

# A Framework with Agile Practices for Implementation of Project Portfolio Management Process

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**Abstract**—There has been an increase in the importance of portfolio management process since its inclusion in quality models and standards. This is shown by the growing number of organizations that are attempting to implement this process effectively and efficiently. This research seeks to assist in the implementation of portfolio management in small and medium-sized companies, by reducing the difficulties and excessive documentation required in traditional processes. This involved carrying out a mapping between the framework for the portfolio management process and the agile practices that were carried out. The result was a set of guidelines that defined how to implement this process framework with agile practices that could be employed for interaction between people.

**Keywords**—software quality; process improvement; portfolio management; agile practices.

## I. INTRODUCTION

Quality is defined by the International Organization for Standardization (ISO) 9000:2000 as “the degree to which a set of inherent characteristics fulfills the requirements” [1]. On the other hand, ISO 10006 adopts a slightly different approach from the previous standard. It states that the scope of quality is the responsibility of management and requires the commitment of everyone involved in the project. Finally, the Project Management Body of Knowledge (PMBOK) defines quality in a similar way to the ISO 9000:2000. According to the Project Management Institute (PMI), “a project with quality is completed in accordance with the requirements, specifications and suitability for use” [2]. It is noteworthy that the aim of these and other concepts of quality is to meet customer requirements and expectations. However, it should be remembered that quality is not only linked to the product but also the process; metrics are defined to ensure the processes comply with applicable quality standards.

In the area of process quality, there have been some improvements in the projects. With regard to software development in particular, there is the Brazilian Software Process Improvement Program (MPS.BR), which is based on the concepts of process maturity and capability. This was set up for the evaluation and improvement of quality and productivity in software and related services. The MPS.BR has maturity levels ranging from A (optimization) to G (partially managed).

This project focuses on the project portfolio management process that is at the maturity level F

(Managed) of the respective model. The aim of the process is to “initiate and maintain projects that are necessary, sufficient and sustainable in order to meet the strategic objectives of the organization” [3].

The portfolio management area has become increasingly important, and is included in several other models, such as: (i) Project Portfolio Management Maturity Model (PPMMM) [4], (ii) Portfolio, Programme and Project Management Maturity Model (P3M3) [5], (iii) Programme, and Portfolio Management Maturity Model (P2M3) [6], (iv) Standard for PMI Portfolio Management [7], (v) Organizational Project Management Maturity Model (OPM3) [8], (vi) ISO 12207:2008 [9], and (vii) MPS.BR [3]. As a result of this diversity, software organizations have struggled to implement an efficient portfolio management.

Since 1996, the Association for Promotion of Brazilian Software Excellence (SOFTEX) has carried out initiatives to support the development, promotion and development of the Brazilian Software and IT Services, one of the largest in the world, and renowned for its creativity, competence and source of talent. SOFTEX has been designated by the Ministry of Science, Technology and Innovation (MCTI) to act as the program manager for the Brazilian Promotion of Software Excellence Program. This program benefits more than 2000 companies around the country through a network of 20 regional agents. It is a system ensures that assistance is provided to SOFTEX through the operational and financial training of associated companies by a broad and solid joint partner in the private, government and academic sectors.

According to the website of SOFTEX [10], from 2013 to 2015, there were 286 official assessments of MPS.BR nationwide. Of these, only 10 were held in the North of Brazil, and only 5 included the maturity level F, which is in the project portfolio management process. This shows a low adherence level to maturity models for software process in small and medium-sized companies located in the region.

On the basis of these data, it is clear that of small and medium-sized companies have difficulty in implementing a portfolio management process by following the guidelines and practices described in the MPS.BR model. Thus, the goal of this work is to propose a flexible approach to portfolio management, which involves holding faster and more dynamic meetings that are mainly concerned with the interaction and commitment of those involved in the process. The project portfolio management process was chosen because according to Pinto *et al.* [11], its objectives are to optimize the portfolios of organizations and link

projects to strategies. In other words, it is an essential process for successful businesses, because it is aligned to the organizational strategy, business, mission and values.

