

Knowledge Transfer in a Management Process for Outsourced Agile Software Development

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Abstract

The outsourcing of IT services is a reality in the Brazilian Government administration. One of the critical aspects of outsourcing software development services is the transfer of knowledge. The purpose of this work was to define procedures for knowledge transfer in an outsourced software development process based on the Scrum framework. This is a descriptive research, in which elements for knowledge transfer were identified from a systematic review of the literature, eSCM practices, agile software development services contracts, and the Brazilian normative. The definition of procedures involved activities, tasks and artifacts, based on the SECI model and bibliographic and documentary research. The main contribution of this paper is showing how these knowledge transfer elements can be introduced in an outsourced agile development process, through the application of the SECI model.

1. Introduction

Contracting in the information technology (IT) domain is done as a way to obtain economic, as well as technological and strategic advantages [1]. For Alaranta and Jarvenpaa [2], IT contracting is defined as a process to transfer a part or the whole of a set of functions to an outside provider that holds the required skills and provides the appropriate services.

Despite its many benefits, outsourcing poses a few challenges such as the risk of curtailing client power, reducing the quality of services rendered, and dependency on the provider [3].

The dependency reduces the power of the client and can negatively affect the general objectives of hiring, stiffening the strategic flexibility of the client, increasing costs, and lowering the quality of the service [2]. The issue of provider dependency comes up when no effective knowledge transfer takes place from the provider to the client [4] [5].

Davenport and Prusak [6] define knowledge transfer as transmission and absorption (and use - it can

be put into practice). Chen and Wang [7], on the other hand, define it as an event through which an organization learns with the experience of another. According to these concepts, knowledge must be transferred among the entities for them to feel confident in utilizing it and innovating whenever necessary.

For Gang and Bosen [8], the procurement of software factories deals intensely with knowledge. Each software development project gathers a great amount of business knowledge, as well as technical issues, thus client and supplier must communicate and collaborate continuously, allowing the flow of knowledge to occur, to reach the success in the contracting [8].

The authors [9] claim that some government organizations have reported the adoption of agile methodologies, whether for in-house development or for software factories, with the Brazilian Public Administration (BPA) among them [10].

One of the main problems found by the agencies of the BPA is the excessive dependency related to the hired company, which becomes aware of the knowledge of work processes and the employed technology. The majority of the agencies can't keep up and absorb the technological development [11]. The Federal Court of Accounts of Brazil (TCU in the Brazilian acronym), a public institution that oversees outsourcing contracts entered into by BPA, recommends the execution of procedures for knowledge transfer [12].

Singh, Singh and Sharma [13] conducted a survey-based empirical research on Indian organizations that were using agile practices for software development. They found that most of the knowledge in agile software development is tacit in nature.

In this context, how can we introduce knowledge transfer procedures in an outsourced software development process based on agile practices? The purpose of this work was to define activities, tasks and artifacts to support the knowledge transferring in an outsourced software development process based on the Scrum framework.

This is a descriptive research, where the most cited procedures for knowledge transfer were identified through a systematic literature review, then, a documentary research was done to analyze and identify recurrent artifacts required for public institutions in their software factory contracts. A case study was conducted to apply the elements of knowledge transfer in an agile development process of a Brazilian public organization.

The procedures involve activities, tasks and artifacts, based on the SECI model [14] and on selected practices of the eSourcing Capability Model for Client Organizations (eSCM-CL) [15].

This work is organized in seven Sections. Section 2 has the theoretical reference on the contracting of software factory, covering aspects such as knowledge transfer and provider transition. Section 3 has the theoretical reference on agile methodologies. Section 4 describes the materials and methods used to produce this work. Section 5 presents the definition of the knowledge transfer procedures. Finally, Section 6 provides the conclusions and suggestions for future work.

2. Software factory contracting in Brazil

As shown in a study by Lee [10], software factory contracting is defined as a process to assign part of the responsibility for information systems development to an outside service provider, to acquire, as a result, economic, technological, and strategic advantages. This expression relates to the attempt to simulate the manufacturing process in the software development activity.

Contracting processes have, in the domain of Brazilian public organizations, to comply with Brazilian legislation and jurisprudence. The Reference Standard Framework [17] offers a catalog of those normative requirements. The main norm that regulates IT solution contracting is the Brazilian Normative Instruction No. 04 (IN 04/2014), of September 11th 2014 [18]. To support the good application of the IN 04/2014, a Model for IT Solution Contracting (MCTI in the Brazilian acronym) [19] was elaborated, which collects a set of best practices about IT Contracting.

The Federal Court of Accounts of Brazil (TCU) published the Guide of Good Practices in Contracting IT [12] that collects a set of risks and intern controls that must be observed in the IT Solution Contracting. One of the risks related to IT Outsourcing is the absence of implementation of a software process that may provide situations where the purchased or developed software do not meet business needs. TCU also published an IT governance assessment guide in

partnership with the international community [20], where one of the biggest concerns is public spending on IT.

The Process for Contracting IT Services for Brazilian Government Public Organizations (PCSTI) [21] is a reference process that complies with the normative requirements and integrates technical aspects related with IT governance and software engineering.

All those mentioned reference models give us a wide vision of the main aspects of the IT Contracting like complying with legislation, best practices, risks associated, intern controls and technical aspects.

Table 1 shows the main activities and artifacts for Knowledge Transfer as recommended in Normative Instruction No. 04 [18], the Contracting IT Solutions Model [19], and the Contracting IT Services Process for Public Organizations (PCSTI) [21].

2.1. Knowledge transfer

According to Joshi, Sarker and Sarker [22] knowledge transfer is a process in which knowledge is transferred from one person to another and may take place in a planned or natural manner as a result of another activity.

The knowledge transfer process, according to Harrison and Hu [23] entails the conversion of knowledge into information, the transfer of information, its interpretations, and the conversion of information back to knowledge.

Nonaka and Takeuchi [14] defined a model for knowledge transfer in organizations that goes through a process to convert tacit knowledge into explicit knowledge and vice-versa. This knowledge conversion process is called a SECI (Socialization, Externalization, Combination, Internalization) spiral and has four knowledge conversion modes: Socialization, where the knowledge is transferred from tacit to tacit; Externalization, where the knowledge is transferred from tacit to explicit; Combination, where it is transferred from explicit to explicit; and Internalization, where it is transferred from explicit to tacit.

As provided in the law [18], the contracting of IT solutions by Brazilian Government institutions should consider procedures for knowledge transfer [12]. The Brazilian Normative Instruction (IN) 04/2014 defines the stages in the contracting process and proposes strategies to minimize issues [18]. One of them states that the knowledge transfer should take place to reduce the dependency of the public institution from the service provider.

Table 1. Activities and Artifacts from IN04 and PCSTI

Source	Type	Task	Description
IN 04/2014 MCTI PCSTI	Artifact	Insertion Plan	Insertion Plan should be prepared in the Contract Management stage. It should at least allow the transfer of the knowledge required in executing the services or to have goods provided by a supplier.
IN 04/2014 MCTI PCSTI	Artifact	Support Plan	Support Plan should be prepared in the Contract Planning stage. It defines how the final knowledge transfer of the execution and evolution of the IT Solution will be done. Besides that, the plan also establishes the preparation of an independency strategy for the contractor in relation to the supplier, including technological knowledge transfer.
IN 04/2014 MCTI PCSTI	Activity	Prepare Knowledge Transfer Procedures	To identify the required knowledge for contract execution, mainly the most critical knowledge for business continuity that the actors should have.
IN 04/2014 MCTI PCSTI	Activity	Initial Transfer	To guarantee the initial transfer of the required knowledge to the supplier for appropriate contract performance.
IN 04/2014 MCTI PCSTI	Activity	Execute Knowledge Transfer Procedures	The contract manager, helped by the contract inspector, should oversee all knowledge transfer procedures planned during the Contract Planning stage and included in the updated Support Plan. The contract manager is liable for the non-performance of these procedures.

