where the CIO or equivalent is the backbone and member of the Board of Directors. This structure consists of at least: IT Strategy Committee, IT Steering Committee, Projects Office and Services	- The government team or the management should take responsibility to start creating a structure of decision making related to IT, where the CIO should be the protagonist and the backbone and integrator of IT strategy in the organization. Therefore, CIO should be part of the Board of Directors. Also, it would be necessary to establish at least the following:

	Commission	-<u>IT Strategy Committee</u>. It should design the strategy and high-level policies related to IT of the university. It should be composed of all managers with IT strategic responsibility , besides CIO that should be part of; -<u>IT Steering Committee</u>. It should design and implement IT projects in order to meet strategic planning designed by the IT Strategy Committee; -<u>IT Projects Office</u>. It should manage IT projects designed by the IT Steering Committee in order to meet strategic planning designed by the IT Strategy Committee; and -<u>Services Commission</u>. It should have a composition to represent all end users of IT services
Service Level Agreement (SLA)	- There is an SLA for every outsourced IT service - SLA includes: the essential aspects of the outsourced IT service, such as the service description and the service availability; and the responsibilities of the parties	- SLA is the reference document where is stated how the service signed between the service provider and the customer is provided. It would be necessary to have an SLA for every outsourced IT service - Every outsourced IT service should include the following: description of the service; availability; and responsibilities of the parties
IT Service Registration (RSS)	- Service catalog clearly defined and updated	- A service catalog clearly defined and updated should be created with all current active services. The following aspects might be missing in the service catalog: the conditions of provision of services; SLA; costs; and mutual responsibilities of the parties
Incident and Problem Management (GIP)	- Incident Management Process (GI) is implemented - The degree of optimization of incident management process is good - Tools that manage incidents are optimized and they allow registration, tracking and monitoring of incidents - Barely there is link between incident management and service level management	- The main objectives of the incident management process are: to detect any change in services; recording and classifying these changes; and assign personnel to restore the service. It would be necessary to have this process implemented with a good degree of optimization. This responsibility would fall into the IT director - The tools for recording, tracking and monitoring incidents, should be optimized, because they constitute an important component of the incident management - The head of the IT department should start being aware of the importance of the link between incident management and service level management
Testing and Deployment (PYD)	- Professional IT staff. There is no improvisation at all	- The deployment and testing of IT services are essential for the proper functioning of services when they are in production. Improvisation should stay out of IT operations when deploying and testing IT services. Also, it is necessary that the IT staff (internal and external) and end users are well trained
Legislation (LEG)	- Possible loopholes in data protection, data processing, location where data processing takes place, clauses for the transfer of data and standard contractual clauses for the transfer of personal data to third countries, have been corrected	- IT service providers access or treat personal data of employees of organizations that hire their services. In the case of universities, IT service providers access to personal data of teaching, research and administrative personnel, besides the personal data of students who have or have had any type of registration at the universities. Therefore, in order to avoid the risks in the privacy of individuals caused by the processing of personal data carried out by third parties, it would be necessary to correct the possible loopholes that might exist in data protection, data processing, location where data processing takes place, clauses for the transfer of data and standard contractual clauses for the transfer of personal data to third countries

VII. APPLICABILITY OF THE MODEL

In order to implement and evaluate the applicability of the model and the assessment instrument designed, by following the measurement process through the improvement plan, we need to apply the model in institutions of higher education. The purpose of this research is not to obtain statistical results of the universe of the study, which in our case are all public and private institutions of higher education in Spain, but to evaluate the usefulness of the proposed model through several case studies. Samples from a universe of study can be classified into probabilistic and non-probabilistic. In the former, the key feature is that every element of the universe has a certain probability of entering the sample, and this probability can be calculated mathematically and accurately. In the latter, the opposite occurs and the researcher doesn't know the error that can be introduced in the assessments.

There are several types of samples in non-probabilistic samples. One of them is the intentional sample. In this kind of sample, units are chosen arbitrarily according to the characteristics of the sample that the researcher finds relevant. Therefore, knowledge and personal opinions are used to identify those units to be included in the sample. It is based mainly on the experience of someone with the population. These samples are very useful and are often used in case studies.

