A New Maturity Model for the Implementation of Software Process Improvement in Web-Based Projects

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ABSTRACT: *Process and continuous process improvement is a very important aspect in Web-based software development organizations to meet the cost effective objectives of organizations. Despite the importance of Software Process Improvement (SPI), there is enough evidence that the majority of Web-based software development organizations are facing major obstacles to adopt existing SPI models and standards as they perceive them as being oriented towards traditional software organizations. This paper attempts to develop a new software process improvement maturity model in order to guide Web-based software development organizations to enhance their SPI implementation program by learning from the experiences of others organizations that are already out there developing Web-based projects. The backbone of this model is the examination and analyzing the existed SPI approaches found in the literature. Additionally, this model is inspired from capability maturity model Integration (CMMI) and is based on critical success factor and best practices identified through literature.*

Subject Categories and Descriptors
K.6.3 [Software Management]: Software development; **H.5.3 [Group and Organization Interfaces]**; Web-based interaction

General Terms
Software Development, Web-based software development, Maturity Models

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1. Introduction

As World Wide Web has had a massive and permanent influence on modern economy, the expectations and demands placed on the Web-based applications have increased significantly over the years [1]. Unfortunately, the development and maintenance of most Web-based application projects is chaotic and far from acceptable [2]. A survey contacted by the Cutter Consortium [3] highlighted serious problems such as (84%)of surveyed delivered projects did not meet business, budget overruns (63%), and (52%) have poor quality of deliverables.

The increasing demands in the Web-based applications industry to find approaches to counter these trends and to improve productivity and quality for Web-based applications development, in response to such demands is through the continuous improvements of Web-based application processes and this process called software process improvement (SPI) [4]. The main idea of SPI is through understanding existing processes and changing these processes to increase product quality and/or reduce costs and development time [5].

Different SPI models such as Capability Maturity Model (CMM), lately capability maturity model Integration (CMMI), and standard such as Software Process Improvement and Capability determination (SPICE), ISOs 9000 have been proposed to help organizations to achieve more expectable results by integrating proven models and standards into their software process[6].

Process improvement does not simply mean adopting specific methods or using a published, generic processes, there are always factors related to products, procedures and standards that influence the process improvement. Although, knowledge and competencies of software developers and managers must be considered during process improvement [7].

Web-based software projects have certain unique inherent characteristics that make Web-based software development considerably different and possibly more difficult comparing with traditional software development [8]. Process improvement in Web-based software projects is major concern for many reasons such as reducing cost and time, producing high quality software, and improving productivity. Web-based software projects are reluctant to adapt SPI models and standard because of their complexity. It has been detected that Improvement efforts in Web-based software projects based on process improvement frameworks which are designed for traditional software projects fails most of the time [9]. The inherent differences between the Web-based software development and the traditional software development approaches require new SPI mechanisms to fit the context of Web-based software development. The motivation for this paper and the proposed model was to fill the gaps regarding software process improvement in the field of in Web-based software projects. The main contributions of this paper are:

1. Proposing a new maturity model for SPI implementation in order to guide Web-based software development organizations in improving their SPI implementation program.

2. Identify the success factors that have positive impact on implementing SPI in Web-based projects.

3. Identifying the best practices to recognize the nature of issues which weaken the SPI implementation in Web-based projects.

4. Increasing awareness on the importance of software process improvement in Web-based projects.

Accordingly, achieving these goals will lead to enrich the SPI program in Web-based projects with new properties that leads to enhance the SPI projects implementation. This paper is organized as follows. Section 2 describes the nature of Web-based software development. Section 3 gives a brief overview of the Capability Maturity Model Integration (CMMI). Section 4 provides overview of the current state of the art in software process improvement. Section 5 describes the development process of Web Software Process Improvement Maturity Model (WSPIM-Model). In Section 6 the importance of WSPIM-Model was introduced with some discussion. In Section 7 the limitation on the research was described. Section 8 provides the conclusion and the future work.

2. Web-Based Software Development

Nowadays, Web-based systems and applications as become a major part of our daily lives, and it provide a complex range of varied contents and functions to a huge number of heterogeneous users. With the increase in the dependency on the Web-based systems and applications, the importance of their performance, reliability and quality have become very important [1].

