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A comparative study between the continuous improvement stage of ITIL services and the continuous improvement lifecycle of COBIT 5[1]

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Abstract

In order to successfully execute processes in a world of high data dynamic, companies need to have their Information Technology (IT)

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department increasingly engaged with the business value, i.e., IT and business should be well aligned. Ensuring this alignment on a permanent and solid basis through an ongoing effort is a challenge that well-known frameworks such as COBIT and ITIL help to overcome. In this context, knowing where the continuous improvement effort of each model promotes value is essential.

In this paper, a comparative study regarding the continuous improvement for both COBIT and ITIL frameworks is presented. In addition, as another contribution, the action boundaries of each framework are shown, contributing to the choice of the IT governance model to be adopted by companies.

Keywords: IT governance; ITIL; COBIT; applicability; continuous improvement.

1. INTRODUCTION

In a world with an increasingly dynamic reality, which requires greater capacity to process massive volumes of data at higher speeds, there also is an increasing use of information technology resources to extract business value for companies. In today's world, information technology (IT) is no longer a unitary and isolated block within a business, but rather a global component that helps top management in value-adding decisions.

Previously, IT was seen as a mere participatory element, with few developed management practices. Nonetheless, information must be considered an important element that serves the entire organizational process chain of a company and is constantly evolving. The close alignment between IT and the business means that an IT department cannot be solely in charge of securing an effective use of its resources. Obtaining greater business value through IT is an organizational competence that must be increasingly evolved and business leaders must develop such competence (Weill and Ross, 2004).

The value added to the business is the result of a considerable organizational effort, together with mechanisms provided by IT governance. However, the efficient use of IT resources alone is not enough to ensure efficient IT governance, as suggested by Luciano et al. (2021). According to the authors, there are other variables that

need to be analyzed in conjunction with IT governance mechanisms, such as the behavior of employees who will operate these mechanisms can favor (or compromise) organizational performance and need to be better understood.

This behavioral variable analyzed by Luciano et al. (2021) is job crafting, which is cited by Singh and Singh (2019) as a mechanism to combat stress, establishing an improvement in the employee's emotional and psychological state, providing, as a result, a better performance at work. Thus, this new behavioral factor has a relevant impact on the effectiveness, control and engagement of teams, influencing the performance of organizations regarding IT governance mechanisms.

In order to address some of the related issues and take advantage of opportunities generated by good IT governance, several frameworks have been developed, namely, COBIT (Control Objectives for Information and Related Technology) and ITIL (Information Technology Infrastructure Library). According to Dos Santos and De Paula (2016), there is no way to predict the best framework for each company, but rather monitoring the evolution of each model, as well as the market trends. Further, no descriptive model on how to build governance itself can be cited. In summary, such models are practiced on a case-by-case basis and implemented gradually, such that COBIT is focused on implementations of best practices aimed at controlling IT area actions, whereas ITIL addresses operational demands of IT services (Gonçalves et al., 2016).

According to Riguete et al. (2021), an organization's IT must always seek continuous improvement in business processes. Additionally, Rodrigues et al. (2020) highlight that continuous improvement should be supported by effective control mechanisms and traceable metrics. In addition to continuous improvement, the authors cite systemic alignment as a critical success element for the development of an effective governance model, defined as the consolidation of the use of IT governance practices among the IT areas within different business units. In this sense, the IT of every organization must always be looking for a contribution to the organization's business lines, thus practicing continuous improvement in a systematic way.

In this work, the implementation of continuous improvement in IT processes using the COBIT and ITIL frameworks is analyzed. In addition, our main contribution is providing resources to companies that aim to use such models in order to implement continuous improvement in their processes.

This paper is organized as follows. Related works are presented in Section 2. Next, Section 3 introduces the theoretical background about COBIT and ITIL frameworks. Section 4 discusses practical cases in which COBIT and ITIL have been implemented from a continuous improvement perspective. Finally, conclusions and suggestions of future works are shown in Section 5.

2. RELATED WORKS

This section provides a brief description of the main related works, presenting their objectives, critical success factors and limitations.

Ranggadara and Prastiawan (2018) studied the implementation of the continuous service improvement stage of the ITIL framework in one of the largest technology companies in Indonesia (PT. Anabatic Technologies). The authors showed in practice the implementation of such stage considering the challenges involved. Nonetheless, the work was limited to the scope of the company's credit monitoring system using rating and services metrics. Critical success factors include good cooperation between project, business and technical teams, periodic project progress reports, and stakeholder support.

Additionally, Lamichhane (2019) conducted a survey on the implementation of continuous service improvement in the government of Nepal. The focal point of the research was to provide a viable path for implementing continuous service improvement using the ITIL framework. However, the work focused only on one governance model, namely the ITIL library, addressing IT service management and service improvement. Moreover, the author focused on narrow areas such as government awareness of continuous improvement of IT services, challenges and benefits for Nepal in adopting these models. The critical success factors listed in the work were the acceptance by

senior management, as well as goodwill and commitment and availability of staff.

In addition, Amorim et al. (2020) developed a discussion about the use of agile methodologies to implement IT governance in organizations using COBIT 5. The main objective is to facilitate the adoption of such governance framework, overcoming some imposed challenges, such as the commitment of top management. Further, the authors addressed the difficulties of implementing COBIT 5 in a company, facilitating its adoption using a hybrid approach with SCRUM and COBIT 5. Nonetheless, a limitation of the work was the small group of people responsible for the approach development.

