IT Services Reference Catalog

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Abstract— **Information Technology Infrastructure Library (ITIL) has become the best and most adopted practice framework to implement IT Service Management (ITSM) within organizations. Service Catalog is a fundamental basis in ITIL adoption because it is the source of information about services. However, organizations often fail in service identification activity, compromising the creation of the service catalog. Moreover, ITIL states how to develop a service catalog nor offers a standard one. In this paper, we propose an IT Service Reference Catalog (ITSRC) as a basis to start creating a Service Catalog or as a reference to adapt. We evaluated the proposal in real-world settings using Design Science Research methodology, and positive results were achieved.**

Keywords—IT services; service catalog; taxonomies; IT Services Reference Catalog

I. INTRODUCTION

Organizations struggle to deliver services that clients want [1] and to accomplish the difficult task of identifying Information Technology (IT) services [2]. The customers' needs and the services organizations offer do not often match [3]. This gap reinforces the importance in the alignment of efforts between IT and business. IT is not just a support tool anymore and has become a business' core, increasing the responsibility of the IT department, and the need to have good management practices [4]. The importance of IT Service Management (ITSM) has increased [5] since it promotes a better alignment between IT and business needs, managing efficiency through the provision of IT services [6]. As a result, organizations adopt best practices from IT Infrastructure Library (ITIL) [5] to ensure the delivery of IT services with quality, efficiency, effectiveness, and less cost [5, 7, 8].

When dealing with services, organizations' main problem is doing correct service identification. In a study conducted with over 100 companies that tried to implement a Service Catalogue (SC), only 57% were successful, and 12% were entirely unsuccessful. Moreover, 34% of these companies claimed service definition was crucial for the success of the service catalog implementation [7]. A poorly defined SC leads to bad ITIL implementations [3]. About 30% of ITSM projects do not finish because of the problems caused by the service definition [7]. A SC is the basis for the development of ITIL's initiatives and processes and allows organizations to understand business needs and the technical services that support these needs. However, despite the innumerous references made in ITIL books, neither ITIL nor other frameworks describe how to identify services [9], and there is no one standard SC, leading to errors and negative consequences [10]. The absence of references in services identification is alarming. Published work center their attention on the description of best practices or specific technological issues. The few techniques that exist in literature [11] are too complex and/or not verified in real life scenarios. Therefore, organizations avoid starting implementing a SC due to its difficulty and fail rate. Looking for quick wins [12], organizations often do not use any SC starting with the implementation of other ITIL processes such as incident management, problem management, etc. Other times organizations developed their own SC through their IT departments and, consequently, used technical language. When there is a misalignment between technical and business services, the use of technical language conducts to a lesser understanding of business services from the user's point of view. We stated that the existence of a generic SC would help organizations from the very beginning.

We propose an IT Service Reference Catalog (ITSRC) to solve the absence of a basis to start a SC. The ITSRC uses the technical and business services and is increased by a new "layer" in-between these two views – IT Services Group. This extra layer makes services more traceable and more organized, helping organizations to adapt and/or adopt a SC to their organization's specificities. This ITSRC is more accurate, complete and useful because it is general enough to be applied in different types of organizations. Therefore, in this paper the main goal is to define an ITSRC.

II. RESEARCH METHODOLOGY

We followed Design Science Research (DSR) as the methodology that best enables the confluence of people, organizations and technology, allowing us to produce, explain and validate a solution artifact accepted as valuable [13]. DSR designates artifacts to meet and understand business needs, explaining and improving behaviors. The focus of this methodology is on problem solving by creating and positioning an artifact in a natural setting. The evaluation is based on the practical implementation of the proposal in real organizations, solving identified problems. We develop and validated a proposal (ITSRC) to solve an identified problem. DSR is applied according to an interactive cycle with different phases [14]. The work presented in this paper was developed following the DSR cycle, where each section corresponds to a cycle phase. We start by presenting the

identified problem and motivation through sections I and III. In this phase, we address the problem related to a SC creation and the alignment between customers' needs and business in organizations. The review of related work underpins our proposal. After that, we describe the objectives of the solution and present the proposal's main goal. Section V details the proposal and presents the ITSRC. The following sections correspond to Demonstration through the application of the artifact in public organizations, and Evaluation in terms of utility, quality and efficacy respectively [13]. The DSR methodology ends with a Communication phase, which is this work.

III. RELATED WORK

A. Service Catalog Management

The SC Management process develops and maintains all information about the services provided. SC Management is, therefore, a fundamental process of Service Design from ITIL. A SC has two catalog service views [4]: technical and business. The technical service defines the technical details of IT services to supports the provisioning of business services. Each technical service has details of the service such as, objective, cost, and SLAs [15]. Business services catalog with a business view of all IT services delivered can be described as the focal points of business activities. They arise due to strategy definition and are shaped according to strategic requirements. In short, the technical service catalog provides the IT service, and the business service catalog translates what the customer wants without technical details. However, these catalogs do not have a clear link between views. The IT services groups presented in the proposal's solution address the lack of connection between the two catalog views.