Although, the Web-based systems have become increasingly complex, and their development process is still un-engineered. The introduction of contemporary processes are adapted to tackle such problem, the contemporary process are devised from the traditional software development and such approach is widely adapted[10]. Deshpande and Gaedke [11] attest to this by remarking that, “there are very few standard methods for the Web developers to use. Hence, there is a strong need to understand and undertake Web Engineering.

Web Engineering is a systematic way of managing the complexity and variety of Web applications. It is focuses on developing and organizing new knowledge about Web application development and applying that knowledge to develop Web applications and to address new requirements and challenges, which might occur during the application development process [11].

It is important to understand that Web-based software development has certain characteristics that make it different and more challenging from traditional software systems, or computer software development. Web-based software applications have the following characteristics: Web-based software constantly evolve, contents are different compared to traditional software, demand a good “look and feel,” small team (frequently young) with different skills, backgrounds, and knowledge compared to a team of traditional software developers, rapid technological changes, delivery medium for Web applications is quite different, strong competition and time pressure[11].

The developed Web-based systems tend to wear out quickly. They also require a high cost to change its design based on the new requirements. This problem is due to the focus on the resulting artifacts instead of managing and improving the process [1]. Therefore, SPI is becoming increasingly important for Web-based software project. The success of Web-based software project development is highly dependent on resolving problems, learning from the others experience, reducing uncertainties and fulfilling stake holders needs in a cost effective and time efficient manner [11]. In this paper, the proposed software process improvement maturity model introduced to tackle the above-mentioned issues through learning from the experiences of other organizations that are already out there developing Web-based projects.

3. Capability Maturity Model Integration (CMMI)

CMMI is an approach that supports assessing and improving an organization’s processes using a best-practice models. It provides an effective guiding framework for determining organizational maturity and process capability [12]. CMMI focuses on a set of process areas that are related to software process capability and improvement. CMMI has two representations [13]:

- **Stages model:** Designed to provide a standard sequence of improvements. It provides a way to assess the company's process capability at 1-5 levels (Initial, Aware, Defined, Quantitatively, and Optimizing).
- **Continuous model:** Focus on the specific processes areas that are considered important for the company's direct business goals. Each process area is rated in terms of maturity level (0-5).

The main difference between the two representations is that the staged model is used to evaluate the capability of the company as a whole, while the continuous model is used to assess the maturity of certain process areas within the company.

CMMI includes a set of goals, which are a brief description of a wanted state that must be reached by an organization. The CMMI has also specific goals, which are related to each process area and describes the wanted state for that area. Moreover, CMMI includes a set of generic and specific practices that covers a set of process areas. These practices describe the ways of achieving a goals. Many generic and specific practices be related with every goal within a process area [12].

Regardless of how good the CMMI approach can be, but still it has certain drawbacks and one of these drawbacks is that it just provides developers practices that are required to improve the process but it does not state how to implement them [14]. In addition, CMMI has a lot of technical definition and documentation because it covers practically the whole thing from initial level process to optimized level, which make it ambiguous [13]. Using CMMI in Web-based projects is a challenging job. Therefore, Proposing a new SPI model that can be fit with the context of Web-based projects is the goal of the proposed model in this paper.

4. Overview of Research on Software Process Improvement

The motivation for execution process improvement activities is to gather information as to what needs to be changed and to set up how to follow the improvements in order to reduce development cost and increase the quality of products created[15]. SPI is about making things better.

