Management Tool for Software Factory Contracts for a Brazilian Public Agency

Full Paper

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Abstract

Contracting Information Technology (IT) services has become common practice in the Public Federal Administration (APF). It allows the APF to focus its resources on the primary activities, allowing a better execution of the planning, coordination, supervision and control tasks. One of the challenges is the interdisciplinarity involved in managing contracts, from the characteristics of the object – financial and legal aspects – to human relationship aspects. The objective of this work is to use the case study and research-action techniques and specify a tool for software development and maintenance contracts management, according to agile principles, to support the management of software factory contracts between a Brazilian Public Federal Agency and its suppliers, in line with the specifications of the contracting notices. The tool specification is in the development stage. Bibliographical and documental research activities, as well as object diagnostics, have been accomplished. From the experience, it is possible to glimpse the specification of a contract management tool aligned with the legislation, the agency contracts, and the software development and maintenance processes defined in the agile methodology.

Keywords

Service Contracting, Outsourcing, Information Technology, Service Level Agreement, Service-Oriented Architecture, Software Factory.

Introduction

The decentralization of activities in Brazil has been managed since the 1960s by Decree-Law number 200 (Brazil, 1967). The main law on general contracting by the Public Administration is Law number 8666 (Brazil, 1993) in which rules related to contracts and bidding are defined and the ones related to services, undue delays, and non-execution of contracts are handled.

Since the mid-2000s there have been many initiatives in Brazil that seek to support and direct the best use of public resources for the contracting of IT services. It comes in the shape of rules, decrees, normative instructions, guides, specific books, and research and development, such as the Normative Referential Board – QRN (Cruz, 2010) and (Cruz, 2008).

The Federal Audits Audit Court (TCU) has already detected a frequency in the irregularities and misconducts in the contracting process. It has recommended the definition and publication of normative instructions, models, guides, and measures to the Department, seeking to make these processes more mature. Nevertheless, there are still contracting-related risks that can frustrate the results and negatively affect governance in Information Technology.

One of the main results of the TCU recommendation was the publication of Normative Instruction 4 (IN04) by the Secretary of Logistics and Information Technology (SLTI) of the Department (Brazil, 2014). It defines that the contracting of each IT service should be aligned with the strategic planning of the agency's IT, which in turn should follow the agency's strategic planning (Brazil, 2014).

The guidelines for contracting services are laid out by the Instruction and are organized in three parts:

1) Planning the contracting;
2) Selecting the supplier;
3) Managing the contracting.

The last part accounts for most of the process, including the execution of previously-defined terms and the extent of the results expected from the contracting.

Still on this topic, there are some initiatives such as the one by Cruz, Andrade, and Figueiredo (Cruz, 2010). They proposed a process for IT service contracting for Brazilian public agencies, in reply to a Brazilian call for books related to IT Acquisitions by the Department of Science and Technology; they also proposed the drafting of the Practical IT Contracting Guide by the MPOG (Brasil, 2014); and the Good Practice IT Solution Contracting Guide by the Federal Audits Court (TCU).

Melo and Ferreira (Melo, 2010) described the results of agile practices adoption in APF and in 2013 (Melo, 2013) presented a survey on the evolution of agile development in Brazil. Since 2012, the publishing of experiences in other countries such as governmental reports (EUA, 2014) and (NAO, 2014) highlights the need for monitoring the progress of agile methodologies adoption in public agencies.

In 2013, TCU ruled on the analysis of agile methodologies adoption by Brazilian public agencies, whether developed in-house or by contracting software factories, according to standard processes based in agile methodologies (Brasil, 2013). Vacari and Prikladnicki (Brasil, 2015) emphasize the importance of top management support to achieve success in agile methodology adoption.

In 2015, MPOG's SLTI published the first version of the Guide for Software Projects with Agile Methodologies Practices for the SISP (Information Technology Resources Administration System) (Souza, 2015). The guide is part of a set of actions proposed during the creation of the Agile Strategy for the SISP, which seeks to apply agile methodologies to define reference processes for software development, through in-house development or through the contracting of software factories.

In this scenario of IT services contracting by the APF, a specific Department finds itself in a moment of transition with its software factory provider and management support provider to a new software factory and two new providers – management and technical support.

However, the Department doesn't have a defined process for software development and maintenance contracts management. At the moment, it possesses the service order forms of the previous contract, it manages the flow of service orders through the OTRS tool (customized and implemented by the IT Services Management Front), and it manages the IT service level agreements through a spreadsheet.

Through the identified gaps, the research question defined in this study was: how to define a contract management tool for Brazilian public federal agencies that is aligned to the legislation and the software development and maintenance reference models of a Brazilian public federal agency?