The Practical Guide of Contracting IT Solutions [19] states that the knowledge transfer should occur along the contracting period. This knowledge transfer process can be understood as one of the procedures that support an efficient communication and attain success in contracting.

In the context of IT contracting, the eSourcing Capability Model for Client Organizations (eSCM-CL) [15] gathers the best practices that enable client organizations to develop and manage their relations with service providers with more efficiency and less failures. The 1.1 version of the model organizes practices in three dimensions: Sourcing Life-Cycle, Capability Areas, and Capability Levels. The Capability Areas dimension provides practices that focus on Knowledge Management. These practices define the means to capture and apply the knowledge, as well as how to establish and maintain an effective work environment where knowledge capture and transfer can take place.

As regards Knowledge Transfer, the model presents 7 practices, 5 of which in the Knowledge Management (KNW) domain, 1 in the Service Transfer (TFR) area, and 1 in Contract Completion (CMP), as shown in Table 2.

3. Agile methodologies

According to Dorairaj et al. [24], agile methods promote knowledge transfer through constant communication and collaboration amongst team members, especially through face-to-face exchange.

Table 2. Knowledge Transfer Practices [15]

Practice	Description
KNW1 – Provide Required Information	Aimed at identifying, controlling and providing the information people need to carry out their contracting tasks.
KNW2 – Knowledge System	Aimed at using a knowledge system to identify, control, and disseminate contracting information.
KNW3 – Market Data	Aimed at analyzing and using market data on service providers.
KNW4 – Lessons Learned	One should use the lessons learned in present and past contracting activities as input to streamline the work done.
KNW5 – Share Knowledge	Aimed at establishing and implementing procedures to share knowledge amongst stakeholders.
TFR5 – External Knowledge Transfer	Aimed at ensuring that the transferring of knowledge to the service providers is planned, supported, and verified.
CMP5 – Knowledge Transfer from the Service provider	Aimed at ensuring that the knowledge transferred during the completion stage is managed according to documented procedures.

Jacobson [25] points that, in the domain of Software Engineering, agility has become a core concept. A team is agile when it acknowledges that people's skills are essential for project success, and can adequately respond to changes, whether in the software that is being created, in the team members, or in the technologies at hand.

The search for better results in software development has led Government institutions to use agile methodologies in specific projects and in software factories contracting [26]. One of the methodologies most frequently used in Brazil is Scrum, followed by the XP/Scrum [10, 26] combination.

Scrum is a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value [27].

According to Schwaber and Beedle [28], the Scrum framework consists of teams associated to roles, events, artifacts, and rules. First, the backlog of the product is identified and prioritized. After that, the Sprint backlog is selected (fixed-duration iteration). Throughout the Sprints (2-4 weeks) the product increments are then constructed. Events are defined in the Scrum framework to create a routine and to minimize the need for unplanned meetings. The events are Sprint Planning, Daily Meeting, Sprint Review, and Sprint Retrospective.

As regards the roles, Scrum Teams are self-organized and multi-functional. The Product Owner (PO) is the party responsible for maximizing the product value and the Development Team value, apart from being the sole person responsible for managing the backlog of the product. The Development Team consists of professionals who do the work to deliver a usable version that potentially boosts the 'ready' product at the end of each Sprint. The Scrum Master is responsible for ensuring that the Scrum is understood and applied.

Recent studies report on the knowledge transfer in agile methods. In the survey conducted by Singh, Singh and Sharma [13] on Indian organizations that were using agile practices, they found that the Indian software industry working with agile practices lacks in providing Knowledge Management. They also found evidence, confirming the beliefs of practitioners, that most of the knowledge in agile software development is tacit in nature and that the agile approach heavily relies on this tacit knowledge sharing.

Razzak and Ahmed [29] identified the knowledge sharing techniques and strategies applied by the practitioners in distributed agile projects. According to them, communication, coordination, and collaboration

are the keys to fostering knowledge sharing between team members in agile software development.

4. Materials and methods

This Section presents the methodological execution of the work, which consisted of two phases.

