



Towards A New System of Selecting Information Systems Frameworks

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Abstract—Information systems have become increasingly used by most organizations, their impact on society, the economy and the daily life of each of us is undeniably perceptible but on condition to manage them effectively to enjoy their benefits. To manage it effectively, requires that each company select a standard framework from multiple IT best practice management that are designed by experts, this choice is a problem for a long time in front the businesses.

To solve this problem we will make a comparison between different frameworks ITIL, COBIT and CMMI, and we will propose a system facilitating the choice of the most suitable framework that responded to the need of a particular companies, the implementation and evaluation of the system has shown that it is very useful for them.

Keywords—Information system, ITIL, COBIT, CMMI.

I. INTRODUCTION

Today information systems (IS) play a very important role in companies, they are sources of benefits that improve companies performance, in most sectors, IS is a tool of communication and coordination between the different services, and management areas of companies. It must produce and disseminate necessary information to transactions on the one hand and strategic, tactics choices on the other hand.

To make a good monitoring and optimum management of its activities, the company is allowed to establish an IS, but to manage it effectively, we must choose a framework among many.

Despite the emergence of new standards frameworks recently the three framework ITIL, COBIT and CMMI are most prevalent in the information technology (IT) industry [1].

None of the three guides that interests us covers alone needs of direction of IT services. It should be selected based on their strengths and weaknesses, their adaptation to the needs and constraints of the market and know their articulate based on their complementarities. It is in this sense that we seemed useful to make a comparative analysis of the three framework before choosing one of them.

According to several studies, the problem in front of companies in recent years is how to choose the best framework.

The enterprises intricately choose the appropriate frameworks because they have to spend long time for studying all standards in market places. A benchmark of each standard is an important key approach for making decision on selecting standard tools for IT governance [2].

In the literature there are several benchmark for example the comparison between the models and standards used today regarding capacity management. A comparison of the strengths and weaknesses of each of the models/standards on the capacity management is presented, so that it can guide organizations to select the model/standard that best suits their needs [3].

Another study that gives a set of benchmarks or standards to ensure the best security practices are adopted and an adequate level of security is attained. In this study, authors introduce various information security standards briefly and then provide a comparative study for major information security standards, namely ISO27001, BS 7799, PCIDSS, ITIL and COBIT. The study will provide a picture of the position and specialization of each standard, adoption by countries and their usability levels [4].

However, none of these studies has an automatic choice, it is the direction of IT services who must analyze these studies in order to select the appropriate framework.

The objective of this work is to make a comparison between different frameworks, and propose a tool facilitating and automating the choice of the most suitable framework and responded to the needs of a particular companies In order to offer the framework that can help them to effective management of their IS.

We did many comparison to identify the most important characteristics of each, thus the area of use of each, at the base of them we chose the appropriate framework to a given case.

The fruit of this work is a system proposing several criteria that we have drawn.

This article will be divided as follows in the first chapter we will address issues of governance of an IS, as well as in chapter 2.1 we will define what is an information system architecture illustrating its components, its development over the past years and the different type of IS.

In the second subchapter 2.2 we will see in detail the peculiarities of the most popular framework in the market and widely used in companies ie ITIL, COBIT and CMMI.

The third section describes a comparative study between the frameworks ITIL, COBIT and CMMI.

In the fourth chapter we will present our system of automatic choice of frameworks, in the fifth chapter their implementation and evaluation, finally a conclusion to conclude and define our perspectives.

II. THE ISSUES OF GOVERNANCE OF AN INFORMATION SYSTEM

The evolution of a company necessarily involves the growth of its activities volume. Which implies a large amount of information to be managed. To manage a companies, it is necessary to have all that information describing the markets in which the company operates, regardless of size or sector of activity, the company must have an information system.

A. Information system

Information system has become a strategic lever for enterprises. It contributes effectively to align business processes on strategies of enterprises. It is regarded as an increase in productivity and effectiveness [5].

The information system provides data which company executives need for efficient use and effective management. Thus it helps reduce uncertainty in the management of the company and to master the complexity of management situations. Harper said: "Manage your business is managing its future and manage its future is to manage its information." Today, the contribution of information systems to business competitiveness becomes increasingly visible. The information system provides opportunities for companies to differentiate themselves, create new services and new markets.

According to Suzanne Rivard, [6] an information system is a set of activities that capture, store, process, and disseminate data in a constraint set called the system environment. Inputs (data) are transmitted by one or more sources and processed by the system, which also uses data previously stored. Treatment outcomes (output) are transmitted to one or more destinations or are used more or less sophisticated IT ranging from simple calculator in the case of very few sophisticated systems to computer networks extremely powerful using multimedia type interfaces.

The IT and communication have become an essential support for all activities of companies. They have emerged as a strategic asset in the service operations and management of the company [7].

So an IS is a tool that allows management of all components of a companies, the processing of data issued by its components.

Whatever type of information system, there are four key concepts which are people, hardware, software, and data.

The IS can be divided into 3 types:

- The information systems of 1st generation or computed systems are the first information systems appeared in 1950 in the companies aims to support repetitive and tedious calculations (automation). Its first applications: payroll, accounting and tracking inventory quantities. The major drawback of these systems that process data but they produced little information and they do not work well if the volume of business activities is increased.
- The information systems of 2nd generation or functional systems (Appeared in 1975) They are developed from first generation systems by expanding the treated area within the activity:
 - Payroll Calculation -> human resources management.
 - Accounting -> Financial Report.
 - Inventory Management -> production management.
- 3rd generation systems: or integrated system eliminates the silos of 2nd generation systems, integrated processes in a transversal view along 3 axes :
 - CRM: CRM or Customer Relationship Management is a strategy through which the company aims to understand, anticipate and manage the needs of its current and potential customers. The customer relationship management is based on the easiest and cost effective principle for retain customers than to find new customers.
 - ERP [8]: means "Enterprise Resource Planning. ERP is the most commonly used term. ERP is a software package that manages all processes of an enterprise integrating all its functions such as human resources management, financial and accounting management, decision support, sales, distribution, procurement, production, or e-commerce. The founding principle of an ERP is to build computer applications for various functions mentioned above modularly, knowing that these modules are independent of each other while sharing a single, common database in the logical sense.
 - SAP: This is a business management software package that belongs to the family of ERP. SAP is a system in which the different company's functions (accounting, finance, production, supply, marketing, human resources, quality, maintenance, etc.) are interconnected through the use of a centralized information system based on a client / server configuration SAP AG is the largest European software designer, and the fourth in the world. It provides management and maintenance systems to companies of all sizes worldwide. It is headquartered in Walldorf, Germany, and it has regional offices on five continents.

Information systems have become increasingly used by most organizations, their impact on society, the economy and the daily life of each of us is undeniably perceptible but provided to manage them effectively to enjoy the benefits that they present. It is not necessary to become IS management expert only from experience, there are framework that are designed by experts for this purpose to manage the IS. The so-called framework that presume to have met international

guidelines provide the company the application of rules and best practices to the survival and sustainability of the organization. In the next chapter, we will study the specificities of the three most used frameworks.

1) Frameworks

Management information systems becomes essential for business development while the IT revolution has been accompanied by the emergence of several methods prepared by experts in the management of information systems, what we call framework.

In summary, the enterprise framework constitutes the backbone around which organize all the formalization of procedures, communication and corporate control.

For many enterprises, information and technology on which it is based are the most valuable assets, even if they are often the least well received. Successful companies know the benefits of IT and use them to deliver value to their stakeholders. These companies also understand and manage the constraints and risks, such as the obligation to submit to compliance rules more binding and the dependence of increasingly strong of many business processes vis-à-vis information systems. The need to ensure of the IS value, the management of risks associated to them and the increasing demands of control over information are now recognized as key elements of corporate governance. Value, risk and control constitute the heart of the governance of the IS [9].

These framework, object of our study theme, offer good practices in a framework by domain and processes and presents activities in a logical structure easy to understand. Their good practices are the result of expert consensus. They are very focused on control and less on process execution. They aim to help optimize IT investments, ensure service delivery and provide metrics which refer to assess dysfunctions.

In what follows we will see in detail the peculiarities of the most popular repositories in the market and widely used in business ie ITIL, COBIT and CMMI.

• ITIL

○ Version 1 :

Late 1980s and early 1990s, the British government is launching a study to determine best practices and practices with the most successes to develop the management of IT services [10].

This study produced a series of books documenting an approach to IT service management required to support users of business organizations.

This practice library received the title of "IT Infrastructure Library" or ITIL.

The original library has grown to receive over 40 books and has led to a craze in the British community of IT services.

In 1991, a user forum, The "IT Information Management Forum" (ITIMF) was created to allow users of ITIL to exchange ideas and experiences. The name was then changed and became the "IT Service Management Forum" (itSMF).

○ Version 2

A national standard, the British Standard 15000 (BS 15000), largely based on ITIL practices, has been defined and followed by other national standards in many countries until an international standard ISO / IEC (called 20000: 2005) is developed and rapidly gaining global recognition.