Furthermore, Zakaria et al. (2019) introduced a case study in which risks related to the Internet of Things (IoT) were reviewed in the context of the Malaysian Government Hospital. Considering IT security, the author compared research already conducted together with other studies involving IoT. The use of seven iterative phases aligned with the COBIT 5 implementation life cycle was considered. Its main objective was to propose a risk management model for IoT practices in the healthcare sector through which the COBIT 5 framework is used to guide the implementation of risk management. However, such approach was limited to using the COBIT 5 framework to guide its implementation, keeping the focus only on the Kuala Lumpur Hospital (HKL).

Finally, Tangprasert (2020) carried out a comparative study of IT risk assessment between private and public organizations through two experiments. Those experiments assessed the risks associated with such organizations against the five areas of COBIT 5. The seven-phase COBIT 5 implementation cycle was applied to reassess the focal points, ensuring continuous improvement in processes. However, the work only addressed the COBIT 5 framework as a governance model to be used, evaluating only the general aspect of the areas that guide the implementation of governance, without going into the details of the processes. Moreover, the risk assessment was carried out by professionals outside the organizations, such that cooperation was a key point for the success of the produced analyzes.

Differently from the above-mentioned works, this paper presents a comparative study considering practical cases in which

COBIT and ITIL were implemented from the perspective of continuous improvement. In addition, we also highlight the action boundaries of each model regarding the continuous improvement, thus contributing to the choice of the method to be adopted by companies.

3. THEORETICAL BACKGROUND

This section introduces the main concepts of IT governance, as well as the COBIT and ITIL frameworks from the perspective of continuous improvement.

3.1. IT governance

IT governance follows the same script as other types of governance. For example, the head of a finance department does not write checks for payment. Instead, a financial governance policy document determines which manager will handle such activity. The role of the head of the finance department is to oversee the company's risk exposures, cash flow, and track metrics given to other employees to manage financial assets. The IT governance presents a similar behavior (Weill and Ross, 2004).

In general, governance decides who makes the decisions in the company. According to De Moraes and Creutzberg (2021), there is a difference between governance and management. Governance determines the company's decision making and in which direction they will go, whereas management takes care of the operational part of the made decision. In summary, management follows the guidelines of governance. Moreover, Weill and Ross (2004) consider IT as one of the six key assets for an organization to exercise governance, as depicted in Figure 1.

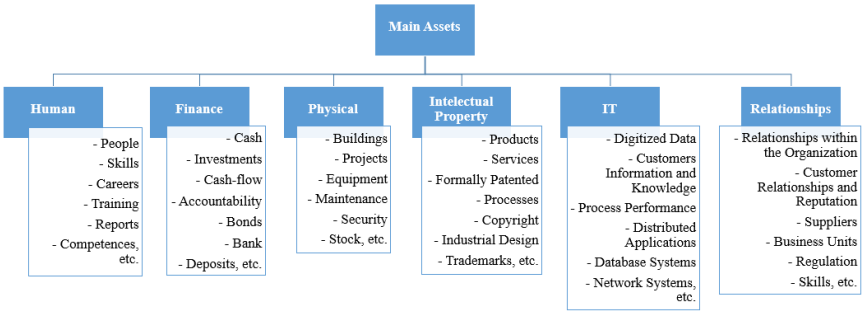

Figure 1. Main governance assets

Companies carry out their strategies and generate business value through the aforementioned assets. Among them, IT has its own governance approach, highlighting its increasing importance in corporate design. Luciano et al. (2017) present five motivating factors when a company decides to start the process of implementing the IT governance, as described in Table 1.

Table 1. IT governance motivating factors

Motivating Factor	Description
Influence of corporate governance	Corporate Governance Mechanisms are quite strong, as IT assets and the mechanisms that surround them are of great importance to organizations.
Influence of factors internal to the organization	Organizations replicate the corporate governance model in their "sub areas" in order to save resources.
Influence of the organization's goals on IT governance	The organization must have a notion of IT governance, so that it can influence the appropriate mechanisms, contributing to the effectiveness of the process.
Influence of cultural aspects	Organizational culture is the way a company does its business, treats its customers, the way decisions are made. The way this norm is interpreted by the organization influences the adoption of IT governance.
Influence of the mimetic aspect	A smaller company acquires more prestige or trust from its peers by adopting the same or similar technologies as those adopted by prestigious companies in a certain field of activity.

First, it is necessary to select the governance model. Once the model is chosen, the appropriate mechanisms are defined and adopted. Also according to Luciano et al. (2017), this a slow step, since the adoption of governance mechanisms requires a change in culture. Finally, the last step is the continuous evaluation of the effectiveness of the adopted mechanisms.

In all stages, it is necessary to take into account the dynamics of each company. Business processes are constantly changing. Therefore, all steps are in continuous evolution, i.e., in continuous

improvement, following the organization's structural and internal changes. This shows that the concern with continuous improvement is present in all sectors and processes of the organization, being thought, planned and monitored from the top management to the operational processes.

3.2. ITIL

According to Fernandes and Abreu (2014, p. 341), ITIL is a grouping of the best practices used for the management of high quality information technology services, obtained in consensus after decades of practical observation, research and work by IT professionals and data processing across the world.