The Agile Manifesto is a set of practices that aims to guide the actions of agile teams, by keeping them focused on what really adds value to both the project and the client. Based on 12 principles, this manifesto is used as a guide for the agile activities of the projects teams, to maximize results. Its principles are as follows: value, flexibility, frequency, unity, motivation, communication, functionality, sustainability, review strategies, simplicity, organization and self-assessment. In general, the manifesto values are: its ability to allow people to interact with processes and tools, its working software for comprehensive documentation, customer collaboration in negotiating contracts, and its ability to respond to change by following a plan. On this basis, it was decided to work with agile methods, so that the project portfolio management process could be more interactive, and allow the staff to be more involved with the process. This was a means of ensuring faster and tangible results, and the team itself encouraged to execute the defined process. This required employing the process framework proposed in [12]. Thus, it was possible to carry out a mapping between this framework and the agile practices of the software project development and management. The agile methods used in the mapping were: Scrum, eXtreme Programming (XP) and Adaptive Software Development (ASD).

This paper is structured in the following way: Section 2 examines the related work and outlines the background of this work. Section 3 describes the approach that is adopted to implement the project portfolio management with agile practices. Section 4 analyzes the expected results of this research, and Section 5 concludes the study with some final considerations.

## II. BACKGROUND AND RELATED WORK

This section provides an overview of the project portfolio management in MR-MPS-SW and some related works.

### A. Project Portfolio Management in MR-MPS-SW

The importance of project portfolio management (GPP) for decision-making is underlined by the inclusion of this process in ISO / IEC 12207:2008 [9] and MPS.BR [10], which is particularly designed for the software lifecycle.

Together with the reference model for software included in MPS.BR, which is called the Reference Model for the Software Process Improvement (MR-MPS-SW), the project portfolio management process has two goals: selecting the projects that will be carried out, and monitoring / evaluating these projects to ensure that they remain viable and adhere to the criteria for which they were approved. In addition, it is essential to “initiate and maintain projects that are necessary, sufficient and sustainable in order to meet the strategic objectives of the organization” [3].

This process has obtained investment and the appropriate organizational resources and has the authority to carry out the selected projects. It performs a continuous

assessment of the projects to determine whether they justify continued investment, or should be redirected [10]. To achieve these goals, the process assumes there will be eight expected results:

- GPP1 – The business opportunities, needs and investment are identified, qualified, prioritized and selected by objective criteria with regard to the strategic objectives of the organization,
- GPP2 – The resources and budgets for each project are identified and allocated,
- GPP3 - The responsibilities and authority for managing the projects are set out,
- GPP4 - The portfolio is monitored with regard to the criteria, which were used for prioritization,
- GPP5 - Actions to correct deviations in the portfolio and to prevent the detected problems from recurring are fully established, implemented and monitored,
- GPP6 - Conflicts over resources between projects are handled and solved, in accordance with the criteria used for prioritization,
- GPP7 – The projects that meet the requirements are kept together with the agreements that led to their approval and those that do not meet the requirements are redirected or canceled,
- GPP8 - The situation with regard to the project portfolio is communicated to the stakeholders, at defined intervals or whenever the portfolio is changed.

### B. Related Work

While carrying out this research a non-systematic literature review was conducted to find previous studies that have related themes to this work but none was found that discusses the question of whether practices by agile methods can be employed to implement portfolio management. However, these studies were analyzed to determine what support can be given by this research to the implementation of portfolio management.

The main work, which was used as a reference-point for this research, was [12], which defined a process framework for software project portfolio management in accordance with the guidelines provided by the MPS.BR Implementation Guide, the ISO / IEC 12207 and the standard for PMI Portfolio Management. In addition, the author supplements this framework with recommendations drawn from the used models and technical literature regarding approaches to the implementation of their activities and tasks.

Another work related to this area is the paper [13], which proposes RisAgi, an agile methodology that supports risk management in software development projects; in the context of the processes, PMBOK is included in the area of risk assessment. Some of the activities within the portfolio management include the identification and analysis of portfolio risks. Thus, this approach was adopted to support the implementation of these practices.

Another work that was analyzed and that makes a contribution to the subject of this research is the work

presented in [14]. This paper based on the development of new products and in the case of software engineering literature, a case study that took place in three companies. This adopts an approach to the implementation of portfolio management in small product-oriented software companies, which involves analyzing their early experiences.

The approach integrates the basic assets of portfolio management, such as strategic alignment, portfolio balancing and “to go or not” decisions, in accordance with the pace of modern software development in small companies. This work was very useful because it showed the reality of that happens in small companies, which is the focus of this work.

Finally we studied the work of Sbrocco and Macedo [15], which carries out a comparative study of features, applications and examples of the main paradigms, such as Scrum, XP, Feature Driven Development (FDD), ASD and Crystal methodologies, among other agile methods. This work provided a macro view of the most widely used current agile methods, to ensure that the best practices were chosen to assist in the implementation of agile portfolio management in small companies.