Different software process improvement models and standards have been proposed to help organizations to achieve more expectable results by improving their software process. These models and standards such as ISO standard, BOOTSTRAP, SPICE), CMM, and CMMI have a share in some common consideration [13]. A lot Web-based organizations are concentrating on process improvement by designing and developing their own models. A model named, DeCU (Design and approach User-Centered) proposed by Claudia Isabel et. al [16]. Project post-mortem system of software process improvement for Web companies proposed in [17]. This approach is iterative in nature, where the organization can be identified according to a category e.g. software, Web, embedded systems etc. It uses a five steps that focus on the current state of practice in the organization. A tool for automatizing the software process improvement initiatives in small Web-based organizations is proposed in [18]. Software process improvement used in AGILE method is proposed in [19]. It describes the design process and evaluation of a web environment for software process improvement in Spain and Latin American. Many Web-based software organizations are trying to follow the model and standards that used in traditional software projects. A case study about SPI models or techniques for process development in Web-based software organization is proposed in [20].The impact of SPI on Web applications development in small software firms is proposed in [21]. MECA in [22] is established to offer a complete suggestion for software process development and assist in providing the basis to keep on improvements in existing method. The reliability improvement of Web-based software applications is discussed in [23]. Measurement framework for evaluating and improving Web processes is proposed in [24]. An intelligent process and product quality assurance (PPQA) Web services for capability maturity model integration (CMMI) assessment is proposed in [25]. There are many challenges facing the implementation of SPI projects found in the literature. Amescua et. al [27] list out some of the resistance factors which apply for the organization who implements the SPI. Meanwhile, Sakamoto et. al [28] has basically identified main problems faced in most SPI implementation which include changeable goals, unclear picture about the current status of SPI project, poorly managed information, unclear role distribution and hardly transferred technology. A systematic review of organizational motivations for adopting CMM-based SPI proposed in [29]. Arshad et. al [30] shows that effective communication in software project development environment among the developers, users and project managers are the deciding factor to minimize project failure.

There are several important factors that influence the implementation of SPI projects. However, critical success factors that influence software process improvement initiatives proposed in [31]. Factors that influence software process improvement discussed by Niazi [32]. Issues in software process improvement in small companies discussed in [33]. Managing factors that affect software process improvement discussed in [34]. Factors that influence the accomplishment of the standard implementation in small and medium software companies discussed in [35]. Factors for the Design of CMMI-Based Software Process Improvement discussed in [25,33,36]. A survey which compares SPI factors in Micro and Small Enterprises proposed in [37]. It describes the factors that affect their implementation strategies and adapt CMMI-DEV to particular process circumstances. Finally, critical success factors that make the successful improvement procedures better discussed in [38].

5. Proposed Web Software Process Improvement Maturity Model (WSPIM-Model)

The proposed Web Software process improvement maturity model (WSPIM-Model) is a new maturity model, which is designed to guide Web-based software development organizations to improve their SPI implementation processes by learning from the experiences of others organizations that are already out there developing Web-based projects

The framework of producing WSPIM-Model was divided into two parts. The first part constitutes of the theoretical definition of the RIAP model. The main goal of the first part is to identify critical success factors and best practices presented in SPI literature that can be used to build RIAP. The second part consists of the transformation of WSPIM-Model into an operational model. The main goal of the second part is to use well-known approach by mean capability maturity model Integration (CMMI) that can bring more structure and formalism to improve the SPI implementation processes in Web-based project.

5.1 First Part: The Theoretical Definition of the WSPIM-Model

The main goal of the first part is concerned with investigating factors that necessary for implementing a successful SPI program in Web-based projects, and the activities that needed to be performed in order to satisfy these factors. This part has two phases: Critical success factors and best practices.

5.1.1 Phase 1: Critical Success Factors

The first step in the development of any model is to collect the required information. This has been achieved as the input for WSPIM-Model by SPI literature. The data collected in this paper was from different Web-based software organizations via their websites, research articles and case studies implemented in Web-based software development environment. We tried to contact many Web-based software organizations to discuss the SPI models used in their Web-based projects but all of them were unwilling in sharing their information. Therefore, the data collected in this paper are totally based on SPI literature review performed on Web-based projects. During the literature review, a set of studies related to SPI were studied and classified, with the focus on the implementation of SPI and critical factors that affect their success. The purpose of this was to get a good overview of the SPI models, best practices and problem-solutions, and the critical success factor that should be supported by the implementation of SPI.

At the end of literature review, a lot of success factors and examples of good practices were obtained from the SPI literature review. It would be redundant to outline the complete list of success factors and good practices. Therefore, the study decided to consolidate this list to avoid possible duplication. To achieve the research goal, the research analyzed the list of the success factors and best practices to re-identify and remove possible duplicates.