Felisberto (2017) complements by arguing that ITIL, in addition to promoting strategic alignment between IT and business, presents the ability to generate value for the organization by providing cost reduction and new business opportunities. The focus is on synchronizing the IT components and integrating them to the company's strategic objectives. Additionally, ITIL provides a service-oriented best practices model, composed by five macroprocesses integrated in sequence, forming thus a life cycle. Moreover, one macroprocess complements each other, providing other processes with specific objectives, guidelines and prerequisites (Júnior, 2021). Figure 2 shows the macroprocesses and their connections.

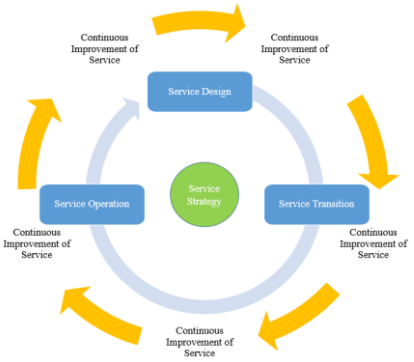

Figure 2. ITIL lifecycle

According to Nascimento (2021), innovation must be a constant strategy rather than be tied to a single event. The differential factor is sustained for a short time, as technology is in constant evolution, and the optimization of its use accompanies this movement. Thus, even if IT is not able to provide innovation to the organization, it must at least meet the demand generated by the services, always aiming the continuous improvement. The continuous improvement of services leads to a reduction in costs and risks, with an increase in the quality. Consequently, the evolution of these elements leads to innovation, which in turn leads to continuous improvement, in a feedback loop.

In this sense, the continuous improvement process encompasses all the others in the representation of the ITIL lifecycle, as illustrated in Figure 3. The official ITIL documentation (OGC, 2007) says that organizations learn to make incremental and large-scale improvements in service quality, operational efficiency and business continuity. Continuous improvement is provided to link improvement efforts and results with the Strategy, Design and Transition processes.

Along the same lines, Nascimento (2021) explains that in addition to aiming at the evolution of processes, continuous improvement must also aim at the evolution of the IT-business alignment in each phase of the life cycle. Continuous improvement aims to measure the quality and effectiveness of processes and services to ensure their effectiveness and efficiency, in addition to suggesting improvements in conjunction with the Strategy, Design, Transition and Service Operation cycles.

ITIL is also about a conceptual model of continuous improvement. This model consists of six steps. Further, there are six questions which direct the organizations in order to pursue continuous improvement. Such questions are described in Table 2:

Table 2. ITIL continuous improvement conceptual model

Phase	Description
What is the vision?	An organization must be driven by a business vision. A vision that tells what the company's objectives and missions are.
Where are we now?	The intention here is to know where the company is in relation to its own service indicators and assessment of process maturity.
Where do we want to be?	Measurements of process maturity assessments and measurement of the organization's target service indicators are performed. At this point goals are created for service improvements or process maturity.
How will we get there?	The actions that will be necessary for the goals to be achieved are determined.
Are we there yet?	After that, the result must be measured, to know if the goal was reached or not.
How to keep the momentum going?	ITIL advocates that this process be repeated constantly.

The only model present in the process of continuous improvement of services is the "seven steps to continuous improvement". In this context, Virtala (2020) defines a seven-step improvement process, described in Table 3.

Table 3. ITIL seven steps to continuous improvement

Phase	Description
Identify the strategy	Before any activities are started, it is mandatory that an overview is built. This step introduces the seven-step process of continuous improvement.
What should I measure?	This step should have already been mapped at the beginning of the life cycle, in the Strategy and Design processes. However, continuous improvement can go through this cycle again through the continuous improvement conceptual model, in the "Where are we now?" step. This identifies the best situation for both the business and IT.
What can I measure?	This activity is related to the "Where do we want to be?" activity. By identifying new business service level requirements, IT resources and available budgets, continuous improvement can perform a gap analysis to identify opportunities for improvement as well as answer the question "How do we get there?"
Collecting data	In this step, data is collected in a raw form, through the Service Operations process. Here no interpretation is made on the data. They are collected based on the identified goals and objectives. It is with this processed and analyzed data that the question "Are we there yet?" is answered.
Analyzing data	The main function of this step is to process data obtained from various sources. Data is processed in alignment with critical success factors and key success indicators. After data processing, analysis can be done.
Presenting and Using Data	Here is the answer to "Are we there yet?" At that point, information is presented to stakeholders in a way that shows an accurate picture of improvement efforts. Knowledge is presented in a way that can reflect your needs.
Implementing corrective actions	The knowledge acquired is used to optimize, improve and correct services. Managers identify problems and come up with solutions. Corrective actions that need to be taken to improve the service are communicated and explained to the organization. Following this step, the organization establishes a new baseline and the cycle starts over.

3.3. COBIT

Information is an essential element for any organization. Information technology has amplified this importance as a result of its evolution,

making it increasingly pervasive in organizations, public, social and corporate environments. This characteristic gives rise to a new type of responsibility towards information on the part of companies.

Thus, they now need to manage an information life cycle that goes from its creation to the moment of its destruction. As a result, organizations and their executives make efforts to maintain high quality information to support corporate decisions, add business value from IT investments, achieve operational excellence through the reliable and efficient application of technology, for example.

In the face of this emerging complexity, successful organizations recognize that IT must be as significant to the business as any other area. Hence the need to strengthen the alignment of the business with IT. In this context, COBIT provides a comprehensive model that helps organizations create value through IT by balancing the realization of benefits, optimizing risk levels and resource utilization (ISACA, 2012).