The case studies in this research have been conducted on an intentional sample, under the schema of positivist research, one of the three approaches there are in qualitative research. This kind of research assumes that reality is given objectively and it can be described by measurable properties (characteristics or indicators of the model) that are independent of the observer and the instruments used. Positivist studies try to test the theory in an attempt to increase the predictive understanding of a phenomenon. In line with this Orlikowski and Baroudi [15] labeled research in information systems as positivist if there was evidence of formal propositions, quantifiable measures of variables, tests of hypothesis, and draw conclusions about a phenomenon from a sample of a population estimated.

Therefore, the case study undertaken to implement the applicability of the model, have been performed on an intentional non-probabilistic sample and under the scheme of the positivist qualitative research.

In the case study, we will apply the established scales, which will rate the university surveyed and the object of study, at a level of maturity within the MM. Depending on the level of maturity in which the university is rated, improvement actions, according to the improvement plan, will be proposed to achieve a target level.

The measurement process to ascend in the MM is as follows (see Fig. 1):

1) Perform an initial measurement after completing the questionnaire;

2) Set goals (benchmark);

3) Identify the gaps between the current measurement and the objectives set;

4) Recommend actions and policies to be implemented within the improvement plan to ascend in the MM; and

5) Once corrective actions have been implemented, perform a new measurement.
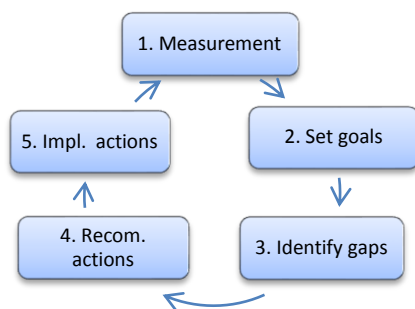

Fig. 1.   Measurement process

The continuous improvement plan to apply the established scales (see Table II) in order to achieve a target level is as follows (see Fig. 2):

1) Initial measurement of the current level of the institution studied after completing the questionnaire. Equivalent to step 1 of the measurement process;

2) Identify improvement objectives using the values of the indicators. Equivalent to steps 2 and 3 of the measurement process; and

3) Implement improvement actions or practices in order to achieve the improvement objectives identified in stage 2. Equivalent to steps 4 and 5 of the measurement process. Back to the first stage.
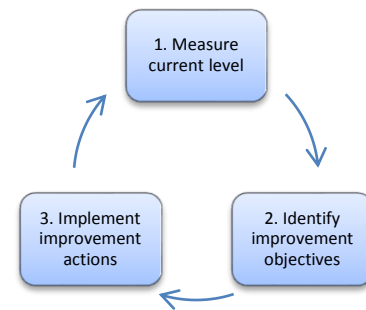

Fig. 2.   Continuous improvement plan

VIII.   RESULTS

A. A case study

In order to accomplish the applicability of the model by case studies, we selected three institutions as an intentional representative sample, and we sent an email to the IT managers asking them to participate in this research project. The email contained a link to the questionnaire and the recipients were asked to complete the questionnaire hosted on the www.encuestafacil.com surveys website. This website provides a tool to design questionnaires in an intuitive and effective way. Also, this web tool allows to export the results / responses of questionnaires to a spreadsheet.

After collecting the responses of the questionnaire, completed by the three institutions selected through the web-based questionnaire and using the tool hosted on www.encuestafacil.com, we start the first stage of the continuous improvement plan (see Fig. 2). In this case, we are going to use only the responses of one institution that we keep anonymous in order to protect its privacy and confidentiality.

1) Stage 1

Once the questionnaire is completed by the institution and the responses are collected by us, we must measure the current level of the institution studied. Table IV shows the responses of the questionnaire. The first column of the table shows the level. The second column shows the indicators corresponding to the level in the first column. Finally, the third column shows the responses corresponding to the indicators in the second column.

