

Knowledge Transfer in IT Service Provider Transition

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Abstract: Although outsourcing Information Technology (IT) services brings benefits, it might cause loss of knowledge and dependency of the contractor in relation to the service providers. When a transition occurs between providers, knowledge sharing is essential for the contractor and to the new contracted. This paper presents the proposal, execution and evaluation of a knowledge transfer process to the transition phase of a contract. A case study was conducted in a Brazilian Federal Government Organization during a contractual transition. Data collected from two projects allowed the evaluation of the proposed process. It was observed that the training activities performed, and the granting of access to process information and to the services to be transferred were essential to an effective knowledge transfer. Although this work is a study of a single case, it was observed that the process could be generalized to service provider transitions involving contracting organizations of IT services.

1 INTRODUCTION

Strategies to outsource IT services are on the increase in today's organizations. However, the loss of knowledge for clients has been reported as a recurring problem that may lead to their depending on the parties contracted and to issues in the transition between service providers.

The end of a contract and the start of another, a process known as contractual transition, is a critical moment as it is in such a period that knowledge has to be finally transferred to the contracting party, and also be handed to the new contracted party to provide services (Grim-Yefsah et al., 2011).

Knowledge transfer during the contract minimizes the dependence between the contracting and contracted parties and it is an important factor for success in the contracting effort (Blumenberg et al., 2009). The eSourcing Capability Model for Client Organizations (eSCM-CL) supports the client-contractor relation. The model has a contracting life-cycle and provides a set of practices for knowledge transfer to boost the consistency and the quality of the work done by the parties (Hefley and Loesche, 2006).

Samsudin et al. (2012) point that government bodies are not prepared for the end of a contract.

Considering the difficulty that the contracting parties have in a contractual transition (Urbach and Würz, 2012), the planning, the monitoring, and the support of knowledge transmitter are essential items for an effective transfer in this period (Samsudin et al., 2012; Deng and Mao, 2012).

For Brazilian Government organizations, the outsourcing of IT services is established by the law (Brazil, 2012) and supplemented by the Normative Instruction no. 04 of September 11th, 2014 (IN 04/2014). One of the goals is to avoid the loss of knowledge, with practices for knowledge transfer between the contractor and the contracting party through all the contract cycle, and especially at its end (Brazil, 2012).

In this context, and given the stages of the life cycle in outsourcing of software development services, the research question was *how to define a process for knowledge transfer in a contractual transition involving software development services?* The goal of this work was to propose a process to transfer knowledge at the time of a transition between software development service providers. A case study was conducted to analyze the execution and refinement of the process at hand in a Brazilian Government body, herein named *Ministry*.

This work is structured into six sections. Section

2 presents the eSCM model with emphasis on its practices and some works of research that entails knowledge transfer in a service provider transition. Section 3 presents the materials and methods used in this work. Section 4 provides the methodological plan. Section 5 presents the execution of Stage 1 – Process Definition and Section 6 presents Stage 2 – Case Study. Section 7 provides an analysis of the results. After that we present our Conclusions.

2 KNOWLEDGE TRANSFER IN IT SERVICE PROVIDER TRANSITION

The eSCM-CL is a model of capability whose focus lies on the predictability of the process and its results. The model is divided into three dimensions: *Sourcing Life-Cycle*, *Capability Areas*, and *Capability Levels*. The Sourcing Life Cycle dimension is split into *Ongoing* (containing practices that cover all the cycle) and the *Analysis, Initiation, Delivery* and *Completion* stages.

Given the scope of the model as related to the life cycle of a service contracted, issues such as knowledge management and transfer of resources and knowledge are practices dealt with in the model. The practices of Service Transfer area are performed on the *Initiation* stage. The practices of Service Completion area are performed on *Delivery* and *Completion* stages. On *Ongoing* are performed the practices of Knowledge Management area.