In fact that implementation of SPI approaches require real life experiences where one learns from errors and constantly enhances the implementation process [33]. Success factors and best practices are frequently identified after the successful achievement of certain activities [24,31]. Hence, these success factors and best practices are close to real life experiences. For this reason, the proposed model is built upon the critical success factors and best practices presented in SPI literature.

This phase of the WSPIM-Model is dedicated to identify the success factors that are most strongly related to the success of SPI programs and which factors have high impact on SPI programs. To achieve this goal, the frequency analysis technique in [39] is used. The proposed model aims is to measure the occurrence of each success factor in the literature. Study documented the occurrence of a main success factor in every study. By comparing the occurrences of a main factor in a many of studies against occurrences of other main success factors in the same studies, study calculated the comparative importance of each factor. For example, a percentage of y for success factor x means that success factor y is cited in y% of the literature, i.e. if a factor is cited in 15 out of 20 articles, it has an significance of 75% for purposes of comparison. In this manner, we compared and classified the success factors. Table1 shows the most regularly cited critical success factors in literature. We have only take into account those top 50% factors as critical success factors on which the management should concentrate their attention.

The most frequently cited critical success factors in the literature is understanding and management of requirement senior management commitment (87%). Most of the Web-based project team lacks in understanding the requirements in the right way, misunderstanding the requirements can affect the project development extremely. Changing requirements is common in the Web-based projects, it is required to manage and control the changed requirements in order to avoid failure. The second highest ratio was SPI awareness (80%). It is very significant to encourage awareness of SPI and to share knowledge between different participants. The third highest ratio was senior management commitment (66%).This indicates that the practitioners' opinion sponsorship can play a very important role in the implementation of SPI. The fourth highest ratio was staff involvement (51%). It shows that practitioners consider their involvement is essential for the successful implementation of SPI. The

Critical Success Factors	Occurrence in literature (n = 47)	
	Frequency	%
Clear and Relevant SPI Goals	12	26
SPI Awarenes	38	80
Teamwork	8	17
Supporting Communication	11	23
Project Planni	18	38
Experienced Staf	13	28
Staff Involvement	24	51
Staff Time and Resources	11	23
Training and Mentoring	13	28
Understanding and management of requirement	42	87
Senior Management Commitment	31	66
Process Ownership	12	26
Reviews	15	31
Product integration	11	23
Unrealistic Management Expectations	7	15

Table 1. Critical success factors

Critical factor	Best Practices
SPI Awareness	P1. The advantages of SPI have been indorsed between the staff members of the company before SPI starts P2. Top management understand the cost and the benefits of the SPI before SPI starts and be willing to invest in SPI. P3. Staff members are understand their duties during the SPI implementation. P4. A strategy has been recognized to make the SPI as part of the business culture
Understanding requirement	P1. Start informal requirement review P2. Start formal requirement review P3. Create and maintain requirements traceability matrix P4. Control change of requirement
Experienced staff	P1. The members of SPI activities have been selected based on their achievement records P2. Establish plane for conflict resolution P3. A strategy has been recognized to check the progress of each SPI member P4. A strategy has been recognized to gather and evaluate the feedback data from each SPI member
Lack of support	P1. Top management provides strong support for SPI P2. Management is prepare all the necessary resources P3. Staff members are understand the profits of SPI execution P4. A strategy has been recognized to check the progress of each SPI member
Time pressure	P1. Efficient time for staff members to preform SPI activities P2. SPI activities has been organized to avoid time pressure P3. The SPI activities has been organized based on staff members interest P4. Top management have to understand the nature of SPI activities
Training and mentoring	P1. Appropriate training most be provided for developing the proficiencies and experience that needed to perform SPI activities P2. allocated additional time staff members to participate in SPI training P3. Training program are evolved on a periodically P4. A strategy has been recognized to gather and evaluate the feedback data from training

Table 2. Mapping between existing best practices and corresponding critical success factors

results also show that Experienced Staff and Managing the SPI Project are also important factors.