The implementation of the COBIT model allows organizations to plan their strategy, improve their operational activity, their projects, optimize resources, reduce costs and obtain greater control over their policies and contractual agreements, whether with internal departments or with other organizations external to them. According to Dos Santos and De Paula (2016), as it is a comprehensive framework, COBIT manages to be generic to the point of representing IT processes and, at the same time, being perceptible to both the operation and the business. It is a model that creates a connection between IT and the business. For this purpose, COBIT acts on five focal points as a principle, as shown in Table 4 (Carolino, 2018):

Table 4. COBIT 5 Principles

Principle	Description
Meeting stakeholder needs	The main purpose of this principle is to raise the needs of each stakeholder in the organization and then define specific objectives for each area or function and map them in a cascade to define corporate objectives, IT objectives and their enablers. Once this mapping is done, priorities and continuous improvement are established.
Covering the enterprise End-to-End	The purpose of governance is value creation. To that end, it calls for a balance between realizing benefits, optimizing risk levels and optimizing resources across the entire organization.
Applying a Single Integrated Framework	COBIT is a model fully aligned with the entire ISACA framework. The model is very comprehensive, being aligned with other frameworks such as VAL IT, BMIS or ITAF, among others.
Enabling a Holistic Approach	This component is related to the elements of the company (people, technologies, information, policies, etc.). For governance to be effective, the model needs to be

Principle	Description
	addressed by the entire organization.
Separating Governance from Management	Governance makes sure that the needs of stakeholders are met and management handles the execution of activities under the direction of governance in order to achieve the company's objectives.

To fulfill the principle of "Enabling a Holistic Approach", COBIT 5 provides seven enablers that help organizations achieve these goals. They are described in Table 5 as follows:

Table 5. COBIT 5 Enterprise Enablers

Enabler	Description
Policies, Principles and Frameworks	These are day-to-day instructions for the organization's management operations.
Processes	Practices to achieve and produce the expected results.
Organizational Structures	Structures in charge of making decisions and sustaining the organization's processes.
Culture, Ethics and Behavior	Behavioral actions of individuals. These are related to the organization's success.
Information	They allow your actions to be governed and managed.
Services, Applications and Infrastructure	Services that keep the organization running smoothly.
People, Skills and Competences	Necessary human resources that carry out the activities, allowing for better decision making.

The "Information" enabler is highlighted, as it is the organization's most important resource, as highlighted by ISACA (2012). In this context, Khaldoon (2015) reinforces that information must be prepared, audited and disclosed in accordance with a high quality standard. The author points out five variables that enable the dissemination of quality information, contributing to good corporate governance. Such variables are described in Table 6:

Table 6. Information Disclosure Variables

Variable	Description
Independent Boards	The inclusion of external directors on the board of directors strengthens the board by enhancing internal controls, providing greater security, mitigating costs and putting pressure on the organization to always seek better information disclosure.
Audit Committee Size	This is an important mechanism to enhance the quality of disclosure, as it influences the amount of information disclosed. Therefore, it is important to observe the relationship between the committee and the information disclosed.
Board Size	This is an important governance feature, as it has a very positive effect on the level of disclosure of corporate information. A great board has the advantage of offering a broad spectrum of collected experiences and expertise that supports better decisions.
Ownership Structure	Managers, who are shareholders, are motivated to increase the values of entities, increasing shareholder wealth as well as their own wealth. Therefore, information disclosure will increase, because majority managers can derive greater market share benefits from better disclosure. Therefore, it is expected that as managers have the same interests as owners, they will disclose more information.
Variable control	This includes a number of controls such as company size, profitability, liquidity and

Variable	Description
	audit quality. These controls are considered to be widely associated with disclosure in the literature.

According to Amorim et al. (2021), despite COBIT 5 is globally recognized as one of the most applied governance frameworks, it is also considered too large and complex, and can take years to be implemented. Most organizations consider the adoption of such framework a very exhausting task, since it is a complex model, composed of seven enablers and 37 processes, with more than 6,000 interdependencies.

To address this scenario, ISACA (2012) provides an implementation guide for COBIT 5, in which the methodology is based on seven phases that must be implemented cyclically, in parallel with creating a sustainable approach to the organization's IT governance and management. Such phases are illustrated in Figure 3.

4. RESULTS AND DISCUSSION

This section presents a bibliographical research regarding two of the most used IT governance frameworks, namely, COBIT 5 and ITIL. As a result of this work, evidence of the action boundaries of the continuous improvement stage of services as well as the approach to the continuous improvement lifecycle of COBIT 5 are shown.

In addition, this work focused on collecting data from case studies using those two frameworks in companies and providing this data as responses to the lifecycle processes of implementing IT governance based on seven phases, COBIT 5, and the seven-step process to continuous improvement of ITIL.

As mentioned in Section 3, the only process present in the continuous service improvement stage of ITIL is the “seven steps to continuous improvement” process. This is compatible with the conceptual model of continuous improvement of the same framework shown in Table 7.