The areas of Knowledge Management (KNW), Service Transfer (TFR), and Service Completion (CMP) were identified as having practices that involve knowledge transfer and contractual transition. The following practices were selected in this work:KNW01 Provide Required Information; KNW02 Knowledge System; KNW04 Lessons Learned; KNW05 Share Knowledge; TFR01 Service Transition; TFR03 Resources Transferred Out; TFR04 Personnel Transferred Out; TFR05 Knowledge Transferred Out; CMP 03 Resources Transfer from Service Provider; CMP 05 Knowledge Transfer from Service Provider.

The *Analysis* stage deals with internal actions of the contracting party to evaluate one's needs to contract. No practices were found in this stage for the context of this work. In this sense Grim-Yefsah et al. (2011) present a set of activities that are carried out at this point. The inventorying of internal and external documents, as well as the code done is in the Third Party Maintenance activity. The

Knowledge Transfer process between the service providers is an activity that includes the transfer of documents, applications and code. In the Maintenance in Cooperation activity, the two service providers execute the maintenance of a system and, in the last activity, the final transfer of the responsibilities to the new service provider takes place.

In these activities Grim-Yefsah et al. (2011) identified good practices. The first one entails meetings between the service providers (the old one and the new one) with the participation of the client, to allow a presentation of the artifacts and the knowledge transfer on the project. The authors also consider cooperative maintenance as a good practice, where the two service providers work in tandem on the joint maintenance of some application.

Alaranta and Jarvenpaa (2010) present facilitating elements for knowledge transfer in transition periods, such as modularization, reuse of 'outside' expertise, joint collaboration e personal identities at work.

3 MATERIALS AND METHODS

This section presents the materials and methods used in this work. The research is descriptive as it aims at identifying, recording and analyzing characteristics that relate to the situation or phenomenon. As regards the technical procedures, we used bibliographical and document research, as well as the application of a case study, given that the goal was to produce knowledge based on a practical and unique case.

The methodology had two stages: Stage 1 - *Process Definition*, and Stage 2 – *Case Study*.

3.1 Stage 1 - Process Definition

In stage 1, a bibliography review was performed to search for elements and practices of knowledge transfer in service provider transition processes. Documents of the client organization were also analyzed to characterize the object of study, as regards service provider transition. After that, semi-structured interviews were conducted with the goal of understanding how the transitions in previous contracts had occurred and what were the perspectives and preparations to the new transition.

Based on the bibliography and document review performed, a new process for Knowledge Transfer was proposed to the Ministry.

3.2 Stage 2 - Case Study

From the Knowledge Transfer process defined in Stage 1, the case study technique was applied to analyze the execution, evaluation and the refining of the process proposed to the body. The case study was conducted in five steps, as suggested by Runeson et al. (2012): 1)Project for a case study: definition of goals and planning the case study;2) Preparation for data collection: defining procedures and protocols for data collection; 3) Evidence collection: carrying out of data collection procedures on the case study; 4) Analysis of the data collected: The analysis procedures were applied to the data; and 5) Report: the study and its conclusions were packaged in a format appropriate for its relaying.

3.2.1 Case Study Project

A Brazilian Government body that would go through a process of contractual transition was chosen. At this point, we defined the goals and the planning for the case study, as well as the research question.

3.2.2 Preparation for Data Collection

At this point, the case study was characterized and a plan was produced for the data collection.

Characterization of the Object of Study: the object, named in this study as *Ministry*, is a Brazilian Government body. The IT area consists of 4 coordination offices. The IT Coordination has a Division of Systems Development (DSYD) responsible for managing software service providers.

Brazilian law provides that civil servants should carry out all management activities. The Ministry’s IT area has a small number of civil servants, which hampers the transfer of knowledge, making the scenario critical for a service provider transition. In the service provider transition period that lasted from December 2016 to February 2017, the IT Coordination area had 3 staff: One head and two analysts.

The contract then in force had implemented two providers who worked with: software and service providing and quality support services. For the new contract another service provider was planned and contracted: technology support.

The definition, execution and evaluation of the transfer process was carried out during the contractual transition period, with an emphasis on an agile software development process (MASDD) (Souza Sobrinho et al., 2015).