5.1.2 Phase 2: The Best Practices

The objective of this phase to discover the best practices and problem-solutions that have been implemented during the process improvement implementation programs.

In research definition, a practices which contributed positively to process improvement is regarded as best practices. As result, in this paper, fifty-one examples of good practices obtained from the studied literature. The study assembled the problem-solutions and instances of good practice that happened in more than one project into one list. In addition, it also listed the problems and instances of good practice that happened in just one project because they are also considered as the major factor that determined the success and failure of such project.

The mapping of critical success factors with the existing practices was a difficult job. The most relevant practices were mapped to the critical success factors to avoid repetition of practices.

It is suggested that on basis of these critical success factors and their mapping with best practices can help Web-based software organizations to implement process improvement activities more effectively. The result of mapping can be shown in Table 2.

5.2 Second Part: The Operational Framework of WSPIM-Model

WSPIM-Model is totally based on capability maturity model Integration (CMMI), and the reason to that was CMMI has been working well with various Web-based software organizations during the year to make changes to their current approaches on the feedback [25,40,41]. Therefore, WSPIM-Model is based on latest research. The CMMI model is intended to be a framework for process improvement that has wide applicability across a diversity of organizations. The main advantage of using CMMI is to decrease cost, use resources efficiently, manage the resources in order to produce high quality products. In addition, CMMI joined best practices and essential principles and linked them in order to improve the process within an organization [13].

Process improvement does not just simply mean adopting specific methods or using a published, generic process, there are always other factors that influence the process such as: local organizational factors, standards, local environment and culture, and procedures [14]. Adapting the same change in process improvements that has been used elsewhere it is not sufficient to guarantee process success [32,42]. Thus, the factors that may be influence the process must always considered. Since Web applications differ from traditional software applications, the architecture of CMMI has been customized in the proposed model to fit the Web-based projects, some of these changes illustrated below:

1. Process areas has been replaced with critical success factors

2. Best practices were defined for every critical success factors

3. Critical success factors and best practices classified into four groups

The CMMI contains 22 process areas classified through the five maturity levels [19]. In the proposed WSPIM-Model, the SPI implementation process is based on critical success factors rather than process areas, because that many different studies have approved the value of the critical success factors approach in the IT field as in [3235]. In addition, critical success factors and best practices are regularly identified after the certain activities have been successfully completed [40], which mean that learning from errors and constantly improve the SPI implementation.

Taking into consideration these facts, the proposed WSPIM-Model rely on identified different critical success factors and best practices, along with the use of frequency analysis technique to calculate the comparative importance of each success factor. In the WSPIM-Model, only take into account those top 50% factors as critical success factors on which management should concentrate their attention. But if Web-based software organizations identify more critical success factors or and best practices they can include them in the model.

The 22 process areas of CMMI can be divided into four groups (Engineering, Process Management, Project Management, and Support) [19]. The WSPIM-Model rely on this tactic and classified critical success factors and best practices into four groups as illustrated in Table 3. The basis of this classification is to represent the relationship of direct influence between each group and the attendant critical success factors. By assigning the critical success factors to these group, the study can observe their impact on the improvement process. It should also be indicated that these critical success factors and best practices are not necessarily mutually limited and there probably will be a certain degree of overlap between them.

In order to split these groups of critical success factors and best practices between diverse levels of CMMI, the WSPIM-Model adopted the conception of process areas division between diverse maturity levels of CMMI.

The CMMI is organized into five maturity levels (Initial, Aware, Defined, Quantitatively, and Optimizing). For WSPIM-Model some changes to the stage structure of CMMI are needed to take account the Web-based characteristics

In WSPIM-Model, awareness factor has emerged as a

Group	Critical Success Factors
Process Management	Staff Involvement, Process Ownership, Training and Mentoring, Experienced Staff, SPI Awareness
Project Management	Understanding and management of requirement, Teamwork,Project Planning, Staff Time and Resources, Senior Management Commitment, Clear and Relevant SPI Goals, Unrealistic Management Expectations
Engineering	Product integration
Support	Reviews, Supporting Communication