The next revision of ITIL lasted from mid-1990 until 2004 (ITIL version 2). It was a more complete version with 9 books in explaining the bridge between technology and the business and strongly based on the processes necessary to deliver adequate services to business customers.

Two books have made the success of this version (e.g. fig. 1):



Fig.1 Books (Version ITIL 2)

- Service Support: we find the only described function "Service Desk" and operational processes that are now found in the "Service Operation"
- Service Delivery: there addresses more aspects related to the provision of IT services (service levels, transversal issues such as capacity, safety, etc. and change management); include these processes in the books "Service Design" and "Service Transition" more or less detailed.

○ Version 3

In 2004, OGC has launched the second major revision of ITIL called the ITIL Refresh in order to bring up to date with new technologies and emerging issues of IT service providers: new technology architectures, virtualization and outsourcing have become commonplace in computer science.

The approach of ITIL process must be adjusted to incorporate new issues.

In 2011, a revision of the 2007 version is produced. It includes corrections identified by the readers and clarification, in particular on the part of the strategy of the service.

Set of specialized organizational functions providing value to the customer in the form of services.

Service strategy aligns the IT organization on company needs:

- The design, transition and operation of services are the materialization of the strategy.
- Continuous improvement of services allows to stay aligned and to improve the overall.

• COBIT

COBIT was published in 1996 by ISACA (Information Systems Audit and Control Association) [11]. ISACA was established in 1967, initially positioned as a COBIT control framework. In 1998, ITGI (Information Technology Governance Institute) was established on the initiative of ISACA, responding to instead increasingly important occupied by the IT. Indeed, in most of the organizations or companies, one of the key success factors is the ability of information systems to provide both strategic differentiation and support activities. In such a context, the "governance" of information systems becomes as critical as corporate governance.

For ten years, ITGI has conducted extensive research through working groups distributed in the worldwide. The result of this research has resulted notably in 2000 with the publication of the V3 version of COBIT offering, along with an audit guide, a "management guide" foreshadowing the later versions

Then, ISACA released successively version 4 (December 2005) and version 4.1 (2007) of COBIT, by combining two visions: "control" and "management" of IS and, more broadly IT.

Version 5 of COBIT is available since April 2012 COBIT 5 to this date is the only framework that is oriented business for governance and management of company's information systems.

Benchmark of good practices in development activities, of maintenances applied to products and services.

COBIT does not distinguish the great small business enterprise. It does not take into account the industry to which the company belongs. A Small medium-sized enterprise (SME) will certainly not do anything that COBIT prescribed. An industrial company has different needs than a service business.

This will require in each case select from COBIT the elements eligible. It is also specified that COBIT is "illustrative and not exhaustive": it provides a basis of expertise in which each company will have to select which corresponds to its priorities. In conclusion, the use of COBIT can distinguish three stages.

- Setting objectives,
- Identification and management of resources,
- Process management.

COBIT set goals concerning the information to be contained and provide efficient information system.

• CMMI

In the 1980s, the United States Department of Defense (DoD) requested the development of a framework of criteria to evaluate its software suppliers.

After a slow maturation, the SEI (Software Engineering Institute) funded by the DoD in 1991 introduced the Capability Maturity Model (CMM). This reference model only applies best practices of software engineering.

In 2001, the SEI has proposed a new version of its model, CMMI (Capability Maturity Model Integration) [12] which includes the best practices of other models, except the management of human resources is not yet considered (version 1.1).The version of the model was refreshed in 2006 (Version 1.2). This version of CMMI tended to simplify the model and improved the inclusion of hardware-type components. The latest version of the model date of 2011 (version 1.3).

The CMMI model defines a scale for measuring the maturity of five levels, and the indicators needed to evaluate the activities of a team in relation to this scale - the team can be a workgroup, one or more projects, company or a state institution.

- o Level 1: Initial

The lowest level show that the organization is not ready, and that the project is not stable. The latter depends on a handful of people, who do not make use of proven processes. It may however, that the project succeed, but exceeding certainly the budget and time allocated. The project does not build on past success.

- o Level 2 : Reproducible

The project built on what was previously learned, using a certain discipline and a basic project management. In fact, the project is managed according to plans, with key steps and verification of the costs and features.

- o Level 3 : Define

It's no more the project that has good discipline, but the entire organization, consistently. All projects are improved.

- o Level 4 : Mastery

The measurement and management efforts allow an effortless control of development, with ability to adjust and adapt to specific projects without disturbing others. The performance of process are predictable in quantity and quality.

- o Level5 : Optimization

The processes are constantly being improved in an incremental and innovative way. The objectives are reviewed constantly to stay close to market needs. The changes are anticipated and managed from start to finish.