On Phase I, elements for knowledge transfer were identified from a systematic review of the literature [30], eSCM practices, contracts of agile software development services from Brazilian public agencies and in Brazilian normative instructions. Elements is a general concept that represents best practices, activities, tasks, artifacts and controls.

On Phase II, by using the SECI model [14] we analyzed how the knowledge transfer elements identified on Phase I would be applied to an outsourced agile development process of a Brazilian public organization – Management Process for Agile Software Development Demands (GeDDAS) [9].

4.1. Bibliographic research

A systematic review of the literature was done to identify the elements that influence knowledge transfer in software processes in factory contracting [30]. As recommend by Kitchenham and Brereton [31], the protocol of the systematic process was defined, having the steps: planning, conducting and writing of the results.

As a research strategy, the method named Quasi-Gold Standard (QGS) [32] was adopted. This method integrates the collection of data through manual and automatized research, while allowing the effectiveness of the search process to be evaluated. The searches were done in the digital libraries IEEEXplore (<http://ieeexplore.ieee.org/>) and Scopus (<http://www.scopus.com/>).

As results of the systematic review, published in [30], five decisive aspects involving the transfer of knowledge were identified, namely: nature of the knowledge (cultural, domain, process, technical), relationship between client and supplier, human aspects (that is related with trust, constant communication), applicable models and frameworks, and supporting tools.

Furthermore, practices from the eSCM model as related to knowledge transfer were analyzed and selected. The practices shown on Table 2 became the basis to define the knowledge transfer procedures.

4.2. Documentary research - analysis of public contracts for agile software development

Given that artifacts are the means used to transfer explicit knowledge in a software development process, government agencies contracts for agile software development at the time were analyzed. From them, it was possible to identify the most used artifacts in outsourced agile software development processes of public organizations.

The contracts were selected from four public institutions, considered the first agencies to apply agile principles in their development processes in Brazil. Furthermore, the current contract for traditional development, then in force within the context of the organization, to which the procedures would be applied, was also considered. It was necessary due to understanding what were the artifacts required by the institution.

After the selection of the contracts, the artifacts were identified and ranked according to disciplines, requirements, analysis and design, construction, testing, implementation, training, and management. At the end, we had identified the common software development artifacts from the selected contracts as possible elements of knowledge transfer to be applied in an agile outsourced software development process.

4.3. Case study - Management Process for Agile Software Development Demands (GeDDAS)

Our case study is an outsourced software development process of the Ministry of Telecommunications (MC) in Brazil. In the context of this public organization, a Management Process for Outsourced Agile Software Development Demands (GeDDAS) [9] was defined, based on the Scrum framework. This process envisages the outsourcing of the technical activities of the software development process. The GeDDAS process comprises six sub-processes:

1. Plan Project, which involves the planning of the whole project;
2. Plan Release, that represents how much scope that team intends to deliver by a given deadline;
3. Run Sprints, provide the main software development activities that the outsourced company must execute;
4. Check Release Quality, procedures that must be executed to guarantee the quality of the software delivered by the provider, regarding the service level agreements established in the contract;

5. Approve Release, in which the main users homolog the system;
6. Deploy Release, putting it into the production environment.

The selected procedures and artifacts for knowledge transfer were identified and applied to the GeDDAS process.

5. Procedures for knowledge transfer

The procedures for knowledge transfer involve the selection of artifacts and definition of activities. The first part presents a set of artifacts that, together, contribute for the client organization to achieve an ample and explicit knowledge of the software.

The second step presents activities that boost the transfer of tacit knowledge regarding the software.

With the elaboration of this set of artifacts and execution of the defined activities, the client organization achieves a higher possibility of internalizing, utilizing, and keeping the software even after a possible change of supplier.

5.1. Selection of artifacts for the GeDDAS

To determine the artifacts to be used in the GeDDAS process, a list of common artifacts was extracted from the selected contracts and crosschecked with the resultant artifacts from the systematic literature review and a bibliographic review of agile methodologies.

The common artifacts found in the contract set are shown in the 'Contracts' column of Table 3. The artifacts that were not part of the organization's culture, as well as those that were not in line with the agile approach for software development were disregarded.

