KNOWLEDGE TRANSFER EFFICIENCY IN EDP DISTRIBUIÇÃO (ONLINE TOOL)

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ABSTRACT
Knowledge management and information flow from EDP Distribuição to the contractors is one of the biggest challenges and greatly impacts asset performance. In 2015 a new contract-cycle began and the objective was that both the DSO and its service providers have a wide knowledge of the activities of the new contract in order to minimize the budgeting errors. This paper presents an online tool designed and developed to address these problems, focusing on knowledge transfer efficiency and the co-creation approach of the overall design process.

INTRODUCTION
Through the last 20 years, EDP Distribuição, the Portuguese DSO, outsourced most of its activity in construction, maintenance, commercial services and technical assistance to the network and customers. These outsourcing contracts have had medium length and due to increasingly fast technology advancements, contract updates and corrections were made during its duration.

The current contract-cycle defines 671 activities, spread out in 17 work classes. Since an activity could be used in several work classes and for different tasks, in order to comply with each technical specification in use, the budgeting system allies each activity with the required materials resulting in over 4500 possible selections (denominated Construction Units). Each intervention requires the user making the budget to select the applicable Construction Units, to face all the tasks to be performed by the contractor.

In this context, knowledge management and information flow, within EDP Distribuição and to the contractors, is a big challenge and greatly impacts asset performance. When a new 5-year contract-cycle begins, there is a transitional period with decreasing budget quality. Records also show that the changes made during a contract (new tasks, the introduction of new technologies and system updates) have a variable field of application due to workers lack of knowledge of the activities, details of the tasks involved and the budget system. In 2015, when a new contract-cycle began, the objective was that both the DSO and its service providers have a wide knowledge of the activities of the new contract model in order to minimize the budgeting errors.

SETTING THE PROBLEM

The Business Context
Contract management and subsequent major and minor updates to all the activities involved in such contracts is done in a centralized fashion, leveraging the company negotiation capabilities, providing a global overview and a more tight control over the outsourcing contracts. Nevertheless, the local teams, geographically distributed over the country, are responsible to exercise such contracts, budgeting and defining the activities required for each specific project. In order to mitigate budgeting deviations and errors, each budgeting officer must have the knowledge of the required activities for each project, including which equipment, tasks and standard procedures are included within the outsourcing contracts. Furthermore, such contracts comprehend several types of activities for all voltage levels, facilities and equipment leading to a budgeting manual that is 900 pages long. Usually each budgeting officer is assigned to a specific portion of the grid, whereby (s)he does not need to have the knowledge of the entire document on daily activities.

Therefore, there was an internal necessity for a system that could ease the transfer of contracts content and updates in a just-in-time manner taking into consideration the following challenges:
- Increasing contracts continuous update rate
- Geographic grid and procedural asymmetries
- Budgeting officer specialization
- Training of new employees or change of budgeting specialization

The creation of an easy to use digital tool, the ITM - Interactive Technical Manual, always up to date, would abolish any knowledge transfer barriers, enabling users to have a convenient medium to clear all possible doubts..

Managing Knowledge Across Organizational Transitions
A growing awareness of the importance of managing organizational knowledge, lead to an increased interest in the issue of how to build information and communication technology (ITC)-based systems to support knowledge management activities, i.e., knowledge management support systems (KMSSs). Knowledge banks/bases are now a common technique to connect people to information and knowledge resources [3]. Still, building
upon the technology acceptance model (TAM), an investigation of the factors impacting on end users' acceptance of enterprise content management (ECM) systems [5] suggests twenty-two factors at the enterprise, process, technology, and content level that can influence ECM success, revealing the complexity of leading such projects to a desirable outcome.

Knowledge and its manipulating activities are sociotechnical phenomena in which social and technical factors interweave the ways in which people work. Moreover, knowledge can be both an instrument for organizational transformation [2] and an asset at risk as an organization undergoes socio-technical transitions motivated by the new ecology of strategies, regulations and practices making its Business context [4]. Therefore, the success of any knowledge management support system depends not only on its technical excellence, but also on its compatibility with the social and cultural fabric of the firm in which it is embedded. An ANT-based investigation [1] also points to a need to recognize contextual elements of knowledge management, namely, Business Thing, Knowledge Thing and Knowledge Actor, together with a Role ontology, thus pointing to acknowledge the multiplicity of actors/roles concerned.

In this perspective, the very genesis of the ITM project was an idea shared on a internal innovation workgroup, by one of the potential end users of this tool. An expert team was assembled with members from the several departments that would manage, implement, feed and use the tool. The design and development of the knowledge system and web platform was addressed following an approach of co-creation ensuring that the several stakeholders not only were heard but called to action and decision-making during the process of design, development, deployment and dissemination.

INTRODUCING ITM

In the conception of ITM several contextual requirements were mapped which led to the identification of central concerns. As previously introduced, in the beginning of this project, current company practice mandated that contractual regulations be stabilized over a five year period, thus being updated mostly because of the introduction of new distribution network regulations or more advanced materials and techniques. In between, the company operates on the basis of budgeting manual that normalizes the kinds of work performed on the infrastructure, what should be done by contractors, as well as reference materials, quantities and associated norms and regulations. Whenever such changes are introduced, a network of people across several divisions (financial, planning, infrastructure, etc) need to adapt and follow new common practices.

Between bigger updates, each five years, several erratas, complements and updates are needed and distributed through a central document system, from which people download and print versions for personal use. After a while several digital and printed versions of the manual are lying around, and it becomes difficult for people to make sure they are using the right version, creating a situation of uncertainty prone to decision errors. As expected these update events periodically induce a disturbance in individual and team performance across the organization originating several budgeting accidents and inefficiencies.

The complexity issue around the budgeting of maintenance works in this context, lead to the emergence of a loosely structured tacit knowledge scenario where a large part of the personnel’s competence is due in large part to a significant investment in personal knowledge of particular budgeting contexts. In order to approach these problems, the team conceived and developed a system around the architecture shown on Figure 1.

ITM is a web-based online knowledge portal, designed around two main modules:

a) MANUAL: a contract module with contractual task information, specifications and associated media to help understand the works and materials used; and

b) USE CASES: a budget case module (with real life cases) to train and assess how comfortable the user is with particular contract tasks and budgeting under specific contexts.

These two areas constitute the core of the available operational content for Budgeting Officers to access, learn and train their budgeting competences according to the new rules. USE CASES approaches the issue of knowledge transfer between experienced employees and the new collaborators by allowing the training based on the study of actual cases and good practices.

Other supporting content is available from TERMS, a glossary of most common and domain specific terms and expressions; MEDIA, a repository of images and videos of the activities, equipment or components relevant when budgeting a new contract service and DOCUMENTS, a repository of more specific set of files related to norms, various regulations that apply and must be followed. Collaborators can easily search by a general term or expression and ITM promptly renders the relevant results in each of these five types of available content.

ITM is available online (in Portuguese), although only registered users (EDP Collaborators and Partners) have
access to the content, according to their permissions.

**Interactive Manual**

After the correct authentication, a Dashboard welcomes the user on each new visit, offering a quick overview of changes to content such as new activities, new cases, updates of existing content, and quick links to associated Documents, Media and bookmarks.

To preserve a familiar structure from previous iterations, the normative document of the MANUAL is organized along two main indices: by class of work (sidebar) and by activity groups, as illustrated in Figure 2.

![Figure 2. Indexing page of the MANUAL, reflecting the two views over information and one of the major changes of perspective over the continuous contract budgeting](image)

When selecting through those hierarchies the user quickly reaches the basic information unit: the manual page for each individual budgeting task. Each activity page (Figure 3) details task information and aggregates previously scattered documentation, such as norms, standards or operational files needed and related with the activity, the officers, frequently consult or use.

![Figure 3. Detail of the content for a specific activity in the MANUAL: visuals, relevant documents and added notes and comments help budgeting officers](image)

At the level of the individual activity the page is structured in a regular composition that is responsive across a diversity of device formats. A code, designation, descriptions, relevant work classes, activity group and subgroup, included and excluded items, as elicited from previous versions of the Manual. Media and Document sections were included in the right, offering extra information and quick links to related documents and files, thus giving an extra reason to consult this page.

On the bottom of the left sidebar, the ITM user can select or swipe left to reach the budget case library and vice-versa, allowing for a more interactive and contextual experience with the available content.

**Budget Case Library**

The budget case library component USE CASES was designed to offer a way to preserve and share semi-structure budgeting knowledge, around the idea of studying and adapting archetypal solutions for common situations as a way of training new personnel. With each new project the professional is required to study the work context, applicable norms and regulations, and construct a budget specific for the situation, having as a basis the project documents and plans associated with the particular process. As such, with each new case comes a new solution, composed of several work orders, bill of materials and applicable rules, norms and explicit contractual assumptions. This basic structure is normalized across the base of budgeting cases circulating in the company as Guia de Orçamentação - Casos, a PDF document, with a hundred of different budgeting cases of more or less familiar situations, with proposed solutions.

Adopting and building on these grassroots model seemed a natural way to preserve and enhance an already existing knowledge capital.

Figure 4 shows the detailed page of information for a particular case on the USE CASES library. Each proposed budgeting example has a description, one or more summaries (problems) to budget, some schema and diagrams or other visuals to help the officer understand the context of the problem. The case has a fit proposed solution, roughly built as a set of activities and quantities of construct units that need to be subcontracted.

![Figure 4. Detailed page of information for a particular case on the USE CASES library](image)

Once studied the case, the officer can train and try to find the (or a) solution on his/her own. The solution is hidden and a new screen is presented, mimicking the actual system of budgeting, simulating a process of picking and selecting the set of relevant and (no more than) the necessary activities to contract for the particular case. Her/his performance is measured against the proposed solution in the system and the train can result in several sessions of improvement. ITM can help by prompt warnings and suggestions when the officer is selecting and obtaining a less than optimal solution.
This mechanic both supports the first steps of onboarding junior budgeting officers along with self-learning, self-training and the work of more experienced users that can train more complex cases or be proactive in proposing new maintenance budget cases to be included in the library, thus being further disseminated as good practices for budgeting.

On the bottom right of the sidebar, the ITM user can select or swipe to promptly reach the MANUAL or directly access the content of each of the activities listed on the good practice solution of the case provided.

**Key Features and Expected Benefits**

ITM is a user friendly tool, available online for DSO workers and contractors. Although still in beta, the system is operational and fully functional since July 2015 for a limited number of users (+700).

ITM enables anytime-anywhere access, onsite consulting and budgeting training. It is a solution to enable rapid and easy access to a single source of the normative information, basis for contractual obligations assumed by subcontractors when taking over network maintenance works. Since ITM provides an online, unique point of access to the information to be consulted both inside and outside the company, it allows for a growing fitness of procedures. The problem of several - sometimes, outdated - printed or locally archived versions of the Manual was minimized, by providing a searchable knowledge base of information on a single point.

Another of the key operational benefits rests on the fact that ITM allows for a regular updating of information and the possibility to notify and contact each collaborator directly, both by email and on the platform, in case of urgent updates, procedures highlights or other. Once a new activity is inscribed in the Manual or a new Case is added, all the budgeting officers and subcontractors can be informed and may see the new information immediately available.

A BACKOFFICE area organizes all the administrators’ tools and features for managing the different types of content and users’ profiles and consult some statistical usage data. Simple gamification strategies (achievements notices, symbolic personal awards, and progress feedback) were deployed to try to engage users and increase tool’s usage providing an immediate feedback aiming for a recurring use. Administrators can use these data and tools to come up with reinforcement strategies or provide oriented suggestions to the collaborators.

**REFLECTING ON THE TRANSITION PERIOD**

Thalmann [6] points out that scholarly knowledge management literature mainly concentrated on the facilitation of knowledge sharing and widely neglected the issue of organizational protection of their knowledge in their organisational risk management. More than securing its knowledge assets the ITM team found it more important to consider the capacity and resilience the organization could show by leveraging the distributed knowledge assets across its internal units to effectively coordinate a coherent and efficient performance during changing times of budgeting.

In this light, the ITM innovation effort addresses the problem of achieving a competitive advantage through the protection, dissemination and update of knowledge assets. With an approach inscribed in the already well established operational culture, the project could focus on how to create a knowledge base, to accurately share and manage formal and semi-formal knowledge assets, as an instrument for inducing a transformation of culture, and transition to updated operational practices.

Albeit ITM is still a pilot, with access distributed to a few hundred collaborators, usage data shown in Figure 5 allows to conclude that the system is starting to gain a solid base of regular users, after some initial spikes following dissemination events.

It is notorious the impact of the dissemination sessions (around end of March and beginning of April) and the slightly growing number of regular users and accesses, attesting for an habit gradually being built. The collected usage data indicates a positive user reception, particularly around the sessions with users, but also the urgent need to complete the next steps of dissemination to reach more users, improve the USE CASES library and establish ITM as the sole knowledge repository for better contract knowledge sharing.
In the short period in the terrain, the team has already identified the next steps: budget simulation (allowing for training an exploratory budget scenario) and system integration (integrating ITM with the rest of the information corporative system in the company.

MISCELLANEOUS

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