TABLE IV.   RESPONSES OF THE QUESTIONNAIRE

LEVEL	INDICATOR	HEI-1
1	ALI3-(1)2345	Y
	LEG1-(1)23	Y
	Maturity 1	1
2	ACF2b	Y
	ACF2d	Y
	ACF2e	Y
	ACF2g	Y
	MON3-(2)34	Y
	MON4-(2)34	Y
	ALI3-1(2)345	Y
	EOG1	N
	EOG2	N
	EOG4	Y
	EOG6	Y
	EOG7	N
	SLA1	Y
	SLA2a	Y
	SLA2d	Y
	RSS1	Y
	GIP1	Y
	GIP2-(2)3	Y
	GIP3-(2)345	Y
	PYD1	Y
	LEG1-1(2)3	Y
	Maturity 2	-
3	ACF 1	Y
	ACF2a	Y
	ACF2c	Y
	ACF2f	Y
	ACF3a	Y
	ACF3b	Y
	ACF3c	Y
	ACF5	Y
	ACF6-(3)45	Y
	MED1	N
	MON1	Y
	MON2	NR/DK
	MON3-2(3)4	N
	MON4-2(3)4	N
	MON5a	Y
	MON5b	Y
	ALI3-12(3)45	Y
	EOG3	N
	EOG5	Y
	SLA2c	Y
	SLA2e	Y
	SLA3	N
	GIP2-2(3)	Y
	GIP3-2(3)45	Y
	GIP4	Y
	GIP5-(3)4	Y
	CAM1	Y
	RIN3	NR/DK
	LEG1-12(3)	N
	PAS1a	Y
	PAS1b	Y
	PAS1c	Y
	PAS1d	Y
	PAS1e	Y

LEVEL	INDICATOR	HEI-1
	PAS1f	Y
	Maturity 3	-
4	ACF4	N
	ACF6-3(4)5	N
	MON3-23(4)	N
	MON4-23(4)	N
	MON6	Y
	ALI1	N
	ALI2	NR/DK
	ALI3-123(4)5	Y
	SLA2f	N
	SLA2g	Y
	GIP3-23(4)5	Y
	GIP5-3(4)	N
	CAM2	Y
	CAM3	Y
	RIN1	NR/DK
	RIN2	
	RIN4	Y
	GDC1	NR/DK
	GDC2	NR/DK
	GDC3-(4)5	
	GAF1	Y
	GCO1	NR/DK
	Maturity 4	-
5	ACF6-34(5)	N
	GC1	NR/DK
	ALI3-1234(5)	N
	SLA2b	N
	RSS2a	Y
	RSS2b	N
	RSS2c	N
	RSS2d	N
	GIP3-234(5)	N
	CAM4	Y
	CPE1	NR/DK
	CPE2	NR/DK
	CGF1	N
	GDC3-4(5)	
	GAF2	NR/DK
	GAF3	
	GCO2	
	Maturity 5	-

Table IV shows indicators and responses needed to qualify for a maturity level in the institution selected. In order to qualify for a maturity level, all indicators of that level must be responded positively ('Y' in the third column of the table IV). Therefore, the institution selected is at level 1.

2) Stage 2

At this stage, improvement objectives must be identified in order to enable and facilitate studied institution to move up the maturity model. But first, we must set goals to achieve, which in our case is to consolidate the level 2, and afterwards identify differences between the objectives to achieve and the current assessment. Indicators of level 2 with the value to 'N' (see Table IV) allow identifying improvement objectives. Red cells in Table V identify indicators that allow to identify improvement objectives.

TABLE V.   INDICATORS THAT ALLOW IDENTIFYING IMPROVEMENT OBJECTIVES

LEVEL	INDICATOR	HEI-1
1	ALI3-(1)2345	S
	LEG1-(1)23	S
	Maturity 1	1
2	ACF2b	S
	ACF2d	S
	ACF2e	S
	ACF2g	S
	MON3-(2)34	S
	MON4-(2)34	S
	ALI3-1(2)345	S
	EOG1	N
	EOG2	N
	EOG4	S
	EOG6	S
	EOG7	N
	SLA1	S
	SLA2a	S
	SLA2d	S
	RSS1	S
	GIP1	S
	GIP2-(2)3	S
	GIP3-(2)345	S
	PYD1	S
	LEG1-1(2)3	S
	Maturity 2	-

The indicators that allow to identify improvement objectives in the institution studied are: EOG1; EOG2; and EOG7.

Improvement objectives must be searched in the tables of improvement objectives and improvement actions by levels (see Table III). In the case of the institution studied, it should move up second level in order to move to a higher level gradually, consolidating steps. Thus, we have to look for the improvement objectives of level 2 in Table III. Firstly, we must find out the concepts, located in the first column of the Table III, corresponding to the indicators selected in the stage 2 of continuous improvement plan. Finally, we need the table of metrics and questionnaire (see Table II) in order to identify the characteristics that define the indicators selected.

Therefore, the improvement objectives are the following:

- Organization starts to build an organizational structure of IT Government where the CIO or equivalent is the backbone and member of the Board of Directors [EOG1].