B. Service Identification

A SC implementation should start by the service identification activity, even though this is the activity that most organizations fail to perform correctly [16]. There are several techniques to identify services [11] but none has become conventional. Some techniques were not tested while others are extremely difficult to be executed, and some of these do not link IT services with the business.

We analyzed Berger's work described in Kieninger et al. [17] to understand which services organizations usually use. Berger presented a predefined list containing six groups of services and inquired several organizations to mark those that are used within the organization. However, when the participants are inquired, Berger does not allow the opportunity to suggest other services not included in his predefined list.

C. Taxonomies of Services

"IDC's Taxonomy Services" [18] is a comprehensive and standardized set of definitions for IT and the business services marketplace. This taxonomy is a valuable reference because it links IT and business. To add more value to the IDC's taxonomy, we analyzed "International Foundation for Information Technology" (IF4IT) [19]. IF4IT has each IT disciplines with an IT glossary along with more than 114.000 entries, making it the world's most complete and comprehensive IT language reference. Although these classifications served as a foundation, none of them was sufficiently complete in IT service identification.
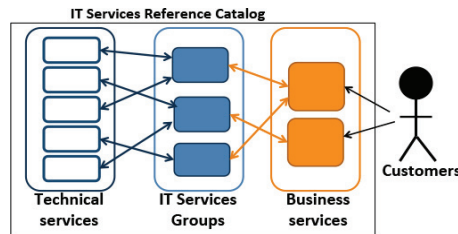

Fig. 1. IT Services Reference Catalog (adapted from [17])

IV. OBJECTIVES OF THE SOLUTION

In a SC, technical services are usually well-known and documented, but that is not the case of the link to business services. The aim of the research is to provide an ITSRC as a basis of a SC, focusing on the alignment between technical and business services through the definition of three main groups as illustrated in Fig. 1: technical services regarding the functionality offered; IT services groups as a set of technical services; and business services as seen by customers and reflecting what the IT department offers. The ITSRC helps in the creation of SC due to the relation between technical and business services and the IT service groups, meeting the customers' needs and reducing their misperception of IT services.

V. PROPOSAL

We start by collecting, selecting and comparing services from six different catalogs [20-25] putting them side by side to Berger's IT services groups [17]. After the first analysis, based on the results presented in a previous paper [26], we realized that we had some technical services not covered by any group. This led to an extension of Berger's work. In accordance with stakeholders' feedback, and as presented in the Demonstration section, we made changes. The new IT services groups created represent the services they encompass. We based ourselves on IDC's taxonomy [18] to categorize, aggregate, and define the new IT services groups by their functionality and technological orientation. Even with the new IT services groups, a few technical services remained without fit in any IT services groups. We also noticed that some business services do no fit in the proposal's catalog. This happens because these services are too specific to each of the organization's service catalogs used.

TABLE I.   IT GROUPS COVERED BY BUSINESS SERVICES CATALOG

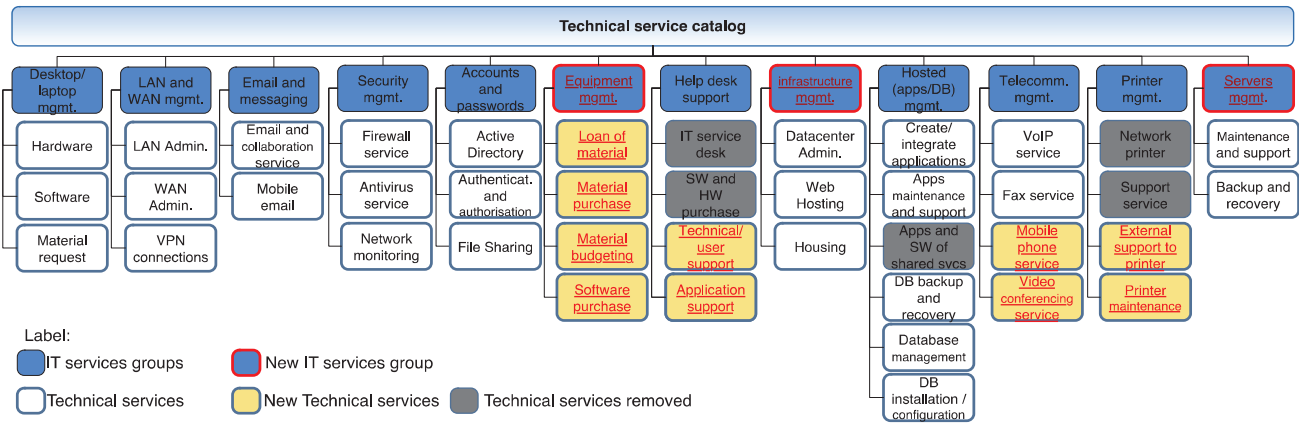| IT services groups	Business services catalog
• Local and wide area network operations management; • Telecommunication management	Network ~~and VoIP~~ and telephone service
• Printer management	Printer service
• Help desk support • Equipment management	Service desk service
• Email and messaging	Communication service
• Accounts and passwords	User accounts service
• Security management	Security service
• Desktop/laptop management	~~Computer/laptop support service~~ Workplace support service
• Infrastructure management	Infrastructure service
• Hosted application management • Server management	~~Datacenter service~~ Application service
• ~~Application management;~~ • ~~Hosting services~~	~~Applications service~~

Fig. 2. Final Technical Service Catalog of the ITSRC

With this analysis, we realized what IT services groups should be present in a service catalog, defining the technical service catalog of the ITSRC. Fig. 2. presents the result and Table I shows the business service catalog that encompasses the IT services groups of Fig. 2.

VI. DEMONSTRATION

To prove that the proposal's artifact can be used to create a SC, as well as to improve the artifact itself, we applied the ITSRC in public organizations. The results can be seen in a previous paper [26]. We applied the proposal in two new case studies: a City Council, and using the previous results in a public university. We made changes in ITSRC after the demonstrations and feedback received.

A. Case Study 1 - IT department of Pombal City Council

This organization does not have any framework of best practices implemented. They just follow some ITIL guidelines to improve the support given by the IT department and increase customers' satisfaction. We applied the service identification method [26] and when we finished, we had a 93% match to the previous ITSRC. We conducted 18 interviews and surveys to people with different IT responsibilities to validate the obtained results. In the technical service catalog, six groups suffered changes, and in the business service catalog only two business services were changed.

B. Case Study 2 – public university

We followed the same steps from previous demonstrations, identifying services from the identification method [26] and validating the results with IT stakeholders and customers. In this case, we obtained a 100% match of identified technical services in ITSRC. Only two groups of technical services suffered minor changes, and in the business service catalog there was no change.

C. Data Analysis and Final ITSRC

Given the demonstrations presented, and the previous results [26], we found an accurate evolution of the ITSRC from case study to case study, with minor changes to be made. The number of technical services has increased because the artifact was applied to distinct organizations and covers more services. This has made the ITSRC complete. We also realized that the number of new technical services is smaller in the following case studies. This shows how with each iteration, the ITSRC becomes more coherent and accurate. After these two new demonstrations, the ITSRC is completed. As illustrated in

Table I, we colored red the last introduced changes and struck through what was removed from the final version. Fig. 2 also shows the last evaluation in the ITSRC, namely the new IT services groups and technical services, and the ones to be removed.

VII. EVALUATION

We based the artifact's evaluation on the Pries-Heje et al. framework [27], which encompasses ex-ante and ex-post orientations. This research lies in naturalistic settings because we used the artifact to solve real problems, and it is also ex-post orientated as we instantiate the artifact in reality, hence obtaining tangible results. We made the artifact evaluation against quality factors from Moody's model quality evaluation framework [28].We did two types of evaluation. First, we evaluated the quality of the proposal's artifact from the ITSRC application in the case studies presented in the previous section. Table II presents the results of the quality factors' evaluation from surveys and interviews with stakeholders. Second, we compared the ITSRC with SC from organizations that already have one, evaluating the differences between them. On the one hand, we concluded that another SC was extremely technical with too much detail, hampering customers' understanding and usage. On the other hand, SC was mainly focused on IT services. We also notice that, besides the great majority of the IT services were in in the organization's SC, they do not cover all the ones presented in ITSRC, and so the proposal is much more complete. Also, most of the nomenclature used by other organizations matches the proposal's nomenclature in the ITSRC.

TABLE II. SUMMARY TABLE WITH OF QUALITY FACTORS' RESULTS

Quality factors		Observation
Completeness	¶	The artifact contains all relevant business requirements given their acceptance
Integrity	--	This quality factor cannot be applied in the artifact
Flexibility	¶	The artifact was easily changed with the addition, removal and changes in the ITSRC. Still, the few changes were easily performed.
Understandability	¶	The stakeholders involved understood the services of the ITSR and what is covered
Correctness	¶	The ITSRC does not use any particular modeling language. Still, the offered views were intuitive.
Simplicity	¶	The views were simple, only with the needed information, and adapted to the different stakeholders
Integration	¶	Through different iterations the final version was accepted fitting the organization's needs
Implementability	¶	The obtained catalog could be easily implemented in long term

VIII. Conclusion

Organizations achieve their success through business understanding, which undergoes the services clarification, laying in the identification of a SC. A SC is the basis for best practices initiatives, as ITIL. Unfortunately, organizations fail to identify the service catalog. Different sources, and through the feedback received from the experiments conducted, claim that it is difficult to identify services and consequently to create a SC. To make this problem worse, the language between IT professionals and the business they supply is often a barrier to success. In addition, there is no generic SC to be adopted as reference to help and promote the SC creation within organizations.

This proposal is the first IT reference catalog to solve identified problems, fulfilling the objectives of the solution in a sufficiently general way to be adopted by other organizations. Based on the developed experiences, we are convinced that the ITSRC can be used in the creation of a new SC or to improve and expand an existing one. The demonstrations and evaluations made in different public organizations confirm the previous statements.

An IT service catalog when deployed is never finished and will never be. Organizations need to be constantly ready for changes based on customers' feedback as well as for the development and improvement of the business. This expectation is in line with the proposed ITSRC and with ITIL continual service improvement. [26]

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