In summary, to provide the information that the company needs to achieve its objectives, computer resources must be managed by a set of processes grouped according to a certain logic. Whatever framework located within the overall

information system of the company, the objective would still be to ensure the best handling of data by the company that looking the quality and confidentiality of its information at low cost. Still need to ensure the adoption of a regulation reference of data the more adapted to structure and to the nature activities of company wishing to implement it. The next chapter presents a comparison of the three frameworks studied under different nails. This comparison is based on several features.

III. COMPARATIVE STUDY OF FRAMEWORKS ITIL, COBIT AND CMMI

Companies must meet the fiduciary, the quality and safety requirements. Leaders must also optimize the use of available IT resources: applications, data, infrastructure and personnel. To fulfill their responsibilities as to achieve their goals, they need to know the status of their system architecture and decide what framework and what IT controls must be implemented.

In recent years, the most important element at the IS internal controls based on the momentum created by the standards such as ITIL, COBIT and CMMI which remain the most known and most used by most of the company.

These frameworks provide IT management tools necessary for the establishment a levels of control more powerful than those that may exist generally in companies.

Many standards exist to improve the quality of service and the organization within information services. Some have been implemented by the direction of IT services, others by branches. The current problem is choosing the best framework since each business requires a framework to manage its information system to achieve these goals.

According to the study of frameworks ITIL, COBIT and CMMI, detailed in chapter II, we have been found that there are differences between these standards, the following table shows a general comparison between these frameworks.

TABLE I COMPARISON OF FRAMEWORKS

Criteria	ITIL	COBIT	CMMI
Year of creation, nationality, organization, creator	GB-1989-Created by OGC (Office of government commerce)	USA-Created 1994, by l'ISACA (Information Systems Audit and Control association)	USA-Created by SEI (Software engineering institute) USA 1999.
its field	IT only	IT only	any type of service
Package	a set of book, to enact good practices in information systems management	a set of collective work for better governance of IT	well-defined models (set of goals)
Application domain	focused on the production process	control and audit of a company's information systems	used to evaluate and improve the maturity of the software processes and applications development
Architecture	5 books covering IT Service 4 roles duties and responsibilities	37 Engineering processes of IS classified into five major functional areas	5 generic goals with generic practice, 24 process with specific goals and specific practices
Objectives and philosophy	ITIL provides a structured framework development process and focus on the customer	a control frame to help management manage risk (safety, reliability, compliance) and investments	optimize the management of IS and to improve the economic and operational performance of the IT department
Companies Type	big business	all	average small business, big business
compatibility with the other framework	ISO 20000, ISO 27001, CMMI, COBIT...	ITIL, ISO 17799 for IS, COSO for corporate governance	ITIL, COBIT, ISO 15504, ISO 9001
Duration of implementation	take several years (from 1 to 5 years for most companies)	quickly	Slowly
Supported users	addresses to public computer scientist	addresses to public computer scientist or not	addresses to public computer scientist

IV. OUR SYSTEM OF SELECTING INFORMATION SYSTEMS FRAMEWORKS

After comparing the frameworks ITIL, COBIT and CMMI in the previous chapter, a step of production is needed, this step affects the technical realization of the project. It is the pure development phase where it is necessary to produce the necessary processes to the system's needs.

In order to achieve its objectives we need to create a system that give the best framework that suits customer needs, according to two processes:

- The company gives its needs.
- The system responds to them with the best choice.

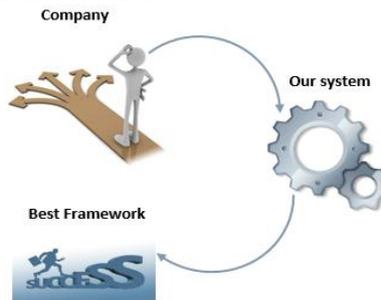


Fig. 2 our system

V. IMPLEMENTATION AND EVALUATION OF OUR SYSTEM

For realizing our system we have created a dynamic web application that helps companies to select the best framework to fully meet their needs. For the creation of the web pages we used the programming languages: HTML and PHP.

In this chapter we are going to design this dynamic web application that is in the form of an interface that displays criteria concern the studied references, after the customer selects the criteria the required criteria, another page appears, for show the appropriate reference to the enterprise.

In order to achieve its objectives we need to create a dynamic web application: contains questions (selection criteria) and according to the criteria chosen by the customer, provides the result in another page, ie the best chosen framework that suits customer needs.