- This IT structure has an IT Strategy Committee [EOG2] and a Services Commission [EOG7].

3) Stage 3

In the last stage of continuous improvement plan we must identify and implement the actions corresponding to the improvement objectives identified in the previous stage (stage 2). Implementation of these actions successfully will allow the institution studied to move up level 2 of the maturity model.

Therefore, the improvement actions to implement corresponding to the improvement objectives identified in stage 2, are the following:

- o   The government team or the management should take responsibility to start creating a structure of decision making related to IT, where the CIO should be the protagonist, the backbone and integrator of IT strategy in the organization. In addition, CIO should be part of the Board of Directors. Also, it would be necessary to establish the following:

- IT Strategy Committee. It should design the strategy and high-level policies related to IT of the university. It should be composed of all managers with IT strategic responsibility, besides CIO that should be as well part of.

- Services Commission. It should have a composition to represent all end users of IT services.

Once improvement objectives and improvement actions have been identified, it is time to implement improvement actions. Once these actions have been implemented successfully, the third stage of the continuous improvement plan has been finished. That means institution studied has achieved the goals set in stage 2 of the continuous improvement plan. In other words, institution studied has reached level 2 of the maturity model.

The continuous improvement plan is designed in such a way that allows moving up gradually in the model by repeating the three stages as many times as necessary. Therefore, the next step would be to perform the first stage of the plan in order to measure the institution again. This first step is critical because the time between two measurements could be long, and some key practices done in the previous measurement, could not be done in the following measurement; and on the contrary, some key practices not done in the previous measurement, could be done in the next measurement, in addition to the practices to implement identified in stage 2 and implemented in stage 3 of the previous cycle of the continuous improvement plan.

IX.   CONCLUSIONS

In order to design the proposed innovative maturity model, we studied in detail every reference on the provision of IT services that there is in the ISO 20000 and ISO 38500 standards and ITIL v3 and COBIT methodologies. In addition, we investigated the relevant literature and failed to find any maturity model that brings together the previous methodologies with a specific focus on IT outsourcing. As a result, a number of concepts and subconcepts were categorized to form the basis of the maturity model.

Furthermore, models, standards and guidelines are recommended in order to enable and facilitate adaptation to universities so that they can move up the maturity model. Thus, the model, based on standards and best practices, is designed to achieve excellence in the management of IT outsourcing. The applicability of the study, allows universities to meet the goal of effective transition to a model of good governance and good management of outsourced IT services. Aligned with the core business of universities (education, research and innovation) this will impact on the effectiveness and efficiency of their management, optimize value and minimize risks.

The model allows organizations under study ascend from one level of maturity to the next without skipping any intermediate level. In practice, organizations can accomplish specific practices in upper levels. However, this does not mean they can skip levels, since optimum results are unlikely if practices in lower levels go unfulfilled.

MM advocates continuous learning and improvements in governance and management of outsourced IT services, even when institutions have consolidated the highest level of the maturity model (level 5).

This study recognizes that it is unlikely to achieve maximum effectiveness and efficiency in the government and management of outsourced IT services, in a higher education institution in a relatively short period of time. The structure of the model proposed, organized in levels, provides a general understanding of the gradual and holistic development of IT governance and management of outsourced IT services. MM expects to be an effective diagnostic tool to measure the efforts made around IT outsourcing in higher education institutions, in addition to a coherent roadmap to guide institutions in their efforts to provide their teaching, research, and administrative staff, and ultimately their students, with a quality and effective IT services in line with the digital technological era of the XXI century.

On the basis of this research, by designing an assessment tool along with the maturity model that allows independent validation and practical application of the model, this study will allow higher education institutions to achieve an effective transition to a model of good governance and management of outsourced IT services in order to meet successfully the requirements demanded in this complex internet age.