The following artifacts were discarded:

- UML Diagrams: the client organization does not require UML Diagrams as mandatory artifacts to be delivered by the service provider. As described by Larman [33], UML modeling aims specially at understanding something more complex, and not to document it. The service provider may use UML Diagrams to foster communication with the stakeholders. However, to the client organization, these artifacts are not effective to share knowledge and, furthermore it is difficult to keep them updated.
- Environment Plan: excluded because it was not required by the client organization in the prevailing traditional methodology.
- Online Help: excluded, as it was not adding value to the system's users.

Table 3. Artifacts identified and selected for the GeDDAS

Artifact	Contracts	Selected	Category
Roadmap		X	Process
Vision Document	X	X	Domain
Product backlog	X	X	Process
Sprint Backlog	X	X	Process
Architecture Document	X	X	Technical
Documented Source Code	X	X	Technical
Unit Tests	X	X	Technical
Integration Test	X	X	Technical
Test Evidences	X	X	Technical
Data Model	X	X	Domain
Data Dictionary	X	X	Domain
Function Points Counting	X	X	Technical
Lessons Learned		X	Process, Technical and Cultural
User Manual	X	X	Technical
Implementation Plan	X	X	Technical
Wiki		X	Domain, Process
UML Diagrams	X		Domain
Environment Plan	X		Technical
Online Help	X		Technical

The column ‘Selected’ on Table 3 marks the artifacts that were maintained after the evaluation of its adequacy to the agile process and, additionally, the ones that were identified from the knowledge transfer elements obtained through the systematic literature review and the bibliographic review of agile methodologies. The artifacts included in this step were:

- Roadmap: to organize the product backlog through time.
- Wiki: their use is recommended to support knowledge management in agile teams as it allows an effective transfer of explicit knowledge [34]. According to Ras [35], the basic features of a Wiki are: single place of publication, simple and safe collaboration, easy creation of links, and demand description. The Wiki can be understood as a manner of knowledge representation that facilitates the transformation of tacit knowledge into explicit knowledge.
- Lessons Learned: required to be identified in Sprints and Releases. The choice of this artifact was based on the KNW4 - Lessons

Learned practice - of the eSCM-CL model [15].

Table 3 also shows a classification of explicit knowledge to be transferred. The categories are: process, domain, technical, and cultural [36].

Process knowledge is related to the knowledge of the process that is in use and to its progress. Domain knowledge represents that of the business and of the requirements. Technical knowledge is related to the knowledge the team has on the development, as related to the technology and the solution. Finally, cultural knowledge comes from the context in which the project is inserted in and is thus the knowledge related to the personal and environmental features of the project.

The set of selected artifacts allow for the explicit knowledge developed during the software’s development to be transferred to the client organization, as to support the incorporation, utilization and evolution of the software. Even after the departure of the service provider, the client organization will have a broad view of the software, as the selected artifacts deal with questions related to processes, domain, techniques and culture.

By using agile methodologies, extra care was taken not to select an abusive quantity of artifacts, to keep from greatly encumbering the service provider. This set of artifacts supply a gap related to the transfer of explicit knowledge that exists in agile methodologies, and allow that the focus of the scrum team continues to be constant communication.

5.2. Definition of knowledge transfer activities

The knowledge transfer activities are distributed amongst the core GeDDAS sub-processes, which are those in which there is PO participation: Plan Project, Plan Release, Run Sprints and Deploy Release. Figure 1 shows these four sub-processes with its respective knowledge transfer activities and artifacts.

The proposed activities are in line with the methodology used by the institution and the scrum framework. Each of them was strategically inserted to allow for each step of the SECI cycle to be followed, allowing the complete transferring of the many types of existing knowledge as shown in Table 4.

Table 4 is divided in three main columns. The first presents the activities proposed to allow knowledge transferring. The second specifies the referred eSCM practice and/or normative. The third explains how the SECI cycle takes place by representing each of its stages.