The selection criteria are drawn according comparisons as we have done in chapter III, so we have found that these three standards are different for the following,

- The type of business
- Business domain
- The preferred model by the company
- Application domain
- The implementation time
- Supported users
- ... Etc.

The following figure shows the home page of our system where we check our criteria:

Chosen the best framework to manage your company

1. What is your company's domain?

- IT services
- All types of services

2. Which model do you prefer?

- Books enacting a set of good practices in management information systems
- A set of collective work for better governance of IT
- Well-defined models (set of goals)

3. What scope do you have?

- Production
- Governance
- Software production and development

4. What type of company do you have?

- Large company
- Average small company and large company
- Average small company

5. The duration of implementation ?

- Take several years (from 1 to 5 years for most companies)
- Quickly
- Slowly

6. What users are supported ?

- Is for IT users
- Is for IT and non-IT users

Fig. 3 Selection criteria.

To generate the results of the choice between frameworks, we are passing to an effective comparison phase between answers chosen. For that we have used PHP language because it is based on the functions and simple control instructions, and is more compatible with HTML.

Based on the questions put on the home page produced by HTML was proposed three options for each question, each identifying a reference more specifically, assigns a value of 'A' 1st choice, 'B' the 2nd choice and 'C' to the 3rd choice. There are two choices in some question which meant that one criteria is in two frameworks. Choosing the best reference is made according to the following algorithm (e.g. fig. 4):

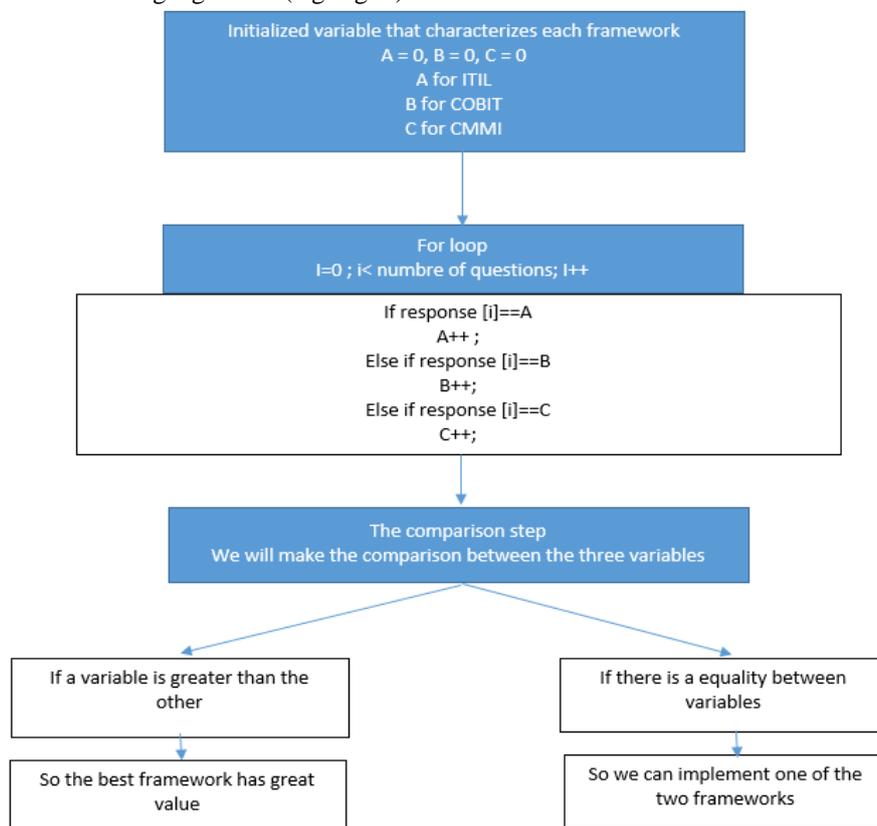


Fig. 4 Algorithm of framework choice.

The figure below shows an example output of choice with justifications:

The best framework for your company

ITIL

Because you have chosen the following criteria:

Is for computer users

Take several years from 1 to 5 years for most companies

Big company

Focused on the production process

Books enacting a set of good practices in management information systems

IT services only

Fig. 5 Example of result

VI. CONCLUSION

In this article we have proposed an effective system which simplifies choosing the best framework satisfying the needs requested by each company.

According to a consistent literature we identified a problem that arises in the creation of each new company, This is the difficulty in the choice of its information system manager and we are involved in its resolution on a specific goal to invent a system that simplifies the problem and help company to choose the framework as needed.

We have several perspective as the publishing system on the web, make other comparisons and take other criteria, offer this system to companies to improve it and make visits to some companies to add other criteria for selection.

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