MASDD is a process consisting of six sub-

processes in which activities, roles, and artifacts were defined, aligned with agile practices and with elements of knowledge transfer ((Brito et al., 2017)). The roles involved in the process entail all the aforementioned service providers and the Ministry’s civil servants. There are the roles of Project Leader (IT Analyst) and the Product Owner (PO) who is the demanding party in the project.

Preparation of the Data Collection Plan: to analyze the results produced by the proposed process, we used the Goal-Question-Metric (GQM) approach as put forward by Basili and Weiss (1983).Table 1presents the resultant GQM.

Table 1: Resultant GQM (Source: Authors).

Goal	Question	Metric
Understand the efficacy of knowledge transfer activities during the service provider transition	What is the productive capability of the new provider?	Ready Rate
		Sub-process duration
	What is the efficacy of the transfer activities as done?	Reuse of specialists
		Adherence to the process
Understand the perception of those involved in the knowledge transfer activities in the service provider transition	What is the perception of those involved in the transition, on the transfer activities done?	Training-execution ratio
		Doubts
		Level of satisfaction of the new provider about the training
		Perception of all involved on the knowledge transfer process

The data on productive capability is of a quantitative nature that allows assessing how the process of knowledge transfer helped with the fulfillment of deadlines and delivery dates of projects. We defined the Adherence to the Process metric to find how much of the project executed (hence transferred) complies with the process proposed. The percentage of people that are executing the process, as well as of those who took at least one of the training courses proposed and those who are executing the process is calculated in the training-execution ratio.

According to Argote and Fahrenkopf (2016), measuring the transfer of knowledge is a challenging task and the approaches most used are questions and observations of the data collected during the

knowledge transfer experience. In this work, the techniques adopted included semi-structured interviews, questionnaires, and observation.

3.2.3 Evidence Collection

In the collection stage, the metrics of the first goal of GQM were gathered through archival data and observations. In order to obtain a general view of the case studied and boost the level of precision, more than one observer was assigned to the task, as suggested by Runeson et al. (2012).

A questionnaire on satisfaction, previously defined in Stage 2, was applied during the training period. The questionnaire consisted in a set of aspects related to the Training, Instructor and a general evaluation. Each aspect was evaluated as Weak, Regular, Good or Excellent. At the end of the process of knowledge transfer, the semi-structured interview was performed with the transcription of the answers into a document.

3.2.4 Analysis and Report of Collected Data

The objective data gathered from the archival data was blended with the observations made during the execution of the project in the analysis stage, and then related to the questions and objectives defined in the GQM. The answers obtained in the questionnaire were presented in graphs to allow the visualization of the results, with their categorization according to the activities proposed in the knowledge transfer process.

Based on the data analysis, a report was generated with the results of the evaluation and suggestions for the knowledge transfer process improvement. The sections below present the execution and the data collection efforts.

4 STAGE 1 - PROCESS DEFINITION

Based on bibliography and documentary reviews performed, a knowledge transfer process for the provider's transition stage was defined for the body under study.

The Ministry's contracts were analyzed. For the outgoing service provider contract, the transition plan was optional and the activities of knowledge transfer were not planned. In the new contract, the transition plan was mandatory and an overlapping period is provided to support the service provider-to-be.

In trying to acknowledge the scenario of a transition period, we conducted interviews with the Head of the DSYD, the Head of the Office Project, and the Management Support Rep. These procedures enabled us to gather a set of practices: Collecting lessons learned from the outgoing service provider; Refining existing processes (from the experience of the outgoing service provider). Collecting feedback on possible refinements to the processes); Holding meetings amongst the service providers with the mediation of the body; Preparing the infrastructure for the incoming service provider; Collecting transfer data to support the drafting of the next contract.

Based on the analysis of the documents and on the interviews, a Process for Knowledge Transfer was put forward for the service provider transition stage. The process proposed entails the stages of Completion and Initiation. Three roles were planned for process execution: the contracting organization, the outgoing service provider, and the incoming service provider.

In the process proposed, there is a period between the two stages, as planned for an overlapping of the service providers, where the old and the new service provider should interact, remotely and in person, to share information. The process proposed is shown in Figure 1.

The audit work is an internal process of the body. This process is aimed at ensuring that the final version of the products and their documentation get delivered, that the software developed throughout the contract have been catalogued, that the final transfer of knowledge did take place, and that all the resources and accesses have been revoked, as provided in (Brazil, 2014).

In the Initiation stage, the Insertion Plan artifact should be prepared pursuant to Brazilian legislation, (IN 04/2014). The plan deals with the planning at the start of the contract, with a meeting held at its beginning and followed by the preparation of the infrastructure to support the incoming service provider.

The organization should have a guide of good practices to undertake such qualification program by the body, the Guide - Training Model. According to guide and to the two references used for the activity, the body should provide an environment for the provider to access the information needed. A definition should be produced in the process on the structuring and use of a remote learning (EAD) environment as well as a Wiki to make the process available, as recommended by Marques-Lucena et al.(2015).

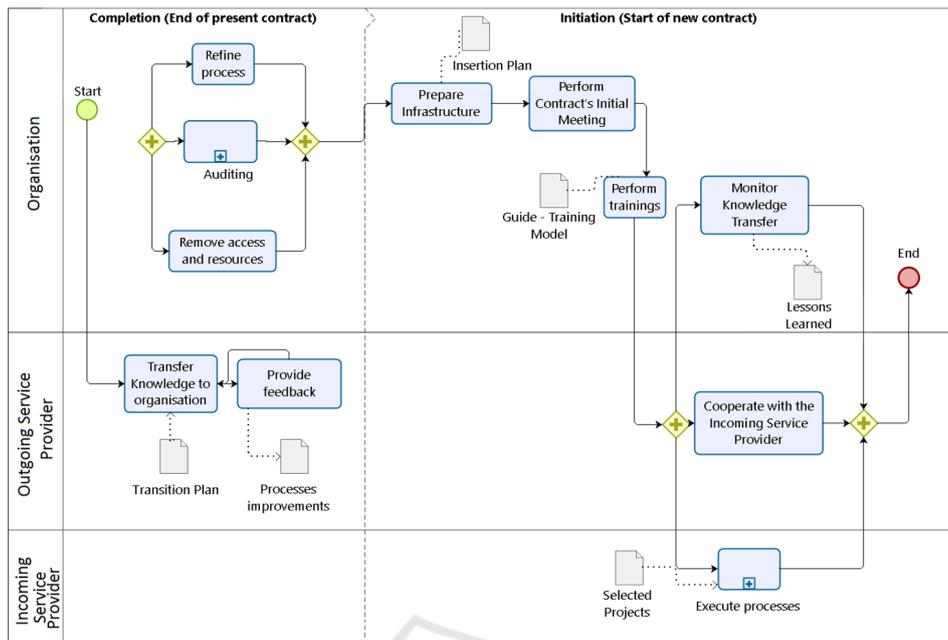


Figure 1: Knowledge Transfer Process in Service provider Transition (Source: Authors).

Table 2: Process activities (Source: Authors).