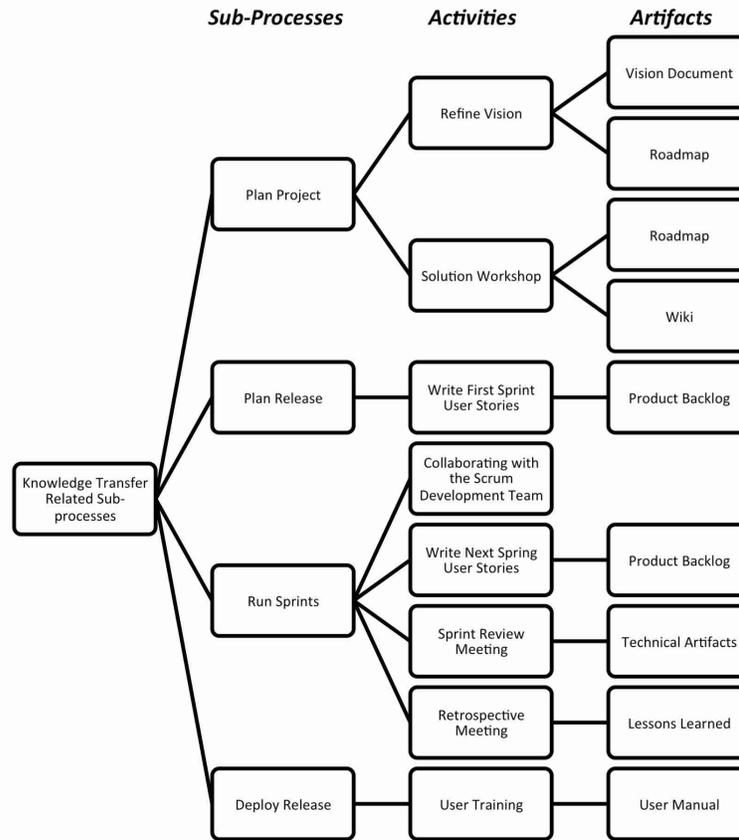


Figure 1. Knowledge Transfer Activities and Artifacts

Table 4. GeDDas Activities for Knowledge Transfer

Activity Proposed	Basis	SECI Cycle			
		Socialization	Externalization	Combination	Internalization
Refine Vision	eSCM-CL (KNW2 - Model Knowledge System)	1 - PO and technical assistant share business knowledge (issues, needs, users, macro-functionalities) through observation, meetings, and informal dialogue.	2 - PO and technical assistant voice the vision on the solution and record the knowledge held on the product on the Roadmap.	3 - PO technical assistant stores roadmap in the repository, which starts to be in the domain of the organization.	-
Solution workshop	eSCM-CL (KNW1 - Provides Required Information, TFR5 - External Knowledge Transfer, and KNW2 - Knowledge System) IN 04-2014, MCTI and PCSTI (Knowledge Transfer)	5 – This activity sees the face-to-face discussion between the PO, one’s Technical Assistant and the Scrum Team of the business and technical aspects of the solution.	6 – From Discussion 5, the roadmap and the solution envisaged are updated. It corresponds to the Externalization of a new vision.	7 - Scrum master updates the project Wiki that has the solution envisaged, the roadmap, and the decisions made in the workshop. The Scrum team records relevant information in the Wiki.	4 - The Scrum team at first reads the roadmap, and does research on the knowledge area of the solution and take notes on their main queries.

Table 4. GeDDas Activities for Knowledge Transfer (continue)

