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TOWARDS MATURITY OF A SOFTWARE-BASED PROJECT MANAGEMENT METHODOLOGY CONSIDERING A LARGE-SCALE CASE STUDY

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ABSTRACT

This paper explores the challenges of designing a project management methodology for a real and large-scale enterprise solution. In this methodology, the performance of the classical waterfall approach versus a new hybrid one are examined in practice. According to the hybrid methodology, the analysis and deployment steps of creating an enterprise solution are managed through the classical version while the development step is accomplished under the umbrella of a new Scrum-based version of the agile method. It is also shown that the proposed hybrid methodology is accompanied by new challenges such as the necessity to consider modifications in the organizational chart. The results highlight how the hybrid approach outweighs the classical way in practice. The paper also includes the required maneuvers of implementing the hybrid approach for the involved parties of a large-scale enterprise solution. Finally, the paper provides managerial insights in the context of the applied lessons-learned that could illuminate the complicated path of accomplishing an enterprise solution from A to Z for the future researchers and industrial participants.

***KEYWORDS*:** Enterprise Resource Planning, Agile Methodology, Software Project Management

1. INTRODUCTION

Project management methodology focuses on devising the necessary maneuvers towards framing, phasing, planning, and monitoring the different steps of a project. In the realm of software projects and in particular the design of an enterprise solution, the steps encompassing analysis, development, and deployment. Due to the amount of activities needed to be accomplished for implementing an enterprise solution from scratch, adopting an appropriate methodology is of paramount importance. Probably, the participants of such a project would try different methodologies to explore the best and most applicable one. However, this may take a lot of time and incurs additional costs for the involved parties. In this regard, the presence of real experiences to demonstrate the issues and challenges of defining the appropriate could be regarded as a salient practice. The present paper is aimed at reflecting the concept of project management maturity during the implementation of an enterprise resource planning (ERP) system from scratch. The project is in fact associated with integrating the business processes of a large-scale steel-making Company called MIDHCO by a fresh yet professional vendor named

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FANAP Company. The project is also supervised under a professional Consultant Company called POSCO ICT. Herein, we concentrate on describing the fact that how the involved participants of the project could reach to an efficient project management methodology for running the required ERP solution. In this regard, we first review different types of methodologies pertaining to the software projects and then illustrate the main concern of the current study.

Despite the important role of project management methodology, there are very little empirical researches to address its issues and challenges particularly in the context of the information technology-based real case studies (Petersen et al. 2009, Dingsøyr et al. 2010, Hermano 20221). In the literature, waterfall approach is among one of the most widely used methodologies related to the software projects. The waterfall methodology follows a heavy-weighted methodology by considering a rigid planning in full details for the complete accomplishment of all the required tasks at the initialization of a project. On the other hand, agile methodology can be regarded as the light-weighted approaches that deem a short-interval and step-by-step planning to conduct the tasks of a project. The reasoning behind the introduction of the agile methodology is the fact that during the development of a software project the needs of the customer are subjected to be modified constantly. Therefore, defining a rigid planning for the whole production interval seems imprudent. Such a reasoning and its applicability in practice leads to the appearance of a number of agile derivatives in the literature. Among the others, one can mention accelerated SAP (ASAP), large-scale-Scrum (Less), Scaled agile framework (SAFe), and Disciplined agile delivery (DAD) that have been generated under the joint contribution of the professional consultants and top leaders of software companies (Kalaimani, 2015; Larman and Vodde, 2016; Leffingwell 2007; Ambler and Lines, 2012). Meanwhile, it may not be workable to distinctively utilize either waterfall or agile metrologies in the context of software projects. In other words, specific steps of implementing a software project could follow the terms and conditions of agile methodology while the others may inherently follow the criteria of the waterfall-based approach. Hence, a combination of the waterfall and agile methodologies has been recently boosted in the literature called hybrid method (Papadakis and Tsironis, 2018). Although an increasing number of methodologies have been introduced for running software-based projects, their usefulness has been rarely tested in terms of practical cases (Conboy and Carroll, 2019). This paper is to fill such gaps by testifying both waterfall and hybrid methodologies in case of an ERP development for the giant manufacturing in MIDHCO. In what follows, we first describe our case study and the associated process of maturing the project management methodology. Then, the applied lessons-learned of the corresponding practices are demonstrated and thereby the conclusion and future researches are pinpointed.

