

Using Scrum in Outsourced Government Projects: An Action Research

Thatiany L. de Sousa, Elaine Venson, Rejane M. da C. Figueiredo, Ricardo A. Kosloski, Luiz C. M. Ribeiro Júnior
Universidade de Brasília, Faculdade do Gama, Federal District, Brazil
thaty_sousa13@hotmail.com, {elainevenson, rejanecosta, ricardoajax, lcarlos}@unb.br

Abstract

The growth in popularity of Agile methods plus a dissatisfaction of Government agencies with traditional software development methods have stimulated the adoption of Agile Methods. The action research approach was used in this work to assess the implementation of a process for the Management of Agile Development Demands - whose original acronym in Portuguese is 'GeDDAS' - for a software factory in a Brazilian Federal Government Organisation. There, two-action research cycles were done with two pilot projects. The work of action research was effective and contributed to the successful outcome of the initiative. The implementation of agile approaches in a public organisation is slow and complex affair mainly due to the interferences made in the working environment of the companies involved and to a high staff turnover. In the end, the difficulties found and lessons learned in the process, as well as the results achieved are presented.

1. Introduction

Government organisations have in recent years studied the adoption of agile methodologies in software development, whether for in-house development or for the software factories. Reports have been published by the US [1] and UK [2] Governments that warn about the need to monitor the adoption with the use of metrics and tools and also with reports on experience accrued [3]–[5] or correlated work [6]–[9].

In the domain of Brazilian Government organisations, the Brazilian Accounts Control Body (TCU) published a decision that describes an audit process made on the adoption of agile methodologies in contracting processes for software development within the Brazilian Public Administration [10]. In that decision, the TCU points to a set of risks in the adoption of agile methodologies but concludes it is possible to align their use with the legal provisions that govern the Brazilian Government domain [10].

This work presents the evaluation of a process for the *Management of Demands in Agile Software Development* (GeDDAS) based on the *Scrum framework*, as defined for a Brazilian Government body that outsources the software development service to software factories [11].

Aiming at evaluating the GeDDAS process [11] in a real context, a choice was made for action research, a promising technique in Software Engineering that is marked by an iterative character (actions carried out in cycles) and by an participation of the research agent [12]. The action research allowed the research agents and those working at the body in question to act in a joint manner in evaluating and refining the GeDDAS.

This study led to the confirmation that the GeDDAS process suits the Brazilian Department in question. As a result, the new contracts were executed with factories for software development in the body follow the GeDDAS process.

This paper is structured as follows. Section 2 describes the theoretical background on the adoption of agile methods and the Brazilian outsourcing context. Section 3 describes the research method. Section 4 presents the results, which are discussed in Section 5. Finally, Section 6 presents the conclusions and paths for further research.

2. Background and Related Work

This Section introduces the main data on the outsourcing of software development services by the Brazilian Federal Government and the characterization of the adoption of agile methods by Federal Public Administration (FPA) organisations, as well as the main aspects found and monitored in agile projects.

2.1. Outsourcing of Software Development Services

The transfer of services to an external provider can be defined as contracting. Some authors claim that outsourcing IT services has become common

practice in companies [13, 14], producing advantages and disadvantages.

In FPA organisations, the implementation of services in support areas or in business core areas should be outsourced whenever possible. The norms for tender procedures and contracts in the Brazilian Public Administration are set out in Law No. 8666/93 [15]. Contracting follows a competitive bidding process that allows the organisation to choose the supplier with the best proposal.

To support FPA organisations and minimize the irregularities identified in contracting, some guidelines have been created in recent years [16] such as: the Practical Guide for the Procurement of IT Solutions [17], the Guide for Good Practices in the Procurement of IT Solutions [18], the Contracting Process for IT Services [16, 19, 20] and the Normative Instruction 04/2014 [21].

Normative Instruction No. 04 (IN04) was published in 2008 by the Brazilian Department of Planning, Budget and Management (MPOG) through their Office for Logistics and Information Technology (SLTI) and provides on the procedure to contract Information Technology Solutions by the bodies in the Brazilian Information and IT Resources Management System (SISP) under the Brazilian Central Government. It is presently in its third edition, of September 11th, 2014 [21]. According to IN04, the contracting process should contain the stages for Planning of Contracting, Selection of Supplier, and Contract Management.