Activity Proposed	Basis	SECI Cycle			
		Socialization	Externalization	Combination	Internalization
Writing User Stories	eSCM-CL (KNW2 - Model Knowledge System) SECI Cycle	9 - PO and Technical Assistant detail and share amongst them the business and technical knowledge through observation, meetings and informal dialogues. It corresponds to Socialization as they are interacting and exchanging tacit knowledge in face-to-face conversations.	10 - PO writes stories and the acceptance tests with the assistance of the PO technical assistant.	11 - PO technical assistant stores the user stories in the repository and makes 'ready' stories available to the Scrum team.	8 – Scrum Team grasps the solutions and searches for implementation alternatives. This corresponds to Internalization, as the team will start to use the knowledge in practice. 12 - The Scrum Team studies the stories and takes notes for discussion with the PO.
Collaborating with the Scrum Development Team	eSCM-CL (TFR5 - External Knowledge Transfer, KNW5 - Knowledge Sharing, and KNW1 - Provide Required Information) IN 04-2014, MCTI, and PCSTI (Knowledge Transfer)	13 - PO available in the period set for sharing knowledge with the Scrum team to clear queries on the system, and to clear any obstacles that may affect sprint outcome. The meeting between the PO and the team may be face-to-face or virtual.	-	-	-
Sprint Review Meeting	IN 04-2014, MCTI and PCSTI (Run knowledge transfer procedure) eSCM-CL (KNW4 - Lessons Learned, KNW2 - Knowledge System and CMP5 - Service Provider Knowledge Transfer)	14 - Scrum team presents work results to PO and to the project's steering committee. Project stakeholders discuss the lessons learned in the sprint.	15 – Delivery of the technical artifacts produced by the provider.	16 – Client verification of the technical artifacts delivered.	17 - Use Lessons Learned in next Sprint.
Retrospective Meeting	eSCM-CL (CMP5 - Service Provider Knowledge Transfer) IN 04-2014, MCTI and PCSTI (Run Knowledge Transfer procedure)	18 – All discuss and talk about the Lessons Learned in the release.	19 - Record Lessons Learned in the release.	20 - Update Wiki with Lessons Learned. Make features from the production environment available.	21 - All use Lessons Learned in future releases.
User Training	eSCM-CL (CMP5 - Service Provider Knowledge Transfer) IN 04-2014, MCTI and PCSTI (Run knowledge transfer procedure)	24 - Discuss the results from the simulation.	25 – Elaborate User Manual.	22 - Make training materials available to users.	23 - Simulate real system use.

The tasks of the process, presented in Table 4 are distributed in the SECI cycle. Each task has an identifier representing its execution order. After the execution of a group of tasks all the stages of the SECI cycle will have been executed and the knowledge will have been transferred from the

service provider to the client organization in its tacit and explicit dimensions.

Besides typical Scrum activities like Writing User Stories, Sprint Review Meeting and Retrospective Meeting, four other activities were

added due to the necessity of knowledge transferring from the client to provider and vice versa:

- Refine Vision: to externalize the knowledge about the product to be developed;
- Solution Workshop: to transfer the knowledge from the client (PO) to the supplier;
- Collaborating with the Scrum Development Team: to guarantee the tacit communication between the supplier and the PO;
- User Training: to transfer the knowledge from the supplier to the client.

6. Conclusion and future work

This work presented the elements of knowledge transfer for an agile management process for outsourced software development of a public organization. It was demonstrated that it is possible to define knowledge transfer activities, artifacts and tasks for an Agile Software Management Process in compliance with prevailing references and standards for IT Services Procurement, Knowledge Management, and Agile Methodologies.

The selected artifacts bring a complete set of technical, cultural, procedural, and domain aspects, which can be explicitly transferred from provider to client, without losing focus of the agility and continuous communication. As for the activities, they were proposed to allow a complete flow of transfer of tacit and explicit knowledge in the process of hiring agile development of software.

The Brazilian normative referential made sure that the activities proposed for the process are aligned with the legislation, best practices, associated risk, intern controls, and technical aspects of contracting in the IT area.

The SECI cycle applied to the GeDDAS Scrum based process allowed observing that the knowledge transfer practices defined in the eSCM are embodied in the process. Furthermore, through the SECI cycle it is possible to analyze how the externalization, which is crucial in the context of outsourcing, occurs.

One of the limitations of this work is that the knowledge transfer activities, artifacts and tasks were not applied and evaluated in the processes of other public organizations. Another limitation of this work is that the knowledge transfer activities were just analyzed by the point of what is important for the client organization.

Immediate future work we see ahead is the evaluation of the proposed knowledge transfer elements through action research. Another future research is to add service providers in the proposed framework and show a comprehensive perspective, how the knowledge transferring from client to service

providers and how service provider learn and manage the transferred knowledge.

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