2. MATURITY OF A CUSTOMIZED ERP

The proposed customized ERP is called MIDRP. MIDRP involves almost 5600 features that have been categorized into 13 product groups. The product groups, per se, approximately includes 202 business process. Notice that, for further information about this real case study and its unique facets one can review Hajipour et al. (2021), Hajipour et al. (2020), and Amouzegar. (2020). Undoubtedly, managing such a giant project that is regarded as a unique practice in the targeted region is so crucial and entails a gradual trend to reach out to the most workable methodology. In the rest of this section, how the project management methodology of MIDRP is evolved from the classical waterfall approach to the hybrid one is discussed.

At the beginning of the project in an attempt to highlight the project steps for the involved participants, the proposed methodology was similar to what is presented in Fig.1. It was composed of scope review, analysis, adjustment procedure of the implementation group (IG), software development, integration test, final changes and approvals, and deployment. In this way, the steps associated with scope review through the final checking and approval are considered as the implementation phase that are going to be put into functionality during the deployment phase. Generally, these steps used to be sequentially conducted. In this regard, these steps are conducted without any interference and in an isolated manner. For instance, FANAP Company as the ERP implementer conducts the scope review and analysis individually and then the results are discussed in the specialized IG group that encompasses the other stakeholders. In fact, such an isolated working structure incurs

extra energy to the involved participants. Under this approach, it takes 13 months to complete the implementation process and 6 months to accomplish the deployment. The implementation interval is resulted by estimating 1, 2, 2, 5, 2, and 1 months for the scope review through the final checking and approvals steps, respectively. For instance, Table 1 enumerates the list of the task that is required for passing the scope review step.

Fig.1. The initial MIIDRP methodology

Towards reducing the implementation time interval, the involved parties of the project, namely, FANAP, MIDHCO, and POSCO ICT started modifying the methodology in order to minimize the reworks under the proposed rigid working structure of the waterfall approach (see Fig. 2).

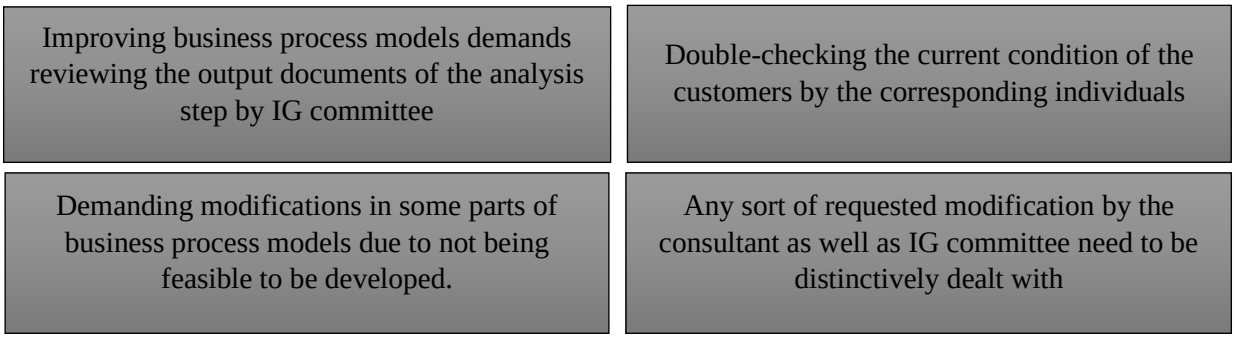

Fig. 2. Reworks associated with the waterfall methodology

Owing to the nature of the project, it has been decided to devise different methodologies for conducting the above steps. In this way, the scope review and analysis steps besides the deployment steps are used to be carried out under the classical waterfall approach. However, the development step in addition to the required tests are considered as a unique step and conducted through a modified agile Scrum-based methodology. Furthermore, the implementation group has been exchanged with the expertise team composed of executive members of MIDHCO, FANAP and POSCO ICT. The expertise team, indeed, plays an active role in all the aforementioned steps and injects the necessary comments during running the project.

According to Fig. 3, in the proposed hybrid methodology the development step observes the agile approach while the others follow the waterfall one. The initial experience under the waterfall methodology has revealed that the development phase entails the interactive feedbacks from the different participants of the project. This means that the customer should constantly monitor different demos of the software during the development phase. In this case, any sort of changes to satisfy the customers' new requirements can be accomplished with minimum amount of rework. However, postponing the demo presentation of the software to end the long period of the software development could be accompanied with burdensome effort for altering the previous customers' requirements to the new ones. Hence, it has been concluded that the development phase needs to be conducted under the agile methodology. Meanwhile, the other steps such scope review and deployment inherently demand to be performed according to the waterfall methodology. The implementer, indeed, should firstly analyze the initial condition of the customer's business and then discuss and finalize its findings with the customer's influencers. During the deployment step, the process could be accomplished based one the waterfall approach

since the entire work is going to be carried out in the business environment in which the involved parties are inherently being in touch.

Table 1. The detail tasks in the scope review step

ID	From	To	Task	Predecessor
1	Implementer	Customer	A request for a representative to identify the current processes	-
2	Implementer	Consultant	A request for introducing the Best practices	-
3	Implementer	-	Reviewing the feature-based requirements of the customer	
4	Implementer	-	Preparing the Big picture of the product under the comment of the Consultant	8
5	Customer	Implementer	Revealing the representatives	1
6	Implementer, Consultant	-	Interviewing with the project's stockholders (representatives)	5
7	Implementer	Customer	Releasing the document related to the initial condition assessment	
8	Consultant	Implementer	Preparing the best practices related to each product	2
9	Implementer	-	Conducting gap analysis between the current and ideal conditions under collaboration with the Consultant	7,8
10	Implementer	-	Assessing the existing Best Practices and the current software of Customer	-
11	Implementer	-	Defining scope of business processes by highlighting their performances	3,4,9,10