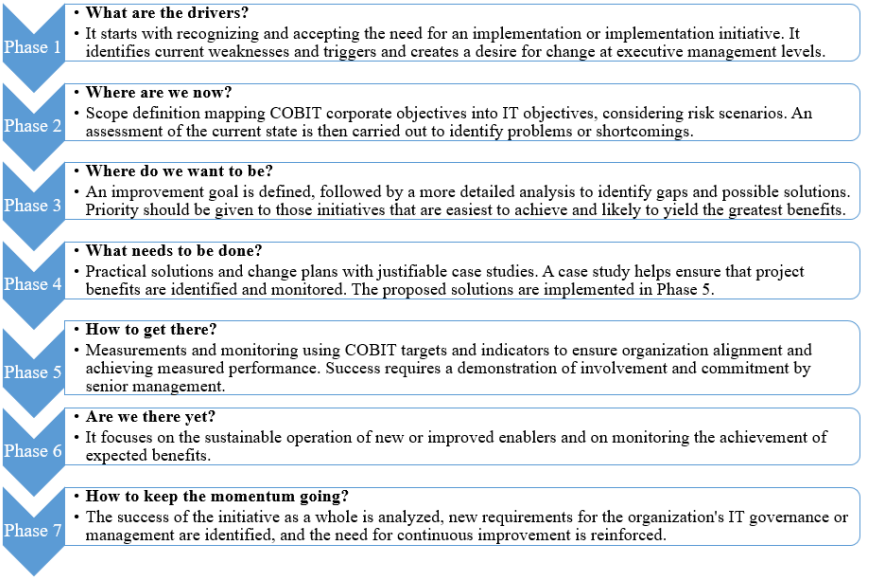

Figure 3. COBIT 5 implementation lifecycle

Table 7. Relationship between the seven steps to continuous improvement with a conceptual model of continuous improvement

Seven Steps to Continuous Improvement	Conceptual model of continuous improvement
Identify the strategy	What is the vision?
What should I measure?	Where are we now?
What can I measure?	Where do we want to be? and How will we get there?
Collecting data, analyzing data, presenting data and using the information	Are we there yet?
Implementing corrective actions	How to keep the momentum going?

Compatibility of these two models is not an exact mapping, since the seven-step improvement process is very procedural. On the other hand, it is a process to guide the implementation of continuous improvement very close to the end users.

The conceptual model is more comprehensive. In addition to services, it considers strategic parts of the business, such as the organization's current condition in relation to services according to the business vision, comparing the findings made in continuous improvement with the business overview in the data analysis phase,

among others. Similarly to ITIL, COBIT 5 has an implementation model that is based on a life cycle of continuous improvement. This life cycle approach has seven phases, constituting an implementation life cycle. Such phases are shown in Table 8 for two related works, Ranggadara and Prastiawan (2018) and Lamichhane (2019).

Table 8. Seven steps to continuous improvement

Phase	Ranggadara and Prastiawan (2018)	Lamichhane (2019)
Identify the strategy	Modernize services to optimize the Credit Monitoring System and WB/SME LOS at the World Bank.	Improved Nepali government IT services for which the government seems unaware.
What should I measure?	Measurement of services such as mining, agribusiness, banking services.	The government of Nepal is not aware of making good IT strategies, being far behind in the field of technology and innovations. The measurement must be made in the Nepal government services according to the analysis made through the 4 P's of Design (People, Partners, Processes and Products).
What can I measure?	Banking services, specifically the credit monitoring system of the World Bank's WB/SME LOS project.	The objective is to reduce service time and downtime with good handling of incidents and problems, with great visibility of services. Perception of the benefits of effective adoption of continuous business process improvement is expected. Every initial implementation of continuous process improvement is confusing and difficult. Review of ongoing processes and data, as well as internal and external services, should be presented to senior managers with recommendations for improvement. It is necessary to ensure that services are well resourced and supported.
Collecting data	Service metrics with SLA used in production related functions, critical components and applications, small efficiency losses in non-essential functions and problems with no operational impacts.	21-question questionnaires designed to evoke the perception of stakeholders in the IT sector. The study took into account a selected group of 30 people from the most varied sectors and was composed of 3 parts: organizational demography, current initiatives and progress, improvement of IT services in business.
Processing the data	Questionnaire with 152 questions on the entire cycle of continuous service improvement. Data represented on a Radar Graph.	Questionnaires were processed with the critical success factors raised in the study and with the key success indicators. After data processing, analysis can be done.
Analyzing data	The Radar chart indicated best for CSI Implementation and worst performance for CSI Technology Considerations.	Processed data are worked together with the graphs generated by the questionnaires shown in the study.
Presenting and using information	Radar chart indicated best for CSI Implementation and worst performance for CSI Technology Considerations.	Data is now ready to be presented to top management and its stakeholders. The performance of business organizations and its shortcomings are presented at the management level to arrive at solutions and steps for improvement.
Implementing corrective actions	The results and graphs generated should be used to help in making decisions to improve services.	The data, facts and figures compiled and generated are important over time to make business decisions and find out what the company needs most.

By combining Tables 7 and 8, we have the descriptions of each work adjusted to the conceptual model of continuous improvement, as depicted in Table 9.