The Contract Management stage corresponds to the execution of the service contracted. Requests for the development of new systems are made through a Service Order whose invoicing is done based on the results produced where the failure to meet the minimum service levels leads to a reduction in the amount payable to the contractor [22].

A risk in contracting is the excessive dependence of the supplier that reduces the power of the client and may jeopardise its strategic flexibility, increasing cost and reducing the quality of the service provided [13]. In the context of the Brazilian public sector, the risks associated with flaws in legislation should be added [16].

2.2. The Adoption of Agile Methods

Several countries have published Government reports [1, 2, 10] on the adoption of agile methodologies. Based on these reports, public organisations interested in adopting agile methodologies can identify the challenges, risks, and best practices in the path to it.

In recent years, the growing popularity of agile methodologies, in addition to a rising dissatisfaction with the procurement of services, generated by the use of the current model, led some public organisations to make their software development contracting based on agile methodologies [10], seeking software quality and fast delivery time frames [8].

According to the TCU [10], the contracting of system development services by Brazilian public institutions has so far been based on traditional methodologies. Presently, some Brazilian public organizations started to contract software development with the use of agile methodologies.

In 2012, Melo et al [23] published research to raise the current state of the adoption of Agile Methods in Brazil. They identified that the agile method most used is Scrum. Dybå and Dingsøyr [24], and Hummel [25] state that Extreme Programming and Scrum are the most popular methods used by the software industry. Scrum is a framework with an iterative, incremental and adaptive approach to project management, with incremental deliveries in short durations (sprints in about 2-4 weeks) [26].

A study presented by Melo and Ferreira [8] described the results of the adoption of agile methods (XP and Scrum) in a FPA organisation operating in the financial system. The evaluation was done by means of a case study, on the implementation of two pilot projects, and the results were evaluated from the technical and managerial standpoints.

In August 2013, the TCU published Decision No. 2314/2013 [10] on a survey on the use of agile methods by public organisations. In it, the TCU concludes that, although there is a conflict between the principles of FPA organisations and agile values (Table 1), one can align the use of agile methodologies with the legal provisions the govern the Brazilian public service domain.

For Melo and Ferreira [8], the deployment of agile methodologies in public organisations is a slow and complex process. Some authors [27, 28, 29] recommend that agile practices should be assessed by means of pilot projects prior to being deployed in the organisation. The pilot project is essential to assess how the environment will be able to transition from the previous methodology to the new one that is unknown to the team [28].

The choice of the right pilot project can be a challenge [27]. The ideal pilot project is that which links four characteristics: length, importance, project size, and the involvement of the business area. According to Cohn [27], the project should have an average duration, strong participation of the business

area, importance to the organisation, and should not be big.

Table 1: Conflicts between FPA principles and agile values

Agile Value	FPA Principle(s)
Individuals and the interaction between them, rather than processes and tools	Efficiency, as it allows the institution's processes to be delegated and as it allows staff rotation to probably cause a loss in productivity of the agile team
Software in place, rather than wide-ranging documentation	Efficiency, as it disregards the adequate documenting of the software contracted, which may affect maintenance goals
Collaboration with the client, rather than contract negotiation	Linking with the calling document as it can lead a contractor to perform services not covered by the contract, causing an accumulation of wealth for no reason by the Administration
Respond to changes, rather than following a plan	Planning and Economical Nature. The first as it allows the software development task to move away from initially-set guidelines and goals. The second as it requires the contractor to re-work, to adjust to changes, which may cause new taxpayer money disbursements.

As regards the research methodology, most of the studies identified by Hummel [25] were done in case studies (38.5%) and only a handful with action research (2.5%). Some studies identified in the literature on the use of Scrum were made with action research. Action research is a type of research conducted in an organizational context, in which the researcher and the client work together to solve a problem by means of an action [30]. According to Petersen et al. [12], there are only a handful of studies in the domain of Software Engineering that follow the action-research technique, a technique that is promising in this domain. The main features of action research are: being interactive, the action to be implemented is performed in cycles; and being participative, the researcher has an active role in performing the action [12].

Kamei et al. [7] conducted action research to deploy Scrum in two public organisations in the state of Alagoas, namely, the State of Alagoas Department of the Treasury and the Department of Public Administration. Carvalho and Mello [6] carried out

action research work to study the deployment of Scrum in a small technology-centred company.