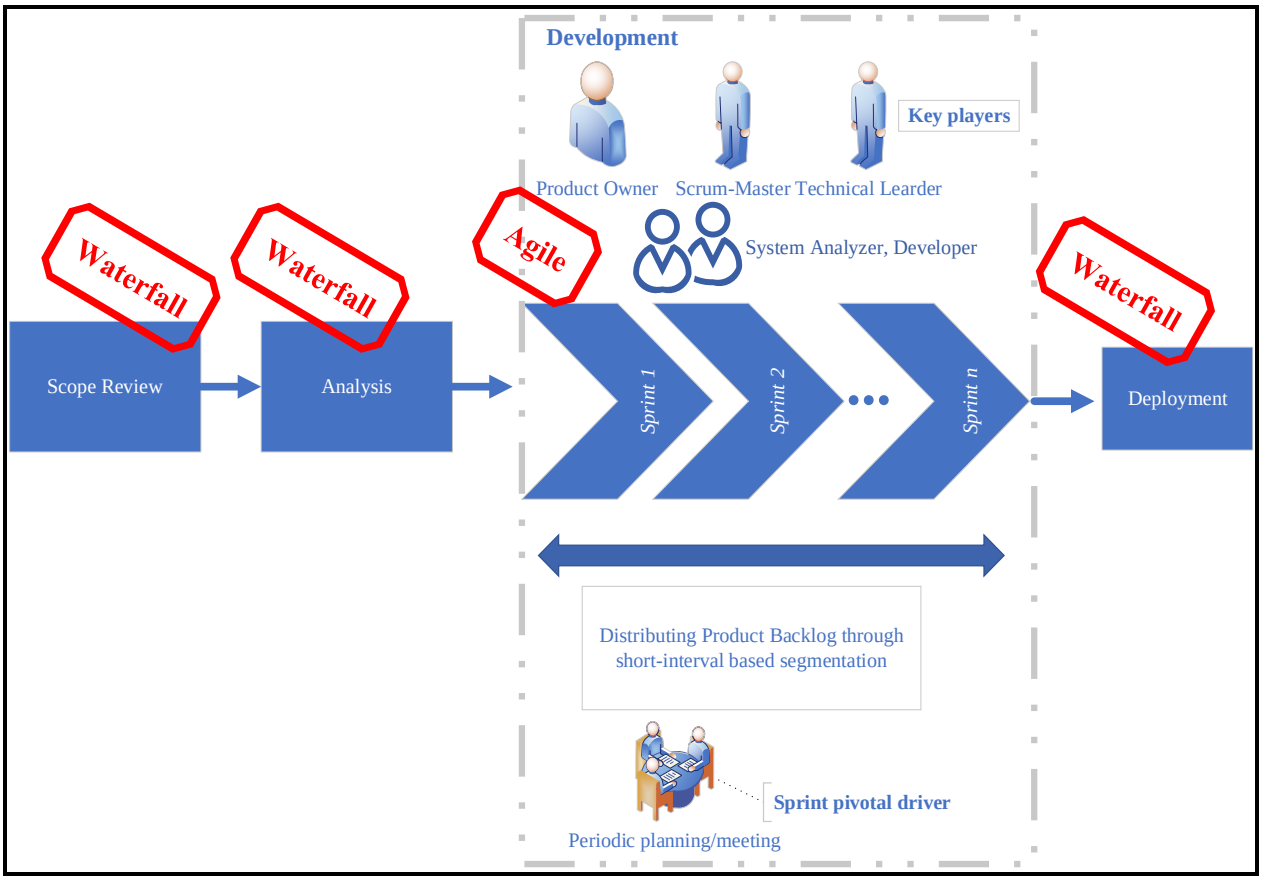

Fig. 3. Hybrid project management methodology

Notably, in the agile version of accomplishing the development step of MIDRP, there is Backlog with respect to the whole task that needs to be conducted in this project. The Backlog is constantly categorized into the smaller lists of tasks called Release plan. This plan, periodically is taken into the account in the context of different segments called Sprint. Each sprint involves three weeks planning and at the end of it, the results areshared with the expertise team to satisfy their comments with the lowest possible cost and rework process. To perform such an iterative process, a number of roles have been defined including Product Owner, Technical Leader, Scrum-Master tester and so on. This certainly entails changes in the organizational structures and thereby the functional matrix has modified into the team-based one. Additionally, different maneuvers, especially motivating rewards, have been set for the purpose of acculturation.

Under the new methodology, the implementation period has reduced to 10.5 months. Particularly, 1, 3, and 6.5 months have been devoted to the scope review, analysis, and development steps. According to Table 2, in the development steps, a rigorous monitoring mechanism is designed to enhance the joint understanding among the involved parties and facilitates the probable modification process.

Table 2. Rigorous monitoring during Sprints of development step

	Even Sprints	Each three Sprints
Actions	Presenting Demo Checking software quality Discussing the process analysis	Revising Process analysis

3. DISCUSSING LESSONS-LEARNED

It is clear that registering the trial-and-errors within a real project would save time, energy, and costs for the prospective practices. So, the value of the practical lessons-learned could be reflected when it comes to running a new similar project. In the current managerial experience several lessons-learned have been obtained that we are going to enumerate them as follows:

- One of the greatest dilemmas in executing agile methodology is associated with enhancing awareness among the key players of the project. These players contain both vendor and customer employees as well as the stakeholders.
- Finding the most appropriate fit methodology for a specific project is a far-fetched task. The participants should, in fact, devote a significant effort to acquire the necessary knowledge about different derivatives of software project methodologies and map the most applicable one to the organizational structure.
- The documentation of agile procedures is of paramount importance since its inherently new terminology may lead to the wrong interpretations.
- The infrastructures related to team-work need to be laid out prior to running the agile methodology.
- Localization of any sort of methodology in the context of environmental and cultural status of the target region is a must.
- Among the new roles created as a result of defining an agile methodology, the Scrum-Master has a very crucial position. It should be noted that the Scrum-Master is not a coordinator.
- Implementing the agile methodology entails a gradual development practice. The agile method should be deemed for those project's segments with the necessary readiness level.

4. CONCLUSION AND FUTURE RESEARCH

The present study has tried to fill the gap between theory and practice by exploring the influence of the project management methodology in the accomplishment of software projects. The study is unique since it assesses the

performance of two distinctive methodologies on a single real and large-scale ERP implementation project. The results reflected that although the hybrid approach is a more challenging one since it involves deep organizational changes, the accomplishment time would be drastically decreased in comparison with the traditional waterfall method. It is also obvious that undertaking acculturation measures is a must when it comes to adopting the agile segment of the hybrid approach. The manuscript has followed a conceptual attitude towards demonstrating the importance of project management methodology in terms of software-based enterprise solutions. Concerning this fact, the future studies could design operation research methods and statistical analysis for figuring out the best methodology in the context of a real project. Additionally, this paper ignores the financial terms pertaining to the adopted methodologies and thereby the future studies could compare the cost and particularly the Earned-value criterion in the presence of classical and hybrid approaches.

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