Activity	Goal	Base Used
Transfer knowledge to organization	Outgoing service provider should transfer knowledge during the contract to the organization, following the body's Transition Plan.	<ul style="list-style-type: none"> IN 04/2014 CMP05: Knowledge Transfer from Service Provider Activities: Responsibilities in the Transfer, Editing, and Validation of a Transfer Plan (Grim-Yefsah et al., 2011)
Provide feedback	Outgoing service provider should provide feedback about the process.	<ul style="list-style-type: none"> Interviews
Auditing	The organization should audit the services provided by the outgoing service provider.	<ul style="list-style-type: none"> IN 04/2014 Responsibilities in the Transfer Activity (Grim-Yefsah et al., 2011)
Refine Processes	Organization should refine the current processes before transferring them to the incoming service provider.	<ul style="list-style-type: none"> Interviews
Remove access and resources	Organization should remove the given resources and accesses from the outgoing service provider.	<ul style="list-style-type: none"> IN 04/2014 CMP03: Transfer of Resources from Service Provider
Prepare Infrastructure	Organization should plan and prepare the infrastructure that will be used by the new provider.	<ul style="list-style-type: none"> KNW02 Provide Required Information IN 04/2014
Perform Contract's Initial Meeting	Organization should establish the services that will be provided and introduce the parties involved.	<ul style="list-style-type: none"> KNW02 Provide Required Information KNW02: Knowledge System KNW05: Share Knowledge
Perform Trainings	Organization should introduce and transfer knowledge on the processes to incoming service provider.	<ul style="list-style-type: none"> KNW01: Provide Required Information KNW02: Knowledge System
Monitor Knowledge Transfer	Organization should monitor execution of the processes at the start of the contract to ascertain the efficacy of the transfer.	<ul style="list-style-type: none"> KNW04: Lessons learned
Collaborate with Incoming Service Provider	Organization should seek to answer eventual queries on the processes, projects and systems with the incoming service provider.	<ul style="list-style-type: none"> KNW05: Share Knowledge Organize personal meetings and Knowledge Transfer activities (Grim-Yefsah et al., 2011) Joint Collaboration (Alaranta and Jarvenpaa, 2010)
Execute Processes	Incoming service provider should start service provision as provided for in contract.	<ul style="list-style-type: none"> -

5 STAGE 2 – CASE STUDY

From the Knowledge Transfer process for service provider transition defined, we used a case study technique to analyze the execution, evaluation and the refining of the process proposed to the body, our object of study.

5.1 Completion

As there was no provision for a transition plan, there was no prior plan for the final transfer. However, the service provider delivered the final versions of the products and their associated documentation. This delivery was verified in their auditing process. Apart from that, the body revoked all access privileges.

At the end of the contract the service provider identified points for improvement in the MASDD process which, along with monitoring of pilot-projects (Sousa et al., 2016), allowed the refining of the MASDD with the goal of preparing it for the new service provider.

5.2 Initiation

With the new contract in force, the infrastructure support area took some time to grant access profiles for the new service provider. These profiles allow the access to documentation and to training resources. After that a start-of-contract meeting was held that covered aspects such as service orders, contract penalties, and existing processes within the body.

5.2.1 Training Execution

The training program was proposed in modules that were made available on the Distance Learning platform and provided in a classroom environment.

The classroom sessions were done in two days due to time constraints of the service providers. Slides were used in the presentations related to the contents. A practice work approach was used in order to present the requirements management tool.

There were 14 attendants on the first day and 6 on the second.

With the intent of evaluating the quality and efficiency of the training program, a questionnaire was applied to capture the perception of the parties involved on the process of knowledge transfer.

5.2.2 Collaboration with the New Service Provider

The collaboration of the former service provider with the incoming one might take place via meetings, information transfer or even an effort on joint development / maintenance. No provision was made in the then-in-force contract for an overlapping period.

5.2.3 MASDD Process Execution

Work to monitor the transfer of knowledge was done during the execution of the process, via the participation in process activities, as observers, and through the archival data. A project was under way during the contractual transition period, having been developed, namely Project 1. A meeting was then held to enable the transfer of this project, with the business analyst of the software factory, to present what the project was about and its history.

The knowledge transfer was monitored in this project and in a new one, named in this effort as Project 2. Both projects were executed simultaneously. During the first Release, the metrics were collected for both of them.

The results of Project 1 were: training-execution ratio: 100%, adherence 99,78%, rate of ready (1st Sprint 40%; 2nd Sprint: 83%; 3rd Sprint 100 %), Duration of the sub-processes: 129 days. The results of Project 2 were: training-execution ratio: 50%, adherence 92,55%, rate of ready (1st Sprint 75%; 2nd Sprint: 71,43%; 3rd Sprint 100 %), Duration of the sub-processes: 132 days.