Kamei et al. [7] did two pilot projects in each organisation, and in one of them the deployment was not effective due to a lack of staff motivation to learn new practices. Carvalho and Mello [6] executed three action research iterations and, at the end, identified an improvement in communications, an increase in team motivation, a reduction in costs, time, and in the risk of the project, as well as an increase in team productivity.

3. Research Method

The Brazilian Department involved in action research as addressed in this work relies on the procurement of IT services due to the low number of civil servants in their IT area. The Department has an IT workforce of 61, with 11 Federal Government staff (18.03%), 2 administrative staff (3.28%), and 48 outsourced (78.69%) [31].

The three more expressive contracts managed by IT concern a Software Factory, IT Environment Support, and Support for Quality Control. The Software Factory is responsible for the maintenance and development of new systems. With their last contractor, the team in charge of new system development was allocated to another Brazilian state and the team responsible for the maintenance of existing systems was allocated inside the Department, together with the staff of companies responsible for the support to quality control and support of the IT environment.

To govern the relationship of the Department with its suppliers, the process to manage demands proposed (GeDDAS) (Figure 1) was defined based on the Scrum Framework.

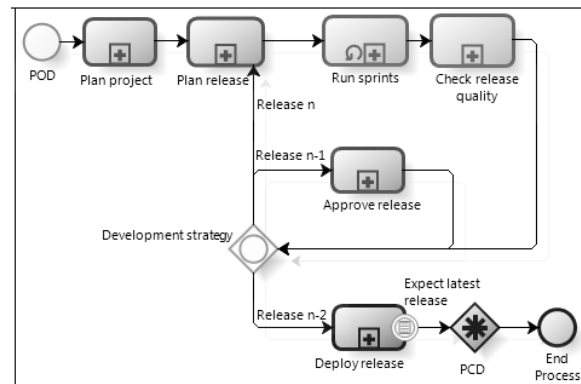


Figure 1. GeDDAS macro process

The process starts with the overall planning of the project, followed by the planning of the release. Each release consists of one or more sprints. At the end of

the release a checking procedure is run for technical quality, along with the homologation by the users and, in the end, its implementation into production.

In the GeDDAS, the needs for new system development are requested via a Service Order, whose invoicing is done according to the number of function points (PFs) produced [22]. Via a *Check Release Quality* sub-process the number of function points produced is measured as well as the service levels. Invoicing is done in one single stage with 70% of the PFs measured being invoiced with the release homologated, with 20% when the release is implemented into production, with the remaining 10% at the end of the assisted operation [22].

As regards the conflict between agile values with FPA values, some actions were implemented to ensure compliance with legal issues such as the definition of service levels measured at every release, to minimise the conflict between the principle of efficiency and the value on 'Individuals and the interaction amongst them, rather than processes and tools', the definition of a minimum set of artefacts to be delivered towards minimising the conflict between 'software in place rather than wide-ranging documentation' and the principle of efficiency, and the invoicing on a per-release basis towards minimising the conflict between value 'Respond to changes rather than following a plan' and the principle of economical nature.

With the goal of evaluating the GeDDAS process, the research methodology adopted in this study was classified as of an applied nature, qualitative approach, explanatory typology, technical procedure action research and data collection techniques through an informal interview, participant observation, questionnaire, and document.

As the process of implementation of action research does not yet exist in a standardised way [30], work steps were defined, as shown in Table 2.

Table 2. Action research steps

Steps	Period
Situation Diagnosis	July/14
Action planning	
Action operation	August/14 – June/15

Situation Diagnosis: the diagnosis to understand the situation in which the Department was as regards the GeDDAS process and the organisation's environment. For this reason, the document "2013 - 2015 IT Strategic Planning and IT Director Plan" [31] was analysed, and informal interviews were made with those involved in the organisation. The diagnosis result was that the organisation would need support to carry out the assessment of GeDDAS in a real-world scenario.

Action Planning: from the diagnosis and recommendation of some authors on the assessment of agile practices through pilot projects, the structure of the proposed and applied action was based on: Defining templates; Choice of pilot projects and of people; Choice of metrics to assess and provide training; Execution of a pilot project and monitoring of the action; and Analysis of Results.

4. Results

Template Definition: as the organisation established that the control of the backlog would be done in spreadsheets, templates were defined for the GeDDAS artefacts, such as: product backlog, sprint backlog, document of vision, quality report, lessons learned, report review, and sprint retrospective.

Selection of pilot project and people: later, the choice was made of the pilot projects and the people who would make up the projects.