Table 3. Critical success factors and best practices

significant success factor for SPI implementation (80%). So, the Process Management group can be straight linked to the second maturity level, namely aware of the CMMI model. Whereas Project Management group can be linked directly to third maturity level, namely defined, because this level focus on organizational standardization and deployment. Level four of the maturity model focuses on founding quantitative measures of software process. Regarding level four, the WSPIM-Model didn't consider this level, because of the lack of any success factor related to this level. As for level five focus on the continuous improvement; so support and engineering group can be linked with this level. Finally, no group for level one "Initial" ,because this level is considered as ad-hoc and it does not need to be realized by itself, and it does not have any success factor for itself. Furthermore, in WSPIM-Model, an assumption were made pinpoint that the success factors groups could overlap and one should always monitor before implemented group.

The four maturity levels proposed in WSPIM-Model are enough and suitable for SPI implementation in Web-based projects because these maturity levels are constructed from success factors which were gathered from real life experiences. Moreover, other studies designed similar maturity levels such as Sommerville et.al [41]. They have published the requirement engineering process maturity model which was based on three maturity levels (initial, repeatable and defined).

The differences between proposed WSPIM-Model and the CMMI is that CMMI just clarifies what are the specific goals in each area and what practices is about those goals, while WSPIM-Model provide set of critical success factors and the best practices around those factors as illustrated in Figure 1.

5.2.1 Main Sections of the WSPIM-Model

Process Improvement: Great improvement process profile to identify the potential success factors and to collect the experiences on improvement process. This can help Web-based organizations to focus on the most critical success factors on their process.

Group: Classify the identified critical success factors into different groups. By classifying the critical success factors

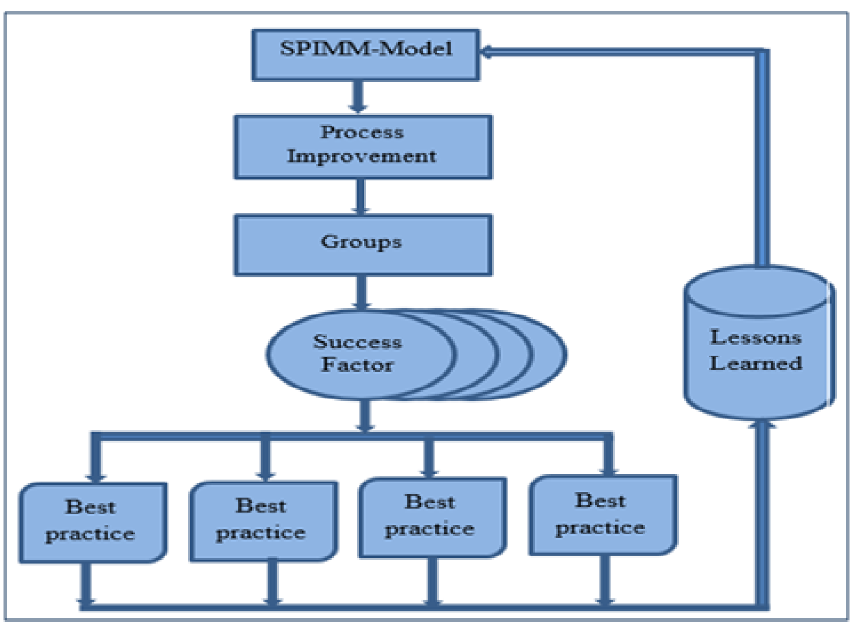

Figure 1. WSPIM-Model

to these group, the study can observe their impact on the SPI implementation. It should be indicated that groups could be overlap between them.

Critical Success Factors: Identifying the critical success factors is the foundation of the WSPIM-Model. Under every success factor different best practices have been designed that guide how to manage and implement every success factor. These success factors and best practices are close to real life experiences. In addition, if any new critical success factor arise from implementing WSPIM-Model, they must be recorded and managed within the same process.

Best Practices: Best practices are set of activities performed in order to satisfy the success factors within each group. It's important to consistently apply the practices that satisfy the success factors, and change the practices that cause difficulties. The selection practices must be modified if its execution is not satisfying. So, the best practices should be refined and improved or freshly redefined based on the lessons learned from each time using WSPIM-Model.

Lesson learned: Success factors and best practices are derived from real life experiences. Based on lessons learned from each time using WSPIM-Model, the best practices should be refined and improved or freshly to ensure that the most appropriate practices can be instituted to achieve the critical success factors.

6. Importance of WSPIM-Model

WSPIM-Model is totally based on capability maturity model Integration (CMMI), and the reason to that was CMMI has been working well with various Web-based software organizations during the year to make changes to their current approaches on the feedback. CMMI enable organizations to improve performance and SPI implementation process. The data collected in this paper are totally based on SPI literature review performed on Web-based projects. During the literature review, a set of studies related to SPI were studied and classified, with focus on the implementation of SPI and critical factors that affect their success.

The WSPIM-Model was designed to help Web-based organizations to improve their SPI implementation processes. Improving software process with WSPIM-Model could help in handling many challenges facing SPI implantation in the following ways:

1. The use of WSPIM-Model resides in its capability as a good general-purpose model with which critical success factors can be detected earlier. In other words, by taking into account the possible impact of success factor, the practitioners can concentrate on improving the most critical success factor first. Moreover, it assists the practitioners in to increase their awareness on process improvement.

2. When improving with WSPIM-Model, the practitioners can avoid obvious faults and select the appropriate practices that can be performed.

3. WSPIM-Model derived as result from the lessons learned of identifying the same critical success factor or similar success factor repeatedly. During software improvement process, best practices are refined and improved or freshly redefined to ensure that the most appropriate practices can be instituted to achieve the critical success factors. This can enhance the traceability of WSPIM-Model and their relationship to feature process improvement.

4. WSPIM-Model tends to amplify the degree of formality and improve the degree of conceptual integrity of the process improvement clarification. As a result, the communication effort as well as the probability of misinterpretation is reduced.

These benefits become even more tangible when the software process improvement is refined into a group of smaller-grained process improvements to exploit the commonalities between different Web applications domains, for instance e-government or interactive learning applications. Here, the Software Product Line and different process improvement can be built for each domain. Instead of making the whole thing from scratch every time a project is started.

7. Limitation on the Research

Research in software engineering is basically different from research in other areas of computer science. The recognitions of problems in software engineering can be done by observing how organizations develop software. Solutions to these problems can be methodology tools, techniques and so on [41,42,43]. This circumstance puts limitations on how research can be done:

1. In the real-world systems, there is a small chance for using well-recognized research methods such as experiments.

2. A solution related to technical and management issues sometimes have an influence on the software engineering process; a solution have to match the general context of business in the company process and have to be allowed by the policy in the company.

The results of using WSPIM-Model can improve the Web-based project process, but never tested in real Web-based organization or any Web-based projects, so the outcome of the results may differ in different Web-based projects environment. Therefore, we are planning to conduct a case study in a Web-based organization in order to validate and test our model in the real world environment.

8. Conclusion and Future Work

The main goal with the paper is to propose a web software process improvement model that was tailored for Web-based projects. The proposed WSPIM-Model has the possibility to help Web-based organizations to improve their SPI implementation processes. This model is obtained from CMMI and is based on critical success factor and best practices identified through literature. An extensive literature was undertaken to review and to determine the success factors and the practice that have a negative or positive impact on the SPI implementation from Web-based organization perspective .As result for the extensive study for the literature led to introducing the WSPIM-Model. WSPIM-Model proposes a novel notation for improving the software process that acts as a set of critical success factor and their best practices that leads to a clear SPI implementation in Web-based projects. Improving software process with WSPIM-Model helps Web-Based organization to detect the critical success factors earlier, so the practitioners can concentrate on improving the most critical success factor first, learning from others experiences, avoid obvious faults, reduce time and effort, enhance communication reduce misinterpretation, and increase their awareness on process improvement.

In the future work, the WSPIM-Model will be applied on a case study in a Web-based organization in order to validate and test our model in the real world environment. The case study will be carried out with three goals. First, to test the validity of WSPIM-Model. Second, to highlight areas where the WSPIM-Model has deficiencies. Third, to show the practicality of WSPIM-Model in use.

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