The objective of this study is to support the specification of a management tool of services contracts for software development and maintenance, for an APF agency. The specific objectives are:

- To identify the legislation on the contracting of software development and maintenance services by third parties, for the Brazilian federal government and to analyze the public notices on the contracting of software factory services of the subject of study;
- To analyse the alignment of the development and maintenance processes according to the agile principles of the subject of study with the Agile guide published by the SLTI/MPOG;

- The eliciting, analysis, and modelling of requirements for the development and/or customization of a management tool for software development and maintenance contracts.

Given that this study is part of a research project in an Agency in which the researchers act and contribute with the improvements through interactions, the strategy applied is Action Research.

This strategy was proposed by (Peterson, 2014) for the elicitation of an instrument. The methodology applied is experimental research, supported by bibliographical and documental procedures.

The remainder of this paper is organized as follows. Section 2 shows the methodological plan adopted as well as the characterization of the case study subject. Section 3 presents the progress of the data collection stage. Section 4 presents lessons learned with this study. And, Section 5 has the final remarks and paths for future work.

Methodology

The methodological plan adopted in this work includes 04 basic stages:

- Research planning;
- Data collection;
- Data analysis;
- Results report.

Planning Stage

Planning starts with the research question definition, and the objectives and methodological classification to reach the objectives, followed by the definition of research procedures and data collection techniques. From the surveys (informal interviews, semi structured interviews, and meetings), the analyses and reports on results achieved are done, as shown in Figure 1.

From the Action Research stages, proposed by (Peterson, 2014), a collection process is defined, whose procedures are employed complementarily.

Data Collection Stage

Bibliographical Research

Consultations to the scientific databases included the following themes: IT Contracting Processes in Public Administration and Contract Management Processes in Brazilian Public Agencies, to build the theoretical corpus.

Documental Research

Documents published by public agencies were analysed in the effort to apprehend the current scenario in IT contracting. Guides, models and normative instructions were also analysed. More specifically, for the case study, public notices for the contracting of IT service providers for the Department were evaluated, as well as the Department's development and maintenance processes. An analysis of the alignment of the Department's processes with the Agile Guide as published by the SLTI/MPOG was done as well as an analysis of its contract management process and support tools.

Action Research

According to Peterson (2014), Action Research requires a participatory relation with the researcher, distinct from the so-called conventional research, and reaffirms that Software Engineering is a social activity and its success or failure greatly depends on its application context. Action Research also presents a methodological strategy for software requirements specification that brings Action Research and case study together.

In this study, the case study object is the Department. An object diagnostics was done, and the other steps of the case study, as set by (Peterson, 2014), are under way.

After deciding on the object (Department) and planning the case study, the intermediary steps – preparing for data collection; the collection itself; and the collected data analysis – are done, with the steps of Action Research as proposed by (Petersen, 2014). Following that, the results report is produced.

In Guidelines for Conducting and Reporting Case Study Research in Software Engineering (Peterson, 2014), the authors presented an application process for Action Research, for the inception and evaluation of an elicitation tool using the Goal Question Metric (GQM), with systematic activities of interaction between the researchers and an organization. GQM is an approach based on the premise that the measurements should be defined according to the measurement goals of the organization, which in turn generate questions that can be answered via metrics. Apart from that, the structure of the GQM approach provides a framework to interpret the measured data, using the established metric and their associations with the questions put forward and the measured results, all of which serve as input to meet the measurement goals (Basili, 1992).

In this study, the techniques of choice were Brainstorming and prototyping, given the availability of the requirements survey between the Department's personnel and the researcher.

Seven iterations came to the fore until the end of the instrument cycle. The collection of data entailed procedures of documental research and interviews. The evaluation stage included the instrument evaluation in the organization.