Table 9. Conceptual model of continuous improvement

Phase	Ranggadara and Prastiawan (2018)	Lamichhane (2019)
What is the vision?	Modernize services to optimize the Credit Monitoring System and WB/SME LOS at the World Bank.	Improved Nepali government IT services for which the government seems unaware.
Where are we now?	Measurement of services such as mining, agribusiness, banking services.	The government of Nepal is not aware of making good IT strategies, being far behind in the field of technology and innovations. The measurement must be made in the Nepal government services according to the analysis made through the 4 P's of Design (People, Partners, Processes and Products).
Where do we want to be?	banking services, specifically the credit monitoring system of the World Bank's WB/SME LOS project.	The objective is to reduce service time and downtime with good handling of incidents and problems, with great visibility of services. Perception of the benefits of effective adoption of continuous business process improvement is expected.
How will we get there?	The implementation of continuous improvement in the World Bank project services depends, among other factors, on the good cooperation of the stakeholders. The results must be presented clearly to assist in decision making	Every initial implementation of continuous process improvement is confusing and difficult. Review of ongoing processes and data, as well as internal and external services, should be presented to senior managers with recommendations for improvement. It is necessary to ensure that services are well resourced and supported.
Are we there yet?	Service metrics with SLA used in production related functions, critical components and applications, small efficiency losses in non-essential functions and problems with no operational impacts	21-question questionnaires designed to evoke the perception of stakeholders in the IT sector. The study took into account a selected group of 30 people from the most varied sectors and was composed of 3 parts: organizational demography, current initiatives and progress, improvement of IT services in business.
	Questionnaire with 152 questions on the entire cycle of continuous service improvement. Data represented on a Radar Graph.	Questionnaires were processed with the critical success factors raised in the study and with the key success indicators. After data processing, analysis can be done.
	The Radar chart indicated best for CSI Implementation and worst performance for CSI Technology Considerations..	Processed data are worked together with the graphs generated by the questionnaires shown in the study.
How to keep the momentum going?	The results and graphs generated should be used to help in making decisions to improve services.	The data, facts and figures compiled and generated are important over time to make business decisions and find out what the company needs most

Following, in Table 10, descriptions of the seven-phase implementation lifecycle model of COBIT 5 are presented.

Table 10. COBIT 5 seven-phase deployment lifecycle model

Phase	Amorim et al. (2019)	Zakaria et al. (2019)	Tangprasert (2020)
What are the drivers?	Favor the adoption of COBIT 5 using agile methodologies to reduce predictability, as the scope of these implementations does not expect changes frequently, and facilitate communication with the customer, as projects are isolated from the environment, generating a fragile relationship of support by the senior management.	It aims to identify and confirm the business need to implement IoT solutions, which is, in the present case, to increase access to care, raise the quality of care and even reduce the costs of care.	Reduce organizational risk through risk management in order to evolve IT risk control performance. Management identified IT risks according to the areas of COBIT 5, enabling their assessment and application of risk responses.
Where are we now?	The scope of these implementations does not expect changes very often. Interviews are carried out in successive iterations with process owners to assess the process's capacity for stabilization. Then the team will assess the current state of the implementation.	The implementation scope uses COBIT mapping applied to IT goals. A series of interviews with HKL IT offices were conducted to get an overview of the hospital's operations as well as to get a sense of IoT implementations.	The current scenario of the organizations was analyzed among the areas of COBIT 5 through interviews carried out with the staff of the six organizations. Risks such as the absence of IT policies and business continuity plans were identified.
Where do we want to be?	In the first iteration, the process was not stabilized to the point where SCRUM was used efficiently. For a more secure implementation, a second iteration was planned, in which the first four phases of the COBIT implementation cycle were taken out of the SCRUM process to enable the project, limiting the new iteration to a fifth phase of the implementation cycle.	The current situation of IT security conditions in hospitals made through interviews has raised a concern about the security of sharing patient health data on IoT devices, requiring actions so that patient safety is not compromised. In this case, the study was limited to observing only the IT aspects of the Hospital.	The assessment of the current scenario required action on the risks involved in all areas of COBIT 5. Risks were assessed limited to the five areas (APO, BAI, DSS, MEA and EDM). A first experiment carried out this assessment and activation of risk response mechanisms followed. A second experiment was carried out again and a new assessment was made to identify the reduction of organizational risks
What needs to be done?	A hybrid approach with SCRUM and COBIT 5 was developed. This model adapts SCRUM concepts to be used in IT governance implementations based on the 7 phases of the COBIT 5 implementation life cycle.	The objective is to identify risks in hospitals for the use of IoT and propose a model for managing IoT risks safely. The rationale for this study did not encompass the entire healthcare industry, as each environment has its own nature.	Two experiments involving six organizations were done. The first evaluated the risks between the areas of COBIT 5. The experiment was carried out under the same conditions and treated the risks in the same way as the first. There was cooperation throughout the process, especially among smaller organizations.
How will we get there?	The study consisted of two iterations to implement the model. In the first, the mapping from SCRUM to COBIT 5 was done using phases 2 to 5 of the COBIT 5 implementation cycle within the SCRUM model. In the second, an increment of the first, only phase 5 of the COBIT 5 implementation cycle was included in SCRUM.	The model consisted of three parts: risk management for IoT, alignment with HPIA, and implementation using the seven phases of the COBIT implementation cycle. To ensure effective adoption, the willingness of the company's management team to use IoT technology is crucial. Commitment to	Two experiments were carried out as follows: The first experiment assessed the risks associated with the six organizations in question against the five areas of COBIT 5. Based on this assessment, risk responses were applied using the seven-phase COBIT implementation cycle. 5. After the negotiations, the second experiment was