Following the guidelines for selecting the pilot projects as set by Cohn [27], the organisation identified two new projects: **Project 1** and the **Project 2**. Table 3 shows the characteristics of the projects.

Table 3. Project characteristics

	Project 1	Project 2
Project size (estimated)	383 Function Points	306 Function Points
Total value (estimated)	R\$88,059.36	R\$70,355.52
Expected duration	~ 7 months	~ 7 months
Business sponsorship	Strong	Strong
Importance	Important	Important
Stakeholders	~ 18 people	~ 11 people
Agile Team	4 people	4 people

For Cohn [27], people are the most important success factor in any project. This way, the profile of those involved consisted of 70% of those involved having from 7 months to 2 years' work in the Department; 50% of IT staff having 6 or more years' experience with software development projects, and 50% of the business staff with no experience. As regards agile methodologies, 50% of the IT staff and 100% of the business staff never participated in projects using agile methodologies. However, 80% of those involved already had heard about Scrum. About 87% of the IT staff has no experience with the standard architecture used in the development of those projects, which had recently been established.

It was possible to see that those involved do not have a proper command of the development practices of the standard architecture or of the practices of Scrum, although they knew the organisation where they worked for. As regards the profile of the Product Owners (POs) it was possible to see that the PO for Project 1 had already participated in software development projects, but did not have a proper command of the business and needs to resort to key-users when necessary. On the other hand, The PO for the Project 2 had no experience with software development projects but understands the business and has no need to be supported by a key-user.

Selection of Metrics and Training: Training courses were held in October 2014 on the GeDDAS process, with user stories and elements of agile management that allowed those involved to learn prior to the execution of the GeDDAS, as indicated by the US Government Accountability Office (GAO) [1].

Parallel to the training work, some metrics were defined to monitor and evaluate the implementation of the pilot projects. This step is in line with the recommendation of the GAO [1] and the National

Audit Office (NAO) [2]. The metrics were set by means of the Goal Question Metric approach (GQM) [32] and are show in Table 4.

Project execution: having carried out the previous steps, the implementation of the pilot projects got under way. As regards the development strategy, the plan was for Project 1 and Project 2 to have 4 releases, the first release having 3 and 2 sprints, respectively

During the sprints, the research group monitored the action through a mentoring activity, to advise on the execution of each activity and on what is expected of them, apart from helping the team in the execution of the activities. Waever and Chelladurai [33] define mentoring as a process in which a more experienced person provides guidance and assistance to the professional development of a participant.

Data collection during the sprints was done with the techniques of participant observation, informal interview with those involved in the projects, and document analysis on the artefacts generated, to monitor the implementation of the process and identify issues and opportunities for improvement.

Table 4. Selected metrics

Goal	Question	Metric	Acronyms	Measurement Unit
Improving the Quality from a Business Area standpoint	Are the needs of the users being converted into software?	Size Function Point	SFP	Function Point
		Size Story Point	SSP	Story points
		Done Rate	DoR	Story points accepted in the sprint
		Average Velocity Time	AVT	Mean Story Points delivered/Sprint
		Delivery Rate	DeR	Function Points delivered / no. of sprints in the release
		Variation Size	VS	Percentage of variation
	Is the software product being delivered with no defects?	Defect Density Waste	DDW	Number of defects per function points
	Was the scope planned for each iteration covered?	Ready Rate	RR	Story points prepared for the sprint
		Done Rate	DoR	Story points accepted in the sprint
Improving the Quality from the IT Area standpoint	Is this a quality product (zero flaws)?	Defect Density Waste	DDW	Number of defects in test per function points
		Test Coverage Unit	TCUnit	Code percentage covered by unit test
		Cyclomatic complexity	CC	Absolute value for the cyclomatic complexity of the code
Improve time frames	Are the time frames being complied with?	Burndown	Bd	Story point / time unit
		Burnup	Bu	Story points / time unit
	Is the scope being covered within the time frame?	Average Velocity Time	AVT	Mean Story Points delivered/Sprint
		Delivery Rate	DeR	Function Points delivered / no. of sprints in the release
		Done Rate	DoR	Story points accepted in the sprint

These pilots had their size of sprints set as 2 weeks. In the end, only two releases were done for Project 2, with 1 release for Project 1, and at the end of the first release for both projects a change of suppliers took place at the Department.

As regards action research, at the end two cycles were run. The first cycle consisting of 1 release of Project 1 and Project 2 and the second one with 1 release of Project 2 (Figure 2).

To support evaluating process implementation, at the end of each sprint or release the measurements were collected and analysed (Table 5). At the end of the action research execution all the data collected was analysed, interpreted and reported.

5. Result Analysis

Following the collection of the measurements, the action was evaluated by the research group based on the previously done mentoring, of the measurements and observations done to identify new training needs or adaptations/improvements to the GeDDAS.

1st Action Research Cycle: the evolution of the agile team and the meeting of the needs of users occurred gradually. In both projects, the first sprint had no deliveries of functional software. As regards team development, the activity of mentoring proved essential to address the concerns of the PO, the key-

users, and of the agile Leader, in terms of backlog maintenance, writing stories, and user acceptance testing.

As regards the quality during the sprints the metric DDW allowed identifying that, despite having been delivered/readied (DoR) 100% or 55.56% of proposed stories in sprints, the owners were accepting the product with failed acceptance tests. In these cases, the tests were transformed into stories and moved onto the next sprint. The TCUnit and CC metrics allowed identifying that the first cycle had no automatic code evaluation by the Brazilian Government Department.

As regards the scope and time frame, the RR metric allowed identifying that the product owner expected the stories to be consumed prior to preparing new ones to complete the product backlog, instead of maintaining the pace of the writing stories, not leaving it to the end of the sprint. The DoR and AVT metrics allowed the inferring that team productivity was, in general, gradual and the planned scope was achieved in almost all the sprints.

After Sprint 2 a need was identified to intervene by assigning more responsibility to the PO in the execution of its duties such as, for example: allowing the product owner to handle the backlog, write the stories, write the tests, allowing the agile leader to conduct the meetings, amongst others.

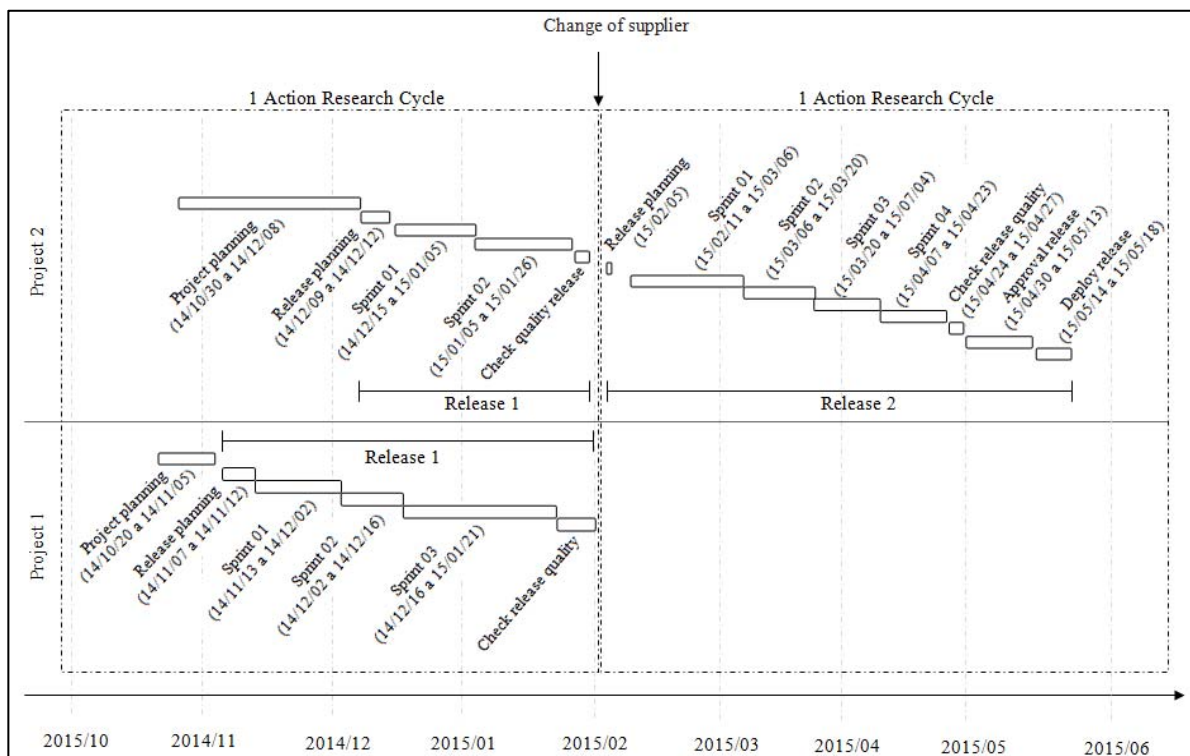


Figure 2. Pilot project execution

Table 5. Measures for project 1 and project 2

Project 2		Release 01		Release 02				Project 1		Release 01		
	SFP	85		120					SFP	60		
	DDW	0.04		0					DDW	0.13		
	VS	-		29%					VS	-		
	DeR	43		30					DeR	20		
		Sprint 01	Sprint 02	Sprint 01	Sprint 02	Sprint 03	Sprint 04			Sprint 01	Sprint 02	Sprint 03
	SSP	177	177	103	177.5	183.5	188.5		SSP	116	118	118
	AVT	0	11	55	49	39	36		AVT	13	20	18
	TCUnit	-	-	83.6%	79%	82.2%	81.6%		TCUnit	-	-	-
	CC	-	-	379	532	580	586		CC	-	-	-
	DoR	0%	100%	100%	280%	100%	173.33%		DoR	40%	100%	55.56%
	RR	-	0.76	0.24	0.27	0.20	0.08		RR	4.15	1.33	0.62

Those involved in the business areas reported that, despite the training work, they found it difficult to understand the concept and write stories and tests in a pattern of writing. To minimize this, a representative of the contractor working to support the quality control was assigned to assist them in this task along with the mentoring provided by the research group.

On the other hand the development team initially saw no sense in carrying out the estimates in story points. The adoption of this practice occurred gradually with the mentoring provided by the research group. Over time, the development team came to understand that the estimate helped to identify how much effort was required to develop a particular story, which helped negotiating the scope of the sprint.

During the sprint review meetings, the product owners reported that the development team did not come into contact with them during the sprints.

At the end of the cycle, it was possible to see that the business areas were more participative in the development process and had more responsibilities. Some points for improvement were identified for the next 2nd action research cycle, such as: doing an evaluation of the code static quality, to increase interaction between those involved through the execution of the GeDDAS process named "Collaborate with the Development Team" and providing new training work on the GeDDAS due to the exit of the supplier that took place at the end of the first cycle.

2nd Action Research Cycle: at the start of this cycle new training work took place on the GeDDAS process, due to a change of suppliers. During the execution of the sprints with the new supplier we observed that the team also evolved over time.

In this cycle, to minimize the difficulty those involved in the business areas had to write stories and acceptance tests, the strategy of implementing low-fidelity prototypes was adopted. With the development of the prototypes, the product owner reported a greater ease in writing the stories and acceptance tests.

Another improvement implemented was the use of the SonarQube tool for the static analysis of the source code. The TCUnit and CC metrics allowed identifying that the coverage of the unit tests was of around 81.6% and that cyclomatic complexity increased as new features were added.

The new contractor maintained a done rate (DoR) of 100% or above and the final average velocity time (AVT) was of 36 points. In contrast with the first contractor, this is probably due to the fact that the second contractor already had experience with the architecture adopted by the Department.

In this cycle, it was possible to see that the development team maintained a closer contact with the product owner and that the development team faced infrastructure issues at the time of the software increment deployment. Apart from that, those involved reported that the practice of carrying out of the activities of 'sprint review meeting' and 'next sprint planning' on the same day was tiresome.

This way, the improvements identified in this cycle were: adding a time of one or two days between the sprints (review and planning meeting of the new sprint), as with two cycles the activities of sprint review and planning meeting occurred on the same day, becoming tiresome; performing automated acceptance tests to facilitate the regression testing done during the sprints; performing continuous integration; and setting quality standards for the Department for inclusion in the concept of readiness. Some examples of patterns that can be defined are:

default database, visual identity, rules of versioning, among others.

5.1. Difficulties met

In general, the main hurdles were:

Cultural Change: during the implementation of the pilot, it was seen that cultural changes occurred gradually. In the beginning, it was one of the main barriers faced, such as the difficulty of for team self-management and the understanding that all have major responsibilities in the process, especially the PO. At first the PO carried out the tasks with the support of the research team and the research team then gradually started to assign more responsibility to the PO in the execution of tasks.

Backlog control with spreadsheets: the control of the backlog using spreadsheets made the generation of Burndown and Burnup Graphics more difficult, and those involved reported that the difficulties in controlling increased as the number of stories increased. This way, one sees the relevance of adopting tools.

