SOFTWARE PROCESS IMPROVEMENT MODEL COMPARISON AND ORGANIZATIONAL FACTORS: A REVIEW

1FAHAD NAWAZ, 2SHAKEEL UR REHMAN, 3SHAHBAZ AHMED

1,2Research Scholar, Department of Computer Science and Software Engineering, International Islamic University Islamabad, PAKISTAN
3Asst. Professor, Department of Computer Science and Software Engineering, International Islamic University Islamabad, PAKISTAN
E-mail: Fahadnawaz111@gmail.com, shki 80@yahoo.com, shahbaz.ahmed@iuu.edu.pk

ABSTRACT

Process and Continuous Process Improvement is a very important aspect of the software organization to meet the cost effective objectives of organizations in competitive environment. So it is a very big challenge for the organizations to constantly analyze their processes and improve them whenever necessary, to make a successful and quality software projects. Considering the importance of Software Process Improvement (SPI), we make a review of different models and make comparison of those. In the end we identify some success and resistance critical factors in the literature, which can be helpful for the organizations to improve their processes.

Keywords: SPI, Software Process Improvement, Continuous Process Improvement, Organizational Factors

1. INTRODUCTION

Software process improvement plays a very important role in development of the software, make it effective for development teams and use same set of activities [1]. SPI is a very big challenge for organization to live in a competitive environment and grasp the new evolving functionalities such as environmental changes, corporate level changes, and unplanned changes and finally enhance the quality of the product [3]. Software process improvement is not implemented at single stage rather it is a continuous and iterative process throughout the life cycle and helping to get high maturity level [4].

In this paper the literature survey of software process improvement and comparison of different software process improvement models is given. Then identify the success and resistance factors necessary for organizations to consider when improving the processes.

Many software industries, SPI enables to participate profitability in the international level [5]. There are many models available for the software process improvement like CMM, CMMI, ISO/IEC 15504 are widely used. Every organization is unique and has their own limitations to consider for improving the software process and some factors like benchmarks, effectiveness, risks and organizational needs [6].

It is also very important to build an environment for achieving software process improvement [7]. There are different tools and techniques used to improve the software process improvement such as SPICE, CMMI, PSP and Six sigma etcetera. Quality of any product is governed by quality of the process being used and should improve time by time [8]. Since software industry is changing
rapidly so organization should align and update their processes to the changes required. There are many forces which are not coming directly under the command of the organization such as customers, competitors or especially government. Now SPI changes should be considered according to the above forces [10]. SPI comprises different practices to make the software process efficient which directly help to improve the quality of the software product.

Process is considered the organization’s best asset and improvement influence over the success of any organization in the competitive environment [11].

This paper structures as follows: section 2 describe the literature survey about SPI, section 3 describe and make comparison of different SPI models, section 4 identify success and resistance factors involved in SPI. In last Section 5 concludes this paper.

2. LITERATURE SURVEY

Some small and medium based web companies don’t use and focus on Process and its improvement. In [1] case study investigates SPI model or techniques for software improvement in web software companies. Software process improvement used in AGILE method is proposed in [2].

Process Meta model is proposed in [3] after investigating the challenges, advantages and disadvantages of existing models. MECA [4] is introduced which provides complete monitoring for software process and help in providing the ground basis to carry on improvements in existing model. For small organization which mainly focuses on the quality rather processes which actually emboss that quality. But there are many factors involve in small organizations. In [5] describes different small organizations reviewed to improve the literature in small organizations.

In [6] identification techniques are proposed for SPI in terms of Quality Functional Deployment (QFD). QFD is basically methodologies that meet the requirements of the customers. In paper [6] takes the voices of customer according to the CMMI reports. In [7] suggests different ways to improve the process and build an environment to achieve. Resistance factors are obstacle in the SPI, in [8] author identifies the resistance factors when implementing the software process improvement. EBM model is proposed in [9] which helps integrates several concepts which contributes a thoroughly understanding of software engineering concepts. Also training plays a very vital role in implementing software process and its improvement. So in [10] shows that training can be very useful to support SPI. Process Quality Measurement Model (PQMM) [11] is introduced which is used to analyze the quality for software organizations.

Six Sigma process models [13] contain theories and tools with software process to improve and produce high quality products after implementing continuous improvement in SDLC. A gradual approach (OWPL) