

## KNOWLEDGE MANAGEMENT IN PUBLIC SERVICES: A MODEL APPLIED IN A PUBLIC UNIVERSITY

### GESTÃO DO CONHECIMENTO EM SERVIÇOS PÚBLICOS: UM MODELO APLICADO EM UMA UNIVERSIDADE PÚBLICA

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#### **Abstract**

Knowledge Management (KM) is a fundamental process for improving the efficiency and effectiveness of organisations, there are few articles that address KM in service environments, especially those in the sphere of public administration. This current situation poses an important gap between the KM in public settings. While in firms the KM practices should be guided to the necessity of firm obtain profits and generate value clients who pay for its products, in public services social wellbeing is the main purpose. In light of this possibility of contributing to the KM literature, in this article we propose a methodology for KM to improve public services. Through an essentially qualitative approach we adopted the case study method to collect data in administrative department in a public university. As a result, it was proposed the knowledge management model to public services settings.

**Keywords:** knowledge management; public administration; service management; knowledge management models; information management

#### **Resumo**

A Gestão do Conhecimento (GC) é um processo fundamental para melhorar a eficiência e a eficácia das organizações. Embora a literatura sobre GC tenha sido extensivamente desenvolvida, existem poucos artigos que abordam a GC em ambientes de serviço, especialmente aqueles na esfera da administração pública. Esta situação atual apresenta uma lacuna importante entre o GC em ambientes públicos. Enquanto nas empresas as práticas de GC devem ser orientadas para a necessidade de obter lucros e gerar valor para os clientes que pagam por seus produtos, nos serviços públicos o bem-estar social é o principal objetivo. Diante dessa possibilidade de contribuir com a literatura sobre GC, neste artigo, propomos uma metodologia para GC para melhoria dos serviços públicos. Assim, por meio de uma abordagem essencialmente qualitativa, adotamos o método de estudo de caso para coletar dados no departamento administrativo de uma universidade pública. Como resultado, foi proposto um modelo de gestão do conhecimento para melhoria dos serviços públicos.

**Palavras-chave:** gestão do conhecimento; administração pública; gestão de serviços; modelos de gestão do conhecimento; gestão da informação.

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## 1 Introduction

Knowledge management (KM) has played a prominent role in the management process of contemporary organizations, because it consists of a basic element for the execution of productive activity. Predominantly, the literature on KM is dedicated to the study of this activity in traditional production systems and companies (e.g. Giampaoli *et al.*, 2017). However, it is possible to observe in the different models of organizations that the execution of the service processes is strongly present, both in the daily life of private companies and also in public institutions (Alvarenga Neto, 2002). In addition, the KM literature is mostly applied to private companies, and few studies have been devoted to analysing the nuances of KM in services, especially public services (Heising, 2009).

It is therefore perceived that the development of the peculiarities of KM in service and public management environments is a issue that should be furtherly investigated. Thus, this research contributes to the development of the KM literature, as well as KM practices, since it demonstrates the applicability of new KM techniques in public organizations, most of which are characterised as service organisations.

Based on the above discussion the purpose of this article is to propose a methodology for KM that can be applied in public settings. This method is based in the research of an administrative department of a Brazilian public university. The main results steps of this methodology are: i) identify the organisational context of the research object; ii) map the processes considered critical by managers; iii) identify existing KM practices; iv) raise the critical knowledge of these processes with the support of the methodology of mapping of critical knowledge; v) identify the focus of action and new practices of KM; vi) structure a framework that enables the organization to deploy an effective KM system.

In addition to this introductory section, this article has five more sections. In the next section, a comprehensive literature review is presented about KM and methodologies related. The third presents the methodological activities employed to produce this study. Next, the research data are presented based in the research setting. In the fifth section, a methodology for KM that comprises the objective of this research is proposed. The sixth section concludes this paper, wherein the final considerations are presented.

## 2 Theoretical Framework

## 2.1. Knowledge Management (KM)

Besides knowledge is an issue of interest of philosophy and psychology, in managerial sciences it has an instrumental character, whereas in organizations its use is fundamental to produce goods and services and consequently generates wellbeing to the society (Heising, 2009). In fact, in organizations knowledge seems to be a key asset which is present in all production and generating value activities (Carlucci & Schiuma, 2007; Denicolai, Zucchella, & Strang, 2014; Teece, Pisano, & Shurn, 1997). Hence, it is in the managerial context of organizations that KM discipline arises. According to Teixeira Filho (2000: 22), "knowledge management can be seen as a collection of processes that govern the creation, dissemination and use of knowledge to fully achieve the objectives of the organization."

Knowledge can be managed in a way that meets the needs of the organisation and advises it in decision-making according to its objectives (Corsatto & Hoffman, 2013). Thus, the focus of KM is on: (a) individual and organizational learning (organizational culture); (b) development of individual and organizational skills; (c) connectivity between people; and (d) mapping, coding and sharing of organizational knowledge (Terra, 2005: 81). Besides these basic premises, it is necessary more sophisticated methods for improve KM. As a result, KM provides a vast availability of KM models (Heising, 2009) which consist of a set of basic assumptions and steps for the adequate KM.

According to Baêta, Martins & Baêta (2002), a model of KM can be understood as a set of procedures or guidelines, in which the organisation, according to its strategic planning and its peculiarities, adapts to favour communication, trust, and the necessary conditions for KM. However, it is emphasised that KM falls into a category of studies under development, and therefore, there is not yet a great diversity of consolidated models to support its analysis and practice. Thus, the use of a model to enable the implementation of a KM project is essential to integrate factors such as innovation, retention, processing, and information sharing, and to highlight the importance of tacit and explicit knowledge (Rebecca and Souder, 2015). This integration ensures better control of knowledge, in the internal and external environments of the organisation, defining its origin and location and facilitating its access.

Studies as Prandini and Pereira (2016), and Heisig, (2009) identified various KM models. Each model has its own peculiarities and contributions to the literature on the subject. For this study, the reference model used was developed by the Institute of Economic and Applied Research (IPEA, 2013), granted its use to implement the state policy for KM in the Government of Minas Gerais state, Brazil. At the following sections there are presented a KM method and

a KM tool, in the sense of illustrate these elements, as well as, to support the further case study introduced.

## 2.2 Methodology for Mapping Critical Knowledge in State Public Administration: IPEA

This methodology can be summarised in four assumptions: diagnose, plan, develop, and implement. The methodology presented in this study focuses on the planning stage. This choice assumes that at this stage, it is possible to identify the organisation’s strategic knowledge gaps, that should serve as a guideline for structuring KM initiatives. This gap refers to the difference between what the organisation should do or know and what, in fact, it knows or does.

The IPEA methodology is composed of two phases: the first phase involves predefining the critical knowledge related to the strategic processes of an organisation, and the second phase involves the actual definition of such knowledge, as can be seen in Figure 1.

**Figure 1: Main Stages of IPEA Methodology**

	Phases	Description
Pre-definition of critical knowledge	Step 1: Identification of the organisation's strategic processes	Making of the macroprocesses of the organisation that are directly related to the achievement of the strategic objectives of the organisation. Their definition and prioritization ensures that the KM approach is undertaken with greater assurance and assertiveness.
	Step 2: Definition of critical knowledge linked to strategic processes	Identification and grouping of critical knowledge for each process defined as strategic in the previous step.
Prioritization of critical knowledge	Step 1: Identification and prioritisation of knowledge associated with strategic processes	Explanation of critical knowledge: one that is not yet well-explained, with manuals and procedures developed and sharing practices. Attribution of grades 1 to 5, related to its importance, and the attribution of grade 1 to the most important knowledge.
	Step 2: Evaluation of prioritised knowledge	Identification of the degree of criticality of strategic knowledge by means of scoring rules (0 - no adherence - 5 - total adherence) with the objective of identifying the gap between the present and the desired situations.
	Step 3: Classification of criticality of assessed knowledge	Attribution of criticality ratings ranging from 0 (not critical), 1 (relatively critical), 2 (critical) to 3 (very critical). Thus, the criticality of knowledge will be defined in relation to the distance between the desired situation and the current situation represented in the rules.
	Step 4: Characterisation of information associated with critical knowledge	Description of the information pertinent to the strategic knowledge defined in Step 1.
	Step 5: Prioritisation of critical knowledge	Structuring a spreadsheet joining all the information obtained in the previous steps, so that successive filters linked to criticality levels are applied to prioritize critical strategic knowledge and thus, to target KM initiatives and practices with greater assertiveness and accuracy.

Source: Adapted from IPEA, 2013.

## 2.3 The Versatility Matrix

The Versatility Matrix is a tool that assists in the evaluation of knowledge available to the workers of a given settings, owing to the its ability to execute the required tasks. In theory, this matrix contributes to an organization's ability to characterize the degree of knowledge available to people, from a holistic perspective. Also known as the polyvalence matrix, it is a spreadsheet that consists of a graphical representation of the qualifications of a company’s employees, regarding the activities related to the process in which they operate (Rigotti, 2016).

Based on the Versatility Matrix, it is possible to perform the allocation of employees to a given process according to the capacity presented, favouring an alignment between the profile of the individual and the skills required to perform the work. Through the matrix, it is possible for the company to work on its weaknesses, because it allows the manager to quickly identify the employees trained for a particular task, as well as the need for new trainings (Kamada, 2008, p.11; Rigotti, 2016).

Yet, for Kamada (2008, p.11), the versatility matrix (see table 1) “is a visual way of checking where there is a problem of unskilled labour and where there are processes with disabilities. Owing to the knowledge and abilities asset of an organization the versatility matrix is a powerful tool for analysis and formulate the organizational strategy of multi-functionality”. Table 1 presents an illustrative use of its matrix, evaluating the level of ability of workers of a hypothetical department of an organization.

**Table 1: Versatility Matrix**

		Level of ability in executing each task			
<b>Task</b>	Task 1	Task 2	<b>Task 3</b>	<b>Task 4</b>	
<b>Workers</b>					
Worker 1	1	2	3	4	
Worker 2	4	3	2	1	
Worker 3	2	1	1	0	
Worker 4	3	4	1	1	
<b>Legend:</b> 0 – Not enabled; 1 – In training; 2 – Need Help; 3 – Able; 4 – Specialist					

Source: Adapted from Kamada, 2008.

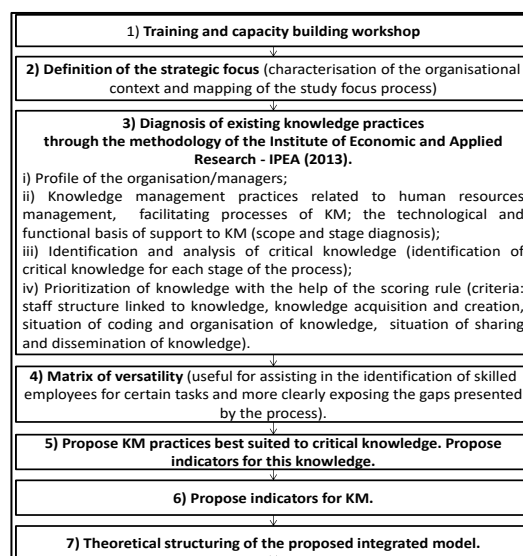
### 3 Methodology

This research was based on the qualitative approach as a way to understand in detail, as well as to explain, a certain phenomenon in the reality (Creswell, 2014; Einsenhardt, 1989). The research strategy used for data collection and analysis was based on the case study method. For the in-depth development of the research and using the mentioned method, a research protocol was developed to guide the collection and analysis of field data. In order to perform data collection, we used interviews, databases, reports and direct observation (Yin, 2015). As a result, this approach allowed researchers to interact more closely with the research object, contributing to their interaction with the external environment, which is one of the fundamental premises of the case study approach (Einsenhardt, 1989; Yin, 2015).

The unit of analysis focused was a administrative department (henceforth DP) of a Brazilian public university whose the function is to develop and implement policies to foster and support research and innovation. Of the different processes in the DP, four were indicated by interviewed workers, which based their response in the significance of these processes for the academic community. In this way, the following processes/services were examined: 1 - Administration of the scientific initiation programs; 2 - Withdrawal of teachers for participating in events and qualifications; 3 - Issuance of diplomas for those who complete undergraduate courses; and, 4 - Creation of a new course or post-graduation research line.

Data were collected through interviews and visits through 2017. The research protocol followed the methodological rigor necessary to conduct interviews, direct observation in the work environment and access to documents and standards related to the investigated processes. The average duration of each interview was 50 minutes. Those involved during this collection a total of four managers, plus the CEO of this department. For the identification of KM practices and the critical knowledge involved, the methodology of IPEA (2013) was used as the basic guideline to elaborate the research protocol. This methodology was analysed in the DP sectors through interviews and questionnaires with their employees. In addition, documents (such as standards) were accessed and analysed according to the knowledge required for the execution of the processes. With the data, it was possible to perform the analysis of the elements and patterns identified in each source of evidence, allowing relations to be established, shaping data and pointing out convergences between the information collected. The main stages of this research are presented in Figure 2.

**Figure 2 - Stages of the research**



Source: Authors

At first, from the compiled data, an analysis of the current state of the DP was performed with respect to the way in which it manages its knowledge. In effect, this analysis was based on aspects such as the domain of activities by its employees and the elements related to the storage of information. In a second moment, considering the propositional nature of this work, in the sense of proposing a KM model for this department, a process of evaluation of the general scenario of the same was carried out using the deductive method, a resulting KM model is presented, as illustrated in Section 5.

From the analysis of the information collected and available, a triangulation of the content of the interviews, questionnaires and annotations from the observations was performed. From this triangulation it was possible to identify elements of knowledge that transcend the individual object, in this case the DP. It is observed that the model proposed here can be applied in environments with similar characteristics, which are intensive in the processing of information and knowledge.

## **4 Presentation of Data and Results**

DP develops, implements, and controls policies for supporting research, innovation, and post-graduation in a Brazilian research public university. The main services offered by this department are related to i) research - administration of scientific initiation programs, internal and external research funding, teacher release for professional qualification; ii) post-graduation -coordination, supervision, and assistance in the creation of courses and postgraduate programs; iii) innovation - coordination of the university infrastructure to foster and encourage innovation with an incubator, and technological innovation and entrepreneurship incentives. We mapped four routines executed within this department: 1) administration of scientific initiation programs; 2) release from lectures for qualification and participation in events; 3) issuance of diplomas for postgraduate courses; and, 4) support for the creation of new courses or postgraduate research lines.

### **4.1 KM Diagnosis in the Four Processes**

The result of the diagnosis of the four processes mapped is shown in Table 2. As such, it is presented the evaluation of critical knowledge necessary to execute each process, as well as the current status of the knowledge referring to criteria as dissemination, sharing, protection, among others.

**Table 2 - Definition and characterisation of critical knowledge**

Processes	Prioritised critical knowledge (criteria evaluated at level 3)	Critical evaluation criteria	Format and source of critical knowledge
Scientific research	<ul style="list-style-type: none"> <li>• Knowledge of software functions: 7 points.</li> <li>• Understand the stages of the scientific research process: 6 points.</li> <li>• Knowledge of standards: 5 points.</li> <li>• Knowledge of the edict: 5 points.</li> </ul>	<ul style="list-style-type: none"> <li>• SDK: 8 points</li> <li>• COK: 7 points</li> <li>• KP: 4 points</li> <li>• ACK: 3 points</li> <li>• GCK: 1 points</li> <li>• SPK: 0 points</li> </ul>	It is possible to notice the predominance of computerised knowledge in digital format (via computerized systems). For knowledge of the software, formalised or unformalised documentation does not exist; only verbal information is carried by a limited number of servers, which contributes to the fact that knowledge is critical because it is easy to lose data and enable errors during its transfer.
Departure for qualification and participation in events	<ul style="list-style-type: none"> <li>• Presidential Decree No. 1.387: 11 points.</li> <li>• Know CEPE Resolution 4.232: 9 points. (leaving for training (doctoral and postdoctoral) established by CEPE 4232 and the other is the short-term leave for events, research, meetings, governed by Presidential Decree No. 1.387.)</li> </ul>	<ul style="list-style-type: none"> <li>• SPK: 6 points</li> <li>• ACK: 5 points</li> <li>• SDK: 4 points</li> <li>• COK: 3 points</li> <li>• KP: 2 points</li> <li>• GCK: 0 points</li> </ul>	The format of knowledge is tangible and easily accessible documents. The criticality of this prioritized knowledge comes from knowledge centered on only one server responsible for every process. It can also be emphasized, with little relevance, that the format originates from a much larger body than the scope of the PROPP, that is the government, therefore, the impositions cover several academic units not addressing the specificities of each academy and each server.
Process for creating a new course or post-graduate research line	<ul style="list-style-type: none"> <li>• Knowledge of the edict for accreditation of emerging groups: 7 points.</li> <li>• Knowledge of the proposals of the groups: 7 points.</li> <li>• Knowledge of the policy of each emerging group: 7 points.</li> </ul>	<ul style="list-style-type: none"> <li>• SPK: 6 points</li> <li>• SDK: 6 points</li> <li>• ACK: 3 points</li> <li>• COK: 3 points</li> <li>• KP: 1 points</li> <li>• GCK: 0 points</li> </ul>	There is a positive point regarding the format and the origin of this knowledge, being a well-structured and formalized process. It should be stressed that dialogue among emerging groups is also paramount, and PROPP has also promoted meetings to disseminate the characteristics and proposals of the groups, providing greater interaction among course coordinators.
Process of issuing a diploma for graduates of the post-graduate course <i>stricto sensu</i>	<ul style="list-style-type: none"> <li>• Knowledge of the programs: 8 points</li> <li>• Knowledge of the online shipping system: 6 points</li> </ul>	<ul style="list-style-type: none"> <li>• SPK: 6 points</li> <li>• SDK: 4 points</li> <li>• KP: 3 points</li> <li>• ACK: 1 points</li> <li>• COK: 0 points</li> <li>• GCK: 0 points</li> </ul>	Analysing the online system of diploma issuance, there is a need for an explanatory/formalized manual, as well as the software of the CI process, mainly as a strategy to prevent failure at the moment of knowledge transfer, which is what happens with knowledge in the verbal-only format. Regarding the origin of this knowledge as well the process of CI and removal and creation of a new course, because the knowledge is of internal origin within the institution itself, it favours the implementation of changes in its format.
Legend:	<ul style="list-style-type: none"> <li>• SDK - Situation of sharing and dissemination of knowledge</li> <li>• COK - Situation of codification and organisation of knowledge</li> <li>• KP - Status of knowledge protection</li> <li>• ACK - Situation of acquisition/creation of knowledge</li> <li>• GCK - General characteristics of knowledge</li> <li>• SPK - Structure of personnel linked to knowledge</li> </ul>		

Source: Authors.

## 4.2 Versatility Matrix

After the mapping of critical knowledge, one performed the fulfilment of versatility matrix (Table 3), where we identified the level of skill of each worker in executing each process in the DP. It can be noted that only one DP employee has specific abilities to perform each process at the moment, which suggests high level of rigidity and dependence of DP relating to specific workers in specific organizational functions. Situations such as the eventual absent of a worker in a workday can cause problems, and eventually the incapacity of this department of provide timely a service required for external agents.

**Table 3: Versatility Matrix in DP**

Task	Level of ability in executing each task			
	Scientific research	Departure	Issuance of diplomas	Creation of new courses
Worker 1	4	1	1	1
Worker 2	1	4	1	1
Worker 3	1	1	4	1
Worker 4	1	1	1	4
Worker 5	4	1	1	1

**Legend:** 0 – Not enabled; 1 – In training; 2 – Need Help; 3 – Able; 4 – Specialist

Source: Authors



As a mean to solve the problem identified this matrix can be used as guide to plan mutual knowledge transfer processes between the workers in the DP. Programmed trainings sections can help to solve the low average of knowledge about the execution of processes, once the workers gradually will gain ability in executing more than one process. As result, this situation could diminish the dependence of DP on the specific abilities of each worker in execute each process, consequently enhancing the flexibility of this department.

### 4.3 A Resume of the Knowledge Management Modelling in DP

Based on the data obtained by the research and considering the specificities of the administrative areas of the universities, it is possible to synthesise, according to Table 4, the process carried out for structuring a KM model in the DP. Accordingly, this table presents a top-down analysis of knowledge management practices in DP, that ranges from the alignment of these practices with the strategic goals of this department until the current status of the knowledge management in the DP processes.

**Table 4: Synthesis of the phases carried in DP.**

Steps	Model Step	Evidence in the PROPP
Diagnosis	Organisational Context Identification of objectives / strategic focus	<ul style="list-style-type: none"> <li>The main strategic objective of PROPP is the development and encouragement of research for students and teachers.</li> </ul>
	Organisational Context Lifting of existing knowledge management practices	<ul style="list-style-type: none"> <li>Practices related to human resource management: communities of practice/knowledge communities, mentoring, coaching, forums (face-to-face and virtual)/mailing lists, narratives, corporate education, corporate university, training.</li> <li>Practices related to processes that facilitate KM: organisational/business intelligence systems/competitive intelligence, skills management system, individual competences bank/talent bank/yellow pages, organisational competences bank, organisational memory/lessons learned/bank KM, best practices, internal and external benchmarking, knowledge mapping or auditing, intellectual capital management/intangible asset management, online support, knowledge security.</li> <li>Practices related to the technological and functional basis of KM support: collaboration tools such as portals, intranets and extranets, workflow systems, content management, electronic document management (EDM).</li> </ul>
	Process mapping Activity splitting	<p>Four processes were mapped and the steps are presented according to their flowchart:</p> <ul style="list-style-type: none"> <li>Process of administration of scientific initiation activities;</li> <li>Process of removal from events and capacity building;</li> <li>Process of creating a new postgraduate course;</li> <li>Process of issuing a diploma for graduates of the post-graduation competition stricto sensu.</li> </ul>
	Lifting and prioritization of knowledge Characterization of knowledge	<p>Identification of critical process knowledge:</p> <ul style="list-style-type: none"> <li>Understand the stages of the scientific initiation process;</li> <li>Knowledge of software functions;</li> <li>To know resolution CPE 4232;</li> <li>Presidential decree No. 1.387;</li> <li>Knowledge of the notice for the accreditation of emerging groups;</li> <li>Knowledge of group proposals;</li> <li>Knowledge of the politics of each group;</li> <li>Knowledge of the programs;</li> <li>Knowledge of the online shipping system;</li> </ul>
	Identification of the official's degrees of qualifications	<ul style="list-style-type: none"> <li>Only a single employee dominates each process, so that the effective performance of these tasks is at the mercy of a specific person.</li> </ul>
Implementation	Linking practices to KM practices knowledge	<ul style="list-style-type: none"> <li>Process of administration of the activities of scientific initiation: situation of the sharing and dissemination of knowledge and situation of the codification and organisation of knowledge;</li> <li>Departure for qualification and participation in events: structure of personnel linked to knowledge and situation of acquisition/creation of knowledge;</li> <li>Process for creating a new course or postgraduate research line: structure of personnel linked to knowledge and situation of sharing and dissemination of knowledge;</li> <li>Process of issuing a diploma for graduates of the postgraduate course stricto sensu: structure of personnel linked to knowledge and situation of sharing and dissemination of knowledge.</li> </ul>
	Propose KM practices	Identification of gaps between KM practices and identified critical knowledge.
	Implement KM practices	
Control	Propose KM indicators	Measurement of the level of improvement of critical knowledge.

Source: Authors.

In this sense, the model was structured to understand the organisational context, identify the objectives and the strategic focus, to raise the existing KM tools and their current development stage. The mapping of processes and activities permitted to raise the critical knowledge, identify the degree of qualification of each employee, propose and implement initiatives that improve the process of KM in the DP and, finally, to present indicators to carry out the monitoring of these practices.

It should be emphasised that these initiatives must consider the deficiencies of information technology infrastructure, the difficulty in capturing undocumented knowledge, the lack of incentives, internal communication, and the current context of the universities as presented by Batista (2012).

## **5 Proposal of a Knowledge Management Model to Public Services Settings**

Based on the data of DP case study, in this section we introduce a conceptual model for knowledge management in public services settings. This model arises as the conceptual generalization of the main constructs observed in this case. Even though the case study does not permit the statistical generalization, this permit the detection of main constructs and categories with are commons to given categories of objects. In this particular case, trough the analysis of a department in a public setting it was possible identify commons knowledge elements, that should be presents in others public services settings.

Thus, according to Figure 2, for KM to be implemented in this department, a diagnosis of the organisational context was made, such as knowing the purpose of its activities, the organisational structure, and the strategic objectives. Further, to explore the context of this sector, it was necessary to identify KM practices related to human resource management, what facilitated.

Thus, from the strategic point of view, the process mapping was carried out, aiming to identify the key management and support processes. To assist the graphic visualisation of the strategic processes, a flowchart was used, following a technique introduced in Barnes (1982) for recording the processes in a simple and easy way. Thus, it was considered that a process is a sequential chain of a series of steps and decision points. In addition, in the process mapping stage, the activities and tasks that make up the analysed processes were decomposed. At this stage, the inputs and outputs, the people involved, the type of information handled, and whether or not a decision point (or verification) was present was evaluated.

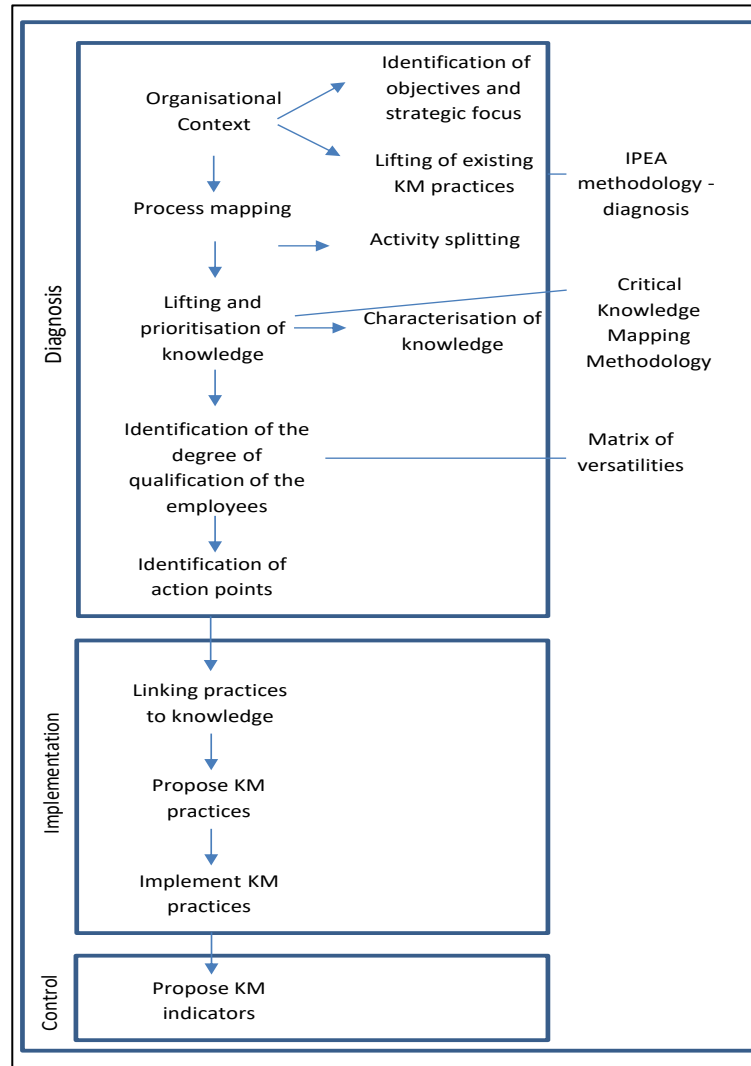
The third step of the model involved identifying the relevant knowledge of each activity described in the process. In this phase, therefore, the associated critical knowledge was identified through the application of the "Methodology for mapping critical knowledge in state public administration" (IPEA, 2013), grouped and ranked in descending order of importance. To analyse the critical knowledge of each process, six criteria (rules) were used: 1) personal structure linked to knowledge; 2) knowledge acquisition/creation situation; 3) situation of the codification and organisation of knowledge; 4) the sharing and dissemination of knowledge; 5) knowledge protection situation; 6) general characteristics of knowledge. In addition, it was possible to characterise the critical knowledge by specifying its format (internal documents, technical publications, database, verbal contacts, etc.) and origin (specific supplier, organisational unit, institution, company, university, etc.). Further, the degree of qualification of the officials was identified.

Thus, it was possible to identify the focus of action, considered so because the survey analysis, and the decision-making process of actions to be prioritised to work with the knowledge were identified as critical, especially the tacit knowledge, given that this type of knowledge were more likely to be lost by the organisation.

Later, it was analysed of the knowledge associated with each activity that composes the key process, making it possible to propose and suggest the implementation of adaptations of existing tools and applications of new KM practices that fit in the context of the process and could solve problems and generate improvements. If this suggestion were implemented as a KM model, it would be necessary to propose the indicators as well, which would allow delimiting critical elements for the project's success, which should be the focus of attention, being measured and monitored throughout the process.

The model proposed in Figure 3 arises from the scientific perspective as the main contribution of this work, because it was proposed through deep contact of researchers with the research object, who empirically investigated the DP. Further, we consider that this proposed model can serve as an instrument for different sectors of different public organisations, as a point of reference for the implementation of an effective KM system.

**Figure 3 - Schematic representation of the proposed theoretical-analytical framework**



Source: Authors.

Still with the purpose of provide a concise process of knowledge management, Table 4 presents the result of the compilation of the critical processes of DP, the main knowledge management practices and the example of some indicators. As such, Table 4 presents at the same time the instantiation and the detailing of the framework proposed in Figure 3. Accordingly, the diagnosis involves the identification of the critical knowledge of the DP, the implementation block in this figure is detailed in the identification of KM practice and the control is enabled by the establishment of indicators. It is important to emphasize that the relationships established between the identification of critical knowledge and the knowledge management practices, that will make possible the effective KM process through the enacting of routines with the purpose of retain and transfer knowledge between the persons of this department.

**Table 4: Critical knowledge x KM practices x indicators**

<div style="text-align: center;">KM practice</div> <div style="text-align: center;">Critical knowledge</div>	Communities of practice/knowledge communities	Cooperative education	Collaboration tools such as portals, intranets and extranets	Forums (face-to-face and virtual)/mailing lists	Content management	Knowledge mapping or auditing	Organisational memory/lessons learned/knowledge bank	Knowledge security	Organisational intelligence systems/business/competitive intelligence	Trainings	Corporate university	Indicators
Understand the stages of the scientific initiation process	x		x	x		x	x					<ul style="list-style-type: none"> <li>- Number of discussion groups on process and product innovation</li> <li>- Number of contributions valid for the organisational memory/intranet</li> <li>- Quality of stored knowledge</li> <li>- Degree of knowledge update</li> <li>- User feedback</li> <li>- Number of active practice communities</li> <li>- Statistics of use of the organisational memory/intranet</li> <li>- Employees' perception of available internal media</li> </ul>
Know the system/knowledge of software functions	x		x	x		x				x	x	
Knowledge of norms	x		x	x								
Knowledge of the edict			x	x								
Knowledge of CEPE 4232		x	x		x				x	x	x	
Domain of standard for short-term departure for qualification		x			x	x	x		x	x	x	
Knowledge of the edict for accreditation of emerging groups Knowledge of group proposals Knowledge of the policy of each emerging group	x	x	x	x		x	x			x	x	
Knowledge of programs	x							x				
Knowledge of the online system for issuing diplomas	x			x				x				

Source: Authors

## 5.1 An Analysis of the Application of the Knowledge Framework

The four mentioned management processes were mapped to identify the critical knowledge, the key necessary practices and indicators which permitted to propose the KM methodology. The IPEA methodology (IPEA, 2013) was used to carry out the diagnosis. It comprised three phases: 1) identification of managers' profiles; 2) identification of KM practices divided in three categories: human resources management with eight practices, KM facilitator processes with eleven practices, and a technological and functional basis to support KM with four practices. For each of these practices, in each of the four processes selected, the implementation stage was evaluated, which aims to analyse the existence of KM policies, and the scope, which intends to evaluate the degree of this implementation; 3) the degree of explicitness and formalisation of KM.

Regarding the process of administration of the scientific initiation programs, it was observed that the activities were performed by computerised means and that most of the analysed practices are unknown by the employees. No practices were rated at the highest level of the implementation stage and only one of them was rated at the maximum reach level (practice corporate education). It was observed that 60% of the analysed practices were at implementation stage 0 (zero). Four types of critical knowledge were selected and four were selected, according to the criticality ranking: 1) knowledge of the system/functions of the software; 2) understanding of the process steps; 3) knowledge of standards; 4) knowledge of public notices. It can be affirmed that the criteria "sharing and dissemination of knowledge" and "situation of knowledge codification and organisation" were the most critical because there was an incidence of critical knowledge with greater distances between the current and desired situations. For each type of critical knowledge, the associated information was characterised, especially with regard to the format and origin of knowledge.

For the process of events and qualification, five types of critical knowledge were identified and prioritised as critical knowledge and two types were prioritized according to the criticality ranking: 1) knowledge of the standard for short-term removal (Presidential decree No. 1387 and 2) knowledge of internal norm 4232. It is worth mentioning that many of the practices covered were unknown within the process studied, none of them was rated at the level of the maximum implementation stage, and only one of the practices that was related to facilitating management processes obtained the maximum reach, seen as widely disseminated in the organisation: organisational skills bank. In short, regarding the process, it can be affirmed that the criterion "structure of personnel linked to knowledge" is the most critical due to the

incidence of critical knowledge with greater distances between the current and desired situations. This criterion directly associated with the availability of and need for professionals and the structure and capacity of the team.

For the process of creating a new postgraduate course or line of research, five types of critical knowledge were identified and three types were prioritized according to the criticality ranking: 1) knowledge of the edict for the accreditation of emerging groups, 2) knowledge of the proposals of the groups, and 3) knowledge of each group's policy. Given the result of the stage of implementation and the scope of practices, it can be seen that there was an expressive number of practices in the process of creating a new postgraduate course, which is a positive point from the KM point of view. With the exception of the narrative, all the practices related to the process of human resources management were identified, most classified as already implemented by this pro-rectory and the others as already implemented, presenting important and relevant results. It can be seen that the criteria "personnel structure linked to knowledge" and "sharing and dissemination of knowledge" are those that present the greatest difference between the desired and current situations.

As mentioned earlier, the personnel structure is related to the availability of and need for professionals and the structure and capacity of the team; the sharing and dissemination of knowledge are related to the knowledge to be transferred and the source or recipient of knowledge or to the context in which sharing takes place, and the dissemination of knowledge involves communication within the organisation.

Finally, for the process of issuing diplomas for undergraduate courses in the *stricto sensu* modality, five types of knowledge were identified, and two types were prioritised following the criticality ranking: 1) knowledge of the programs and 2) knowledge of the online system for issuing diplomas. Based on the information obtained, it can be highlighted that most of the presented practices were unknown by the process. On the other hand, the few identified practices that were in the implementation stage presented important and relevant results. The need to apply these management practices in search of improving the process was then perceived. The process presented greater similarity between the desired and current situations, having a lower level of criticality, resulting from the cumulative experience of 10 years of the employee responsible for it. When analysing the knowledge format inherent to the process, there was a need for an explanatory/formalised manual as well as software for the scientific research process, mainly as a strategy to prevent failure at the moment of knowledge transfer.

After analysing the critical knowledge, the matrix of versatilities was elaborated as a way of assisting in the identification of the employees qualified for a certain task and exposing the presented gaps for the processes. It was observed that there was only one employee who dominated each process, being solely responsible for it. Note that for each process, there was only one employee with the cycle completely filled, characterising total activity dominance. The other employee had fractionated knowledge, that is, the basic knowledge of other processes that did not dominate. This fact negatively impacts the institution's KM, and sometimes, compromises the performance and quality of the service provided.

## 6 Conclusion

The objective of this article is to develop a methodology for KM for improving public services, specifically an administrative department of a public university. In view of the different processes carried out by the aforementioned DP, four processes were selected to carry out the research: 1 - administration of scientific initiation programs; 2 - release from lectures for qualification and participation in events; 3 - creation of a new postgraduate course or research line; 4 - issue of diplomas for postgraduate courses of the modality *stricto sensu*.

The main contribution of this work is the proposed KM model in an information- and knowledge-intensive environment in the context of public management. Nevertheless, this model uses tools already proposed in the literature, with emphasis on the methodology proposed by IPEA (2013). However, the proposed framework presents an advance of the application of KM tools in public settings where the predominant work is immaterial. As such, this model can be used as a reference guide for the development of KM practices for public departments with predominantly information and knowledge processing systems.

The limitations of this research include the development of the study from the perspective of managers of the processes of DP. For future studies, we suggest that this research be expanded to incorporate the vision of other public settings such as departments of the direct administration. Additionally, the users' vision would be included in the process dynamics, contributing to the identification of KM practices that may actually contribute to the improvement of performance indicators of these processes.

As future research suggestion, this study can be used to follow for the development of techniques of codification of explicit knowledge, as well as, information technology environments capable of storing explicit knowledge.



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