Difficulties with the architecture adopted: both projects were also pilots for the new architecture adopted by the Department. With this, it was possible to see that the architecture assessment affected the evaluation of the GeDDAS and vice versa, given that the first vendor did not master the technology adopted.

Achievement of estimates: at first the team did not see the importance of doing an estimate in story points. The mentoring done was essential to change the perception of the team.

Writing stories and user acceptance testing: the civil servants, as the PO, had much difficulty to take up the task of writing requirements and acceptance tests pursuant to a set standard.

As regards the context of contracting and Government, the difficulties were:

Excellence and motivation cannot be controlled at the supplier end: despite the setting of minimum service levels to be provided by the contractor, the organisation cannot interfere in the FPA, in the internal practices adopted by the development team of the contractor.

Daily meetings: this practice could not be adopted due to the impossibility to interfere in the internal environment of the contractor. On the other hand, the “Collaborate with the development team” task was done so that the team and the Po could interact during the sprint period.

Staff turnover: this should also be well managed. The turnover of public employees, holidays and the possibility of contract termination may hamper the

implementation of action research and the deployment of the agile methodology. During the execution of this action research, and whenever this happened, new training sessions were held.

Communication between the contractor's development team and the PO: even with the implementation of the “Collaborate with the development team” activity, at some points the communication and the interaction between the development team and the PO was difficult, especially because of the physical distance between the teams. To minimise this, their contact was done in video conference, with set times every week in which the PO would be available to the development team and, in the sprint review meeting the team was advised to reflect on how to improve it all for the next sprint.

5.2. Lessons learned

Most of the lessons learned are a result of the interactive character and collaborative action research. The main lessons learned were:

Relationship between researchers and stakeholders: a good relationship is essential for the deployment and use of the methodology. This interaction was satisfactory in the GeDDAS, produced by an attitude of collaboration from the parties, especially due to the mentoring activities carried out by the research agents.

Training and Support: The training sessions provided by the research agents were essential for the process execution, as they provided advice and evaluated the products generated.

Product Owner Profile: in any organisation, the product owners will have different profiles and experiences. The researchers performed the selection in the organisation of those product owners that had the right characteristics to carry the task out. However, in the public area, it is possible to see the high staff turnover and a lack of time slots in agendas due to other responsibilities of the civil servant.

Commitment of the team and of the organisation: Despite the fact that in the civil service their relation with the contractors is based on the level of services and on the efficiency to be acknowledged with bonuses or rejections, it is essential to try and have a good relationship.

6. Conclusions

The deployment of agile approaches in Government bodies is a slow and complex process, especially in the context of contracting where one

cannot have full control over the work environment of the contractors and where a high staff turnover can negatively affect the process.

This work presented the manner in which the evaluation and refining of the GeDDAS was done, a process to manage demands for software development based on the Scrum framework, as proposed to a Brazilian Government body. Difficulties related to the outsourcing context in software development by a Government body were identified and tackled.

The methodology adopted, namely action research, was a success factor in the adoption of the new process as it allowed the mentoring by the research agents for the benefit of the professionals, and the gradual transfer of the execution of process activities to them along the cycles of research.

The GeDDAS was evaluated based on pilot projects. The collaboration amongst the members of the research group and those of the organisation, along with the participation in the execution of the pilot projects, were essential for the success of adopting the GeDDAS at the Department.

Some of the issues found are similar to those identified in other studies, such as: contractor team had no expertise in agile approaches, difficulty to communicate and in collaborating, between the development team and the PO, and a difficulty to set and keep different technical environments.

As a practical result of this study, it allowed us to confirm that the GeDDAS is adequate for the Department. As a result of that, the new process was incorporated to the public notice aimed contracting a software factory that is presently under execution.

One of the contributions of this study is to serve as a basis for future interventions in other public organisations that contract software development and that wish to adopt agile methods to manage the relationship with the supplier/vendor, as the challenges met in that context are presented here and how they were approached/minimised in the GeDDAS.

As future work we envisage to study to adopt backlog control tools and acceptance test automation; the production of a proposal for an evaluation framework for a PO profile to allow the Department to evaluate the minimum skills necessary to have civil servants apply for such roles; and the making of a comparative study between projects done with the traditional methodology and with the GeDDAS, to demonstrate the benefits to be attained and to characterise which cases best fit each process.

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