Phase	Amorim et al. (2019)	Zakaria et al. (2019)	Tangprasert (2020)
	Interviews with process owners were carried out successively to assess the capacity of the process and align senior management's commitment to the project.	the use of IoT by the hospital staff, awareness among the healthcare community in the institution, and support for the IT infrastructure contributed to the successful adoption of IoT.	carried out with the same process as the first. The seven-phase COBIT 5 implementation cycle was applied to re-evaluate focal points, ensuring continuous process improvement.
Are we there yet?	10 interviews with experienced SCRUM or COBIT 5 professionals were conducted. Interviews were conducted by the author over a period of one month. Also, a questionnaire with open and closed questions about COBIT 5 and SCRUM was done. The interviews asked what their experience with COBIT 5 and SCRUM was on a scale of 1 to 5. Some points were observed, pointing to failures, the main one being the lack of coordination mechanisms in the mapping of processes from SCRUM to COBIT 5. This point of failure made the author identify the need for a second iteration, improving the proposed solution.	A series of interviews with HKL healthcare professionals was conducted to gain an overview of the current state of IoT implementation. The interview was then transcribed and coded according to theoretical propositions. Finally, the sharing step in which textual and visual materials are composed was sufficient to present the evidence to reach the conclusion of the study. It was found that the adoption of IoT is currently in the initial phase. Its risk management is dependent on monitoring by the teams. Therefore, the COBIT implementation cycle for IoT implementation was proposed.	For risk assessment diversity and for comparison purposes to find guidelines for risk management, 6 organizations including 3 government organizations and 3 business organizations were selected. The interview and data collection were carried out with 5 people from each of these 6 organizations, totaling 30 people. The experiments were conducted using 3 methods: 1) interview, 2) observation, and 3) empirical evidence-based survey as an experimental framework for this study. The risk assessment was conducted by 3 people; researcher, external IT auditor and IT manager of each organization.
How to keep the momentum going?	While developing the solution, despite the high level of capability target defined during scope, it was possible to reset the initial values as the solutions were designed and implemented. The engagement of process owners was felt in all decisions. In order to evolve the performance of the frameworks, the author obtained feedback through a set of interviews carried out among those involved.	The results of the IoT risk management model, the HPIA processes and the COBIT phases are analyzed to discover possible needs for new requirements and reinforcement for continuous improvement.	The study of IT management in government and private organizations in Thailand showed that using the COBIT 5 implementation life cycle in risk control reduced organizational risk. As this process is continuous and iterative, observations must continue to be made so that IT risk management is always evolving.

Finally, Tables 9 and 10 show in a practical way the phases in common between the continuous improvement models of ITIL and COBIT 5. Both are models that, despite having the same structure and apparently the same phases, present different approaches, as detailed below.

Phase 1: What are the drivers?

It aims to identify and confirm the business need to implement solutions. In Ranggadara and Prastiawan (2018) and Lamichhane (2019), the needs for modernizing credit monitoring services and improving IT services in some areas of the government of Nepal, respectively, are considered. In Amorim et al. (2019), Zakaria et al. (2019) and Tangprasert (2020), the use of agile methodologies to reduce predictability in the implementation of continuous improvement in organizations, the use of IoT to improve the quality of care in sector organizations and organizational risk reduction using COBIT 5, respectively, are the reasons that led to the implementation of continuous improvement. Although both are addressing the business aspects, the scope of Ranggadara and Prastiawan (2018) and Lamichhane (2019) refers to the provided services, whereas Amorim et al. (2019), Zakaria et al. (2019) and Tangprasert (2020) are more focused on senior management and business strategy.

Phase 2: Where are we now?

This phase defines where it is necessary to establish the scope of implementation using monitoring tools to map the current situation of the organization or services. Ranggadara and Prastiawan (2018) raised the scope of measurement of services such as mining, agribusiness and banking services. In addition, Lamichhane (2019) stated that the measurement should be done in the government services of Nepal according to the analysis made through the 4 P's of Design. Further, Amorim et al. (2019) found that for the implementation of continuous improvement in organizations, successive interviews with process owners are necessary to stabilize the processes and, thus, analyze the current scenario. Zakaria et al. (2019) saw that a series of interviews with HKL IT offices needed to be conducted to get an overview of the hospital's operations, as well as to get a sense of IoT implementations. Moreover, Tangprasert (2020) observed, through interviews carried out with the stakeholders of six organizations, the absence of IT policies and business continuity plans, as well as inadequate IT systems installations, expired contracts and the absence of IT service monitoring. In this sense, we observe the scope of the services addressed in Ranggadara and

Prastiawan (2018) and Lamichhane (2019), as well as the scope for the business view in the works of Amorim et al. (2019), Zakaria et al. (2019) and Tangprasert (2020).

Phase 3: Where do we want to be?

This means that once improvement targets are met, they must be followed up by a more detailed analysis to identify potential solutions. Ranggadara and Prastiawan (2018) and Lamichhane (2019) performed their analyzes based on the services provided by organizations. Ranggadara and Prastiawan (2018) limited its solution to banking services, specifically the World Bank's WB/SME LOS project credit monitoring system. Moreover, Lamichhane (2019) identified, through the analysis of the Nepalese government scenario, that the objective is to reduce service time and downtime with good handling of incidents and problems, with high visibility of services. Realization of the benefits of effective adoption of continuous business process improvement is expected, especially in Nepal. Furthermore, Amorim et al. (2019) realized in a first iteration that SCRUM was not stabilizing the analyzed processes. A second iteration was required with a modification to its model to enhance the solution addressed for the organization. Additionally, Zakaria et al. (2019) observed through the scenario of using IoT in the hospital sector in Kuala Lumpur, that worrying security risks to patient data were raised, requiring a scope of action of the solution for the IT aspects of the analyzed Hospital, leaving out patient issues. Then, Tangprasert (2020) limited its solution to the five areas of COBIT 5, not entering its application to processes. Finally, Amorim et al. (2019), Zakaria et al. (2019) and Tangprasert (2020) further analyzed the scenario proposing solutions for the business, again differentiating the scope of the studies carried out with the ITIL framework.