REFERENCES

[1] O. Adelakun, IT Outsourcing Maturity Model, in: Proceedings of the 12 European conference on Information System, (ECIS) Turku Finland, June 14-16, 2004

[2] E. Beulen and P. Ribbers, Managing complex IT outsourcing-partnerships, in: Proceedings of the 35th Annual Hawaii International Conference on System Sciences, 7-10 Jan 2002, vol., no., pp.10 pp., doi: 10.1109/HICSS.2002.994424

[3] T. Dahlberg and P. Lahdelma, IT Governance Maturity and IT Outsourcing Degree: An Exploratory Study, in: the 40th Annual Hawaii International Conference on System Sciences, Jan. 2007, vol., no., pp.236a,236a, doi: 10.1109/HICSS.2007.306

[4] A.M. Fairchild, Information technology outsourcing (ITO) governance: an examination of the outsourcing management maturity model, in: Proceedings of the 37th Annual Hawaii International Conference on System Sciences, 5-8 Jan. 2004, vol., no., pp.8 pp., doi: 10.1109/HICSS.2004.1265565

[5] Fan Jing Meng, Xiao Yang He, Yang, S.X. and Peng Ji, A Unified Framework for Outsourcing Governance, in: the 9th IEEE International Conference on E-Commerce Technology, and in: the 4th IEEE International Conference on Enterprise Computing, E-Commerce, and E-Services, CEC/EEE 2007, vol., no., pp. 367, 374, doi: 10.1109/CEC-EEE.2007.16

[6] E. Fernández, UNiTIL: Gobierno y Gestión del TIC basado en ITIL, in III Congreso Interacadémico 2008 / itSMF España. Last Access on 5th Sept 2011at http://www.uc3m.es/portal/page/portal/congresos_jornadas/congreso_itsmf/UNiTIL%20Gobierno%20y%20Gestion%20de%20TIC%20basado%20en%20ITIL.pdf

[7] P. Gottschalk, and H. Solli-Saether, Critical success factors from IT outsourcing theories: an empirical study, Industrial Management & Data Systems, Vol. 105 Nos 5/6, pp. 685-702, 2005

[8] P. Gottschalk and H. Solli-Sæther, Maturity model for IT outsourcing relationships, Industrial Management & Data Systems, Vol. 106 Iss: 2, pp.200 – 212, 2006

[9] T.P. Herz, F. Hamel, F. Uebernickel and W. Brenner, Towards a Multisourcing Maturity Model as an Instrument of IT Governance at a Multinational Enterprise, in: the 44th Hawaii International Conference on System Sciences, Jan. 2011, vol., no., pp.1,10, 4-7, doi: 10.1109/HICSS.2011.448

[10] ITGI. Last Access on 26th Febrary 2014 at http://www.itgi.org/

[11] K. Lyytinen, Penetration of information technology in organizations, Scandinavian Journal of Information Systems, 3, 87–109, 1991

[12] R. Mobarhan, A.A. Rahman and M. Majidi, Outsourcing management framework based on ITIL v3 framework, in: the 7th International Conference on Information Technology in Asia (CITA 11), July 2011, vol., no., pp.1,5, 12-13, doi: 10.1109/CITA.2011.5999536

[13] Ning Su and N. Levina, Global Multisourcing Strategy: Integrating Learning From Manufacturing Into IT Service Outsourcing, IEEE Transactions on Engineering Management, Nov. 2011, vol.58, no.4, pp.717,729, doi: 10.1109/TEM.2010.2090733

[14] R.L. Nolan, Managing the computer resource: a stage hypothesis, Communications of the ACM, 16 (7). 399, 1973, doi: 10.1145/362280.362284

[15] W.J. Orlikowski and J.J. Baroudi, Studying Information Technology in Organizations: Research Approaches and Assumptions, Information Systems Research (2) 1991, pp. 1-28

[16] Nandish Patel, Emergent Forms of IT Governance to Support Global eBusiness Models, Journal of Information Technology Theory and Application (JITTA), 4 (2), Article 5, 2002, Last access on 19th January 2014 at http://aisel.aisnet.org/jitta/vol4/iss2/5

[17] C. Schwarz, Toward an understanding of the nature and conceptualization of outsourcing success, Information & Management, 51(1), 2014, pp. 152-164

[18] Thompson S.H. Teo and Anol Bhattacherjee, Knowledge transfer and utilization in IT outsourcing partnerships: A preliminary model of antecedents and outcomes, Information & Management, 51(2), 2014, pp. 177-186

[19] R. Yanosky and J. Borreson Caruso, Process and Politics: IT Governance in Higher Education, ECAR Key Findings. EDUCASE, 2008, Last Access on 6th March 2013 at http://net.educause.edu/ir/library/pdf/ekf/EKF0805.pdf

[20] R. Yanosky and J. McCredie, IT Governance: Solid Structures and Practical Politics, ECAR Symposium, Boca Ratón, Florida, 2007