The doubts that have appeared were related to the storage of the artifacts and the evidences criteria of the tests.

Semi-structured interviews were made with those involved in the process, such as: Project Leader, New Software Factory Rep, Tech Support Rep on Quality, and Management Support, to try and discover their points-of-view on the execution of the MASDD and on the knowledge transfer. The answers obtained were transcribed and analyzed.

6 DATA ANALYSIS

At the start of the contract it was observed that the start-of-contract meeting was essential. The preparation of the infrastructure, despite the fact it was not adequately done, it did not affect the case under study, as the projects took some time to roll. That does not invalidate the need for this activity.

In the case of the training program, the evaluation done during the activity showed that, for most of the respondents, the classroom training sessions were evaluated as Good or Excellent on both days. On the first day, from a total of 14 people, 8 people rated it as Good, 4 as Excellent, and 2 as Regular. On the second day, from a total of 6 people, 4 evaluated it as Good and 2 evaluated it as Excellent.

In the execution of the MASDD process, no representative of the new service providers had worked with the new process yet and, as a result, all the reps selected took the training course. As regards the training-execution ratio, Project 2 scored 50%, as the PO and a developer did not attend the training sessions. The non-availability of the PO led this project to a smaller adherence to the process.

The ready rate was lower in the first iterations. Problems were identified with the architecture used, but no issues were found as related to the knowledge transfer. The doubts that were brought up were after all related to aspects that were not made clear in the documentation or in the training sessions. This way it was possible to identify improvements in the MASDD process.

The product verification was longer than anticipated in both projects, 30 and 18 days, respectively, as two failures occurred. We concluded that a lack of expertise of the supplier as to how the product would be evaluated produced such failures. The body has guides for quality checking and the contractor was unaware of them. Therefore, a reference to these guides was added to the process.

At the end of the execution of the knowledge transfer process, the answers from the interviews done were ranked into categories such as: *access to information* and *efficacy in knowledge transfer*. As regards the access to information, the respondents indicated the approach they considered the most efficient to learn about the process and to clear eventual queries. Diverging opinions were found between the distance training, classroom training and the documentation. They also pointed that the representatives of the body and the documentation were enough to clear the doubts then produced.

In the answers related to the efficacy of the knowledge transfer, we found that some gaps in the definitions of the MASDD affected the knowledge transfer, as shown below:

'Artifacts not related to the MASDD (but to the project) are still 'lying about''. A lack was observed of a general view of what is necessary to deliver (of the process as a whole, in the MASDD and outside the MASDD).'

'I believe there are complications related to what to do. I have seen acceptance tests get similar to the steps of a use case. I saw that the manual has insufficient information and other flaws in documentation. Although this is not about the process, but about the products and their quality levels.'

Despite all of these gaps, all those interviewed said that the activities for knowledge transfer, as proposed, would allow an understanding and the execution of the MASDD process.

With the obtained results, the following lessons learned were identified.

- Infrastructure preparation is essential to provide knowledge artifacts.
- Good relationship with the outgoing service provider can facilitate the process.
- Care should be exercised in the preparation of the process documentation and of the training sessions to prevent an adverse effect on the execution of the services.

7 CONCLUSIONS

The service provider transition process in organizations is a critical period as a loss of knowledge can occur. In order to avoid it, it is essential that the knowledge transfer process in this period is planned and monitored.

This work describes a proposal, the execution and evaluation of a knowledge transfer process for a contractual transition, as witnessed in a Brazilian Government body. The process was based on related study practices of the eSCM-CL model and on Brazilian Law.

In the transition that occurred in the body of our study, the data collected from two projects allowed us to evaluate the process proposed. Considering the gaps found in the MASDD process during its execution, we found that the preparation of the training program and the granting of access to process data and the services to be transferred are essential elements for a successful knowledge transfer process.

At the end of the transition period it was found that the process proposed was effective and helped in the transfer of knowledge.

This work is a study of a single case but it is possible to observe that the process can be generalized to service provider transitions involving contracting organizations of IT services.

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