Phase 4: What needs to be done?

This phase refers to the practical solutions justified by the case study. For Amorim et al. (2019), a hybrid approach with SCRUM and COBIT 5 was introduced. The author has developed a lifecycle model that adapts SCRUM concepts to be used in IT governance implementations for organizations. In addition, Zakaria et al. (2019) proposed a model

for managing IoT risks for their safe practice in healthcare organizations. Moreover, Tangprasert (2020) conducted two experiments among six organizations to show that implementing IT governance using COBIT 5 reduces organizational risk. The "How do we get there?" phase of the ITIL framework can be combined with the "What needs to be done?" phase of COBIT 5.

Phase 5: How will we get there?

This phase refers to the proposed solutions that need to be implemented, demonstrating the involvement of senior management. Ranggadara and Prastiawan (2018) noted that the solution to banking services depends, among other factors, on the good cooperation of interested parties. The results must always be presented clearly to assist the decision making. For Lamichhane (2019), the review of internal and external services must be presented to senior managers with recommendations for improvement. It is necessary to guarantee the support of the services. In addition, Amorim et al. (2019) needed to implement two models with an agile approach to stabilize the organization's processes in order to achieve success. The processes were marked out with interviews with senior management, aligning the dependencies and the changes that arose. Moreover, Zakaria et al. (2019) saw the participation of both senior management and the HKL IT team in implementing the IT risk management model for IoT as crucial. Alignment with senior management enabled the engagement of all participants in building the solution. Furthermore, Tangprasert (2020) noticed cooperation and acceptance of risk management throughout the process, aligning with organizations, through interviews and observations, as a success factor for the solution. In this sense, there is a recognizable difference in the approach adopted by each work, despite the similar requirement for this phase.

Phase 6: Are we there yet?

This phase refers to the conduction of enablers of the new improvement solution. According to Ranggadara and Prastiawan (2018), these enablers were conducted through the use of SLA in production-related functions, such as focal metrics. Questionnaires are designed to score and help build a radar chart to be presented to

operational management. On the other hand, for Lamichhane (2019), these enablers were conducted through questionnaires made with members of the government of Nepal to assemble graphs for helping the service management. Furthermore, Amorim et al. (2019) conducted interviews with process owners and, punctuating these interviews, identified several coordination failures in the organization's processes. In addition, Zakaria et al. (2019) transcribed the interviews carried out with HKL professionals, which were codified with theoretical propositions. Then, the observations were shared, demonstrating the observed points of risks to the use of IoT in hospitals. Moreover, Tangprasert (2020) collected data from interviews conducted with the personnel of the assessed organizations to raise empirical evidence and, thus, demonstrate the progress of the experiments to senior management. In this sense, once again a palpable differentiation of the scopes of services and top management can be noticed.

As described earlier, this phase is related to the "Presenting and Using Information" phase of the ITIL Seven-Step Continuous Improvement process. Thus, Tangprasert (2020) conducted a study in line with Khaldoon (2015), which used an external audit to strengthen the quality and foundation of his work, highlighting his concern with good governance.

Phase 7: How to keep the momentum going?

In this phase, the successful implementation of the solution is reviewed with the need for reinforced continuous improvement. In Ranggadara and Prastiawan (2018), the generated results and graphs should be used to help in decision making to improve services. Further, Lamichhane (2019) noted that the compiled and generated data are important for making business decisions, finding out what the company most needs. Additionally, Amorim et al. (2019) noted that it was possible to redefine the initial values as the solutions were designed and implemented, and continuous improvement would be made by aligning the interviews with the process owners. Moreover, in Zakaria et al. (2019), the results of the IoT risk management model are analyzed to discover possible needs for new requirements and reinforcement of continuous improvement in the organization. In

addition, for Tangprasert (2020), as the improvement process is continuous, risk management in organizations must always be revised.

5. CONCLUSION

This work showed, through bibliographical research, the continuous improvement models aimed at the ITIL and COBIT 5 frameworks. In addition, both frameworks are compared from the point of view of continuous improvement applied in related works, showing their boundaries of action. In this sense, our main contribution was to provide observable inputs to be used by companies when applying such models to implement continuous improvement in their processes.

As limitations, few references with practical applications describing in detail the phases of the continuous improvement life cycle for both ITIL and COBIT 5 frameworks have been found in the literature. Such difficulty was also reported by Amorim et al. (2019). In addition, another limitation of the study was the scope reduced to the stages of continuous improvement of the studied models. Moreover, this work was not intended to cover the IT governance implementation frameworks existing in the market, but rather focusing on more recent research on continuous improvement implementations of the ITIL and COBIT 5 models.

For future works, it is suggested that the data survey can be used as an incentive for further discussions regarding the implementation of continuous improvement. Comparisons with other IT governance frameworks would also constitute a valid follow up, for example, by comparing the ITIL and SCRUM models.

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