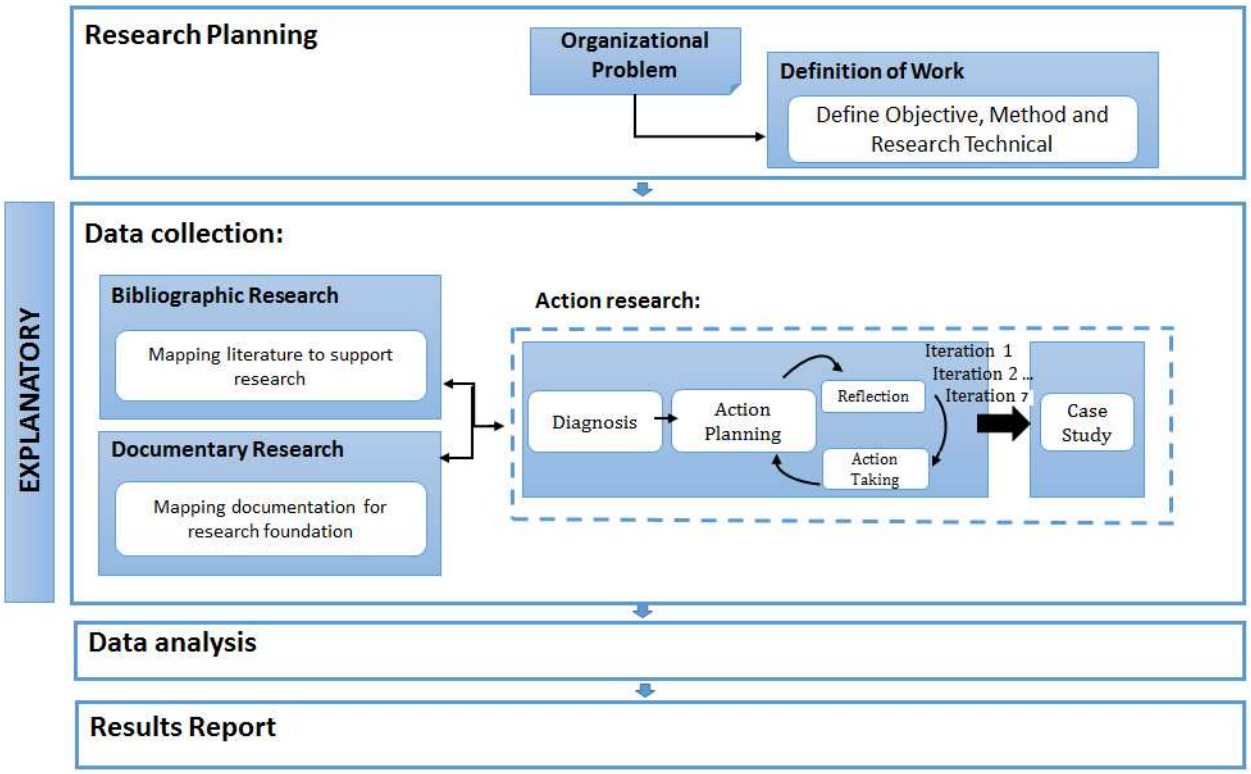

Figure 1. The methodological plan adopted

Diagnostics

The case study object selected in this study is called Department. According to (Runeson, 2008), an object should be selected and the objectives and planning of the research, defined. Having done that, the data collection step should be planned. After selecting the object, the Action Research steps are applied.

The diagnostics stage took place with the understanding of the current processes of the Department, as well as the survey of its needs, through meetings as well as informal and semi-structured interviews. With that, the action plan to elicit the contract management tool requirements was done.

Action Research Iterations

As provided by (Peterson, 2014), the Diagnostics step was followed by planned iterations in which the Action Planning, Reflection, and Action Taking steps were executed seven times.

The information gathered during the Diagnostics step was used as input for the first iteration in Action Research, aimed at getting a general picture of it and allowing for the distribution of the tool themes into modules (e.g.: contract, commitment, and others), to be treated over the following iterations, for each Action Research step.

Using the Brainstorming technique, Iteration 1 proved fundamental for the progress of the work, as shown in Table 1.

Brainstorming Stage	**Iteration 1**
	Action Planning
	• Gathering macro information for the elicitation, analysis and modeling of the proposed tool's requirements.
	Reflection
	• Discussing the importance of contracting and its inspection; • Pointing other possible uses for the tool.
	Decision Making
	• Separating the main information items into modules; • Defining the main sub-information in each module; • Linking the modules.

Table 1. Iteration 1 Activities

Iterations 2 to 5 continue with the application of the Brainstorming technique during the informal and semi-structured interviews for requirements elicitation, as shown in Table 2.

Brainstorming Stage	**Iterations 2 to 5**
	Action Planning
	• Selecting the module to be detailed.
	Reflection
	• Presenting a proposal for two iterations back, enhanced according to the results of the iteration's reflection; • Evaluating decision, and structure of the previous iteration; • Validating the information gathered in the previous module; • Extracting useful knowledge for the next iteration.
	Decision-Making
	• Refining an enhanced proposal according to the results of the iteration's reflection; • Adjusting the relation of the detailed module with those previously discussed; • Gathering the detailing information related to the module; • Consolidating the information gathered in a schematic representation for future evaluation and validation.

Table 2. Activities of Iterations 2 to 5 of the Action Research

With the use of the modules set in Iteration 1, the following iterations resulted in the collection and refinement of the relevant data for the last two iterations.

The Prototyping technique was used in Iterations 6 and 7, which allowed for the design of the tool's screens and validation with the agency. Such results proved necessary for the gathering of requirements, as shown in Table 3.

Prototyping Stage	**Iterations 6 and 7**
	Action Planning
	• Establishing the tool's screens to be prototyped.
	Reflection
	• Presenting the refinements of two iterations back in the prototyping, enhanced according to the results of the iteration's reflection; • Evaluating the decision-making process in the previous iteration; • Validating the prototyping done in a previous iteration; • Extracting useful knowledge for the next iteration.
	Decision-Making
	• Refining enhanced prototyping according to the results of the previous iteration's reflection; • Gathering detailing information on the prototyping; • Consolidating the data gathered during the prototyping for future evaluation and validation.

Table 3. Activities of Iterations 6 and 7 of the Action Research

All the meetings between the researchers and the Department's agent occurred periodically, at least once a month. They began in January and extended until June/2016. These meetings had the minimum participation of one researcher, the agency's staff member, and at least one person from the requirements collection team to record important aspects of the meeting.

The meeting had two moments: one on the Reflection of the Action Research iteration, in which there was feedback from the Decision-Making step in the previous iteration and aggregation of useful information for the next iteration; and one on the Decision- Making step, in which information is gathered for the consolidation of schematics or prototypes.

With this, the results went through a minimum of two validation activities, highlighted in green, and one refining activity, highlighted in orange, as shown in Figure 2.

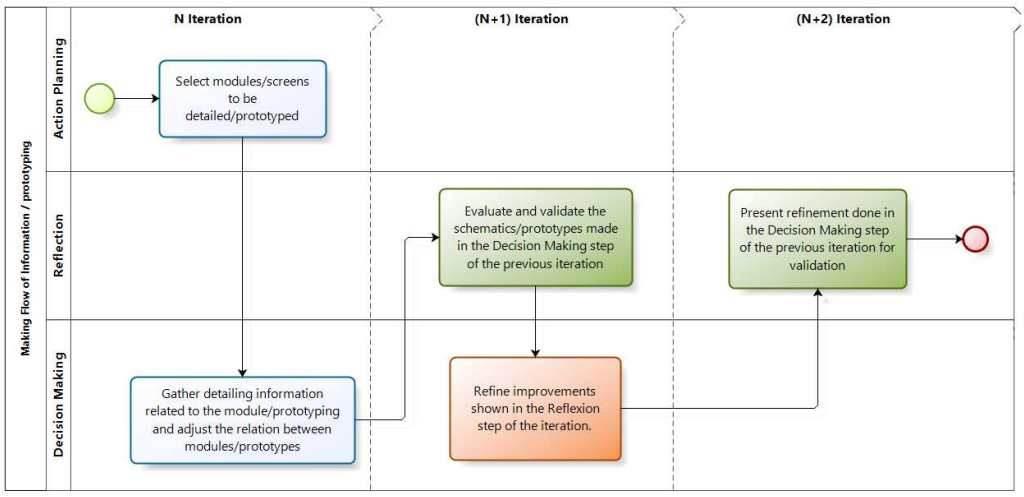

Figure 2. Flow of Information / prototyping

Data Analysis

Data collection was executed between January and June. Meetings took place in a semi structured way, through Department's agents interviews, aimed at helping with the inception of the elicitation tool.

The requirements were elicited, evaluated and validated by the agency's representatives. This was done as an intervention with the researcher in a given context, searching for a more active participation when solving the problems found. Such approach is characterized in the action research method (Peterson, 2014).

With the participation of the researchers and the agency's representative, the chief of the Systems Division (DSIS), the iterations of Action Research began.

Using the Brainstorming technique, the result of the first iteration proved it was essential for the research to proceed. It was through the first iteration that the general needs were identified and divided into modules for a better grasp of the scenario and the needs of the study object. These were: tool access profiles, contracts, their commitment, projects, and associated service orders.

From the second to the fifth iteration, in line with the above technique, schematics were elaborated according to each previously defined module. The last two iterations made used the resulting schematics and, with the use of the prototyping technique, obtained the definition and validation of the tool's screens.

In order to support the construction of the tool, business rules were defined, in which all the information obtained through schematics and prototypes was consolidated. This can be seen in Table 4.

Number	Business Rule
RN 01	Access to the tool should be possible through different user profiles (login and password).
RN 02	Every move done in the tool through the profiles should be registered.
RN 03	The tool's Administrator should be the first user to have access, and will be responsible for registering others.
RN 04	The first functionality shown to the logged user should be a view of the contracts associated to that user.
RN 05	Only the Manager, Auditor, and Contracts Team profiles will be able to view contracts not associated to their own user. However, they will not be allowed to edit or delete them.
RN 06	The users can filter contracts (either their own or all contracts, according to their permission) through a search filter located in the first screen, after logging in.
RN 07	Only the Manager, Auditor and Contracts Team will be able to begin registering a contract.
RN 08	Only the Manager and the Team will have permission to register a contract or save their draft. The Auditor will be limited to saving their draft.
RN 09	The contract's record should have all the information relevant to the public notice's contract and its associated members.
RN 10	When selecting a previously registered contract, the user can view its information and, if cleared for that, to alter it.
RN 11	The information related to the contract and its monitoring are shown in tabs: General contract data, Balance, Attachments, Commitment, Systems (Project), and SO.
RN 12	The Balance tab shows the balance of the contract's items, their quantities and associated values, as well as the contract's total value.

Number	Business Rule
RN 13	The total value is calculated based on the value of the items and their quantity, originally shown in the registry.
RN 14	The balance values related to the financial value and the items are linked directly to the SO tab, as their values are updated when SOs are created and finished.
RN 15	The attachments related to the contract can be seen in the Attachments tab.
RN 16	Files are attached in the Attachment tab, where types of documents can be set. These are standardized, without stress marks and in capitals.
RN 17	In the Commitment tab, the user can search for commitments (either all of them or those related to the user, according to the permission) and view them.
RN 18	The commitments associated to a contract are added to the Commitments tab, which can also be modified (according to the user's permission).
RN 19	The systems (or projects) associated to an user are viewed and searched using filters in the System(s)/Project(s) tab.
RN 20	The System(s)/Project(s) tab allows registering a system (or systems), and even adding an SO to it (optional).
RN 21	In the SO tab, it is possible to search and view a contract's SOs.
RN 22	The SOs are registered in the SO tab, where it is also possible to associate systems or projects to them.
RN 23	The information to register in a SO is enabled as its process evolves and its status changes.

Table 4. Business Rules

Lessons Learned

The tool proposed in this study aims at managing the service level agreement (SLA) of the Department. SLA is a contract between a service provider (either internal or external) and the end user, which defines the service level expected from the service provider. SLAs are output-based in that their purpose is specifically to define what the customer will receive (Curtis, 2015).

The lessons learned from the tool construction and specification process, using the method by (Peterson, 2014) is that all business rules can be implemented and used by the tool throughout the SLA life cycle of the Department.

With action research, it was possible to achieve the interaction between researchers and Department members, and build the tool according to the specifications developed throughout the iteration cycle. It allowed each iteration results to be evaluated, and when approved, to use them as inputs for the next iteration. The brainstorming and prototyping techniques were employed and proved to be very effective.

At the end of the iterations, the action research process was completed, meeting the final specific object: requirements elicitation, analysis, and modeling for a software development and maintenance contracts management tool.

Furthermore, it was possible to observe how the proposed methodological strategy attained its goal and answered the research question. Given the characteristics of action research, it was possible for the researcher to intervene, that is, understand the consequences of decision-making in each iteration; and interact, that is, to streamline the decision-making process with each iteration; and include, that is, to actively participate in the resolution of the problems found, following and evaluating the related actions.

Conclusion

The objective of this study was to specify a software factory contract management tool between a public federal agency and its providers. The specification included the legal and financial scenario of the country, as well as being tailored to the agency's processes.

With the bibliographic and documental reviews, it was possible to reach the defined specific objects, such as:

- Identifying the legislation related to contracting;
- Analysis of software factory contracting notices in the Department;
- Description of the management of SOs and Service Level Agreement management for the Department's new notice;
- Analysis of the alignment of development and maintenance processes according to the agile principles of the study guide, using the Agile Guide published by the SLTI/MPOG;
- Analysis of the adaptation of the Department's development and maintenance processes, to define a new contract management tool.

Proceeding with the methodological process, after the specification, a Case Study should be initiated for the construction of the tool. More specifically, the implementation and deployment of the specified tool. With the Case Study, we expect it to evaluate the effectiveness of the tool in managing software factory service contracts in the Department.

With the tool materialized, future studies can include the expansion of the tool's scope for its use not only in the context of software factories, but also for other IT service contracting contexts within the Department. It could also include considering its availability at the Portal do Software Público Brasileiro (Public Brazilian Software Portal), so that other agencies could use it. Another possibility is the incorporation of calculations of minimum-level services in order to verify the indicators provided by the contractor, and the analysis of consumption, making possibly relevant comparisons.

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