One of the weaknesses of these studies is that they fail to deal with the project portfolio management in an integrated way or consider the benefits offered by agile methods. They do not demonstrate how agile principles can be applied within the portfolio management in a way that can facilitate the implementation of the process in organizations.

On the positive side, the analysis of these works was used to support the construction of a solid knowledge base for this study. First, the portfolio management process was well understood, and then the agile methods were studied; a relationship was forged between them, resulting in the achievement of the goal of this research, which is to propose an agile portfolio management.

### III. AN APPROACH TO THE IMPLEMENTATION OF PORTFOLIO MANAGEMENT BY MEANS OF AGILE PRACTICES

In the context of agile methods, several models have been proposed, but the ones that will be used in this work are as follows: XP, ASD and Scrum [16]. These methods were chosen because their practices are compatible with the activities of project portfolio management.

The XP is one of the best known and most widely used methods. It discusses iterative development and customer engagement at extreme levels. It advocates a number of good practices, such as the use of metaphors that have the power to convey complex ideas simply and clearly. In addition, it includes ideas of refactoring, release delivery, pair programming and the use of stories that are small cards where the customer writes the features that are required by the system.

Another agile method used in this work was Scrum [16], which is also widely used in organizations that employ agile project management. In general, Scrum has three main parts in its model: roles, events and artifacts. It also has the following events: sprint, sprint planning meeting, daily

meeting, sprint meeting and sprint retrospective and review meeting [17].

Each Sprint is divided into phases that use roles, events and artifacts to reach their ultimate goal, which was set for the customer.

Finally, ASD practices were used, which are concerned with communication. Sprint also uses the code review to improve its quality and make more progress in learning. In addition, preliminary workshops are run to raise the high-level requirements for the project; these requirements are outlined in detail along with the iterations.

#### A. A Workflow for the Portfolio Management

A portfolio management framework was used for this project as proposed in [12]; the main phases of this are described in Fig. 1.

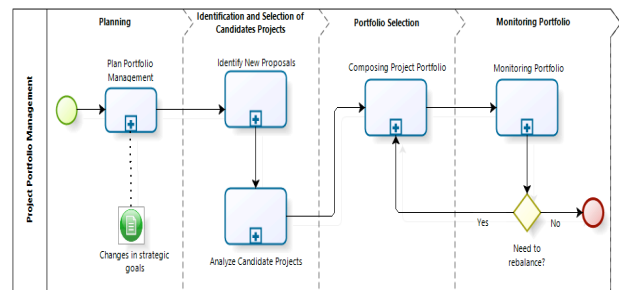


Figure 1. A Macro-workflow for the Portfolio Management

The process framework includes activities, tasks and recommendations to define a process for software project portfolio management in accordance with the recommendations of the Project Portfolio Management process of ISO / IEC 12207 and the expected results of the MR-MPS-SW model. The framework is divided into phases, activities and tasks, which are defined as a set of good practices, and are arranged in a flowchart as proposed in Fig.1. The following phases are defined:

- **Planning:** this is the stage for defining the guidelines of the project portfolio management process. It consists of the “Plan Portfolio Management” activity. Within this activity, the procedures and techniques used within the portfolio management process were defined, and range from using boards to defining the categories of the projects and the organization has resources,
- **Identification and Selection of Candidates Projects:** the purpose of this phase is to attract new project opportunities for the “pre-selection” of projects with greater strategic potential for the organization. It consists of the “Identify New Proposals” and “Analyze Candidate Projects” activities. In this phase, projects are categorized, evaluated and selected. The projects are written on cards and placed in the CANVAS,
- **Portfolio Selection:** this phase includes the project portfolio composition stage, which makes use of the

information from the “Identification and Selection of Candidates Projects” and “Monitoring the Portfolio Project” phases. It consists of the “Composing a Portfolio Project”. The activity of composing the portfolio project includes the following: prioritization and portfolio balancing, identification of expected results, identification and analysis of portfolio risks, approval of the portfolio and starting projects,

- **Monitoring the Portfolio:** this phase is carried out constantly and involves monitoring the portfolio; in addition, it produces some information about the situation of the portfolio and its components for decision-making, balancing and the allocation of organizational resources. It involves the “Monitoring Portfolio” activity. In this activity, the burndown and burnup chart tools monitor the performance, by means of assessment indicators such as: risk probability, delivery, costs and development work.

### B. An Agile Approach

The proposal of a framework for agile project portfolio management was based on the results obtained by mapping the 5 activities identified in the macro workflow and the agile practices that can be used in these activities. This required checking the compatibility of the agile practices for all the activities present in the macro workflow - a total of 34 tasks for the project portfolio management. Some of the agile practices that can be used in each activity of the macro workflow are outlined in the subsection below.

#### 1) Activity 1: Planning and Portfolio Management

In this activity, employed practices are that used in Scrum method; for example, the Planning Meeting used in Scrum. A preliminary workshop is run, which employs the ASD method to identify organizational goals and plan the portfolio management.

#### 2) Activity 2: Identifying New Proposals

In this activity an example of agile practice that can be applied is derived from the Scrum and XP. The practice of writing “User Stories” is similar, because it was adopted in this approach to write projects on cards and to compose the portfolio. The stories and features are written with the aid of these methods.

#### 3) Activity 3: Analysis of Candidate Projects

In this activity the Scrum practice of “Meeting the Product Owner” was used, as it will make it possible to evaluate the projects written on cards that will be carried out along with the portfolio management.

#### 4) Activity 4: Composing the Project Portfolio

A technique was employed for carrying out this activity that involved writing “user stories” in Scrum. This practice was used to prioritize the projects and select the projects that make up the company’s portfolio.

In addition to this practice, the “Review Meeting” will also be adopted. In Scrum, this meeting is held for the approval of each sprint (iteration) that is completed in the projects. In this research it can be adapted so that not only the modules can be approved but also the portfolio as a whole.

Finally, the “Retrospective Meeting” practice in Scrum is used to record the lessons learned when developing the portfolio, and showing the strengths, weaknesses and improvements needed for the project portfolio.

#### 5) Activity 5: Monitoring the Portfolio

The practice of using the Burndown chart is recommended for monitoring the portfolio and tracking the progress of the projects. The graph shows that there was a deviation from the plan and this deviation can be detected in the practice of the “Daily Meeting”. If any deviation from the plan is found, the “treatment actions” are turned into cards and are estimated like the others. The portfolio performance can be reported by images from the burndown chart or photos of periods in the project task board.

### C. The Evaluation of the Approach

The evaluation of this work was initially carried out to check whether the activities that form the project portfolio management framework are compatible with the agile practices. This involved sending an expert in Software Quality and Process Improvement areas to obtain feedback about its evaluation and to give opinions or make suggestions about improvements.

After the improvements have been made in the mapping on the basis of the appraiser’s experience, a set of guidelines was prepared on how to implement the improvements with agile practices was drawn up. The artifacts, events and roles were defined. As a result, the process of agile project portfolio management in an organization could be implemented and a case study will be conducted to determine its effectiveness and efficiency. This case study is underway in a Brazilian software development organization, and some metrics are being collected to assess how far these goals have been achieved. In the case study, we have already identified some factors such as the need to adjust the order of some of the framework activities to provide more mobility for the Process Portfolio Management. In addition, it is clear that there are benefits in using cards and putting a list of the activities carried out on the wall, to provide more transparency to the process.

## IV. EXPECTED RESULTS

This paper sets out a model of project portfolio management to support small and medium-sized companies. By means of this model, we intend to offer a new alternative for organizations interested in process improvement or looking for an official evaluation of MPS.BR that can speed up and reduce the costs and time needed for process implementation.

At the end of this work, we hope to make a contribution to this area of studies by means of the following: (1) a

mapping of project portfolio management practices underpinned by a framework based on models of quality standards and agile practices, (2) a proposal on how to implement the framework activities in an agile way, and (3) suggestions about the events, artifacts and roles involved in this process.

The main distinguishing feature of this work is to propose a solution for the agile portfolio management based on the activities of a Brazilian region characterized by a limited adoption of quality models. Thus, the work provides knowledge and resources to help improve the local software process and also other small and medium-sized companies not located in this Brazilian region.

## V. CONCLUSION

This study shows the importance of improving the process quality within organizations and how the portfolio management process has gained prominence in terms of quality models and standards.

A mapping of the portfolio management framework based on the expected results of the MR-MPS-SW and agile practices that are most widely used was carried out to assist organizations to implement this process. In addition to this mapping, a set of guidelines was recommended on how to implement all the agile portfolio management processes.

Future work in this research area could involve carrying out an experiment through the use of an agile framework in a case study. This could be conducted in a software development organization to make comparisons about the situation of this organization before and after the implementation of the practices. This will be evaluate by us together with the members of the organization to ensure the necessary improvements are made in the framework so that it can be adapted to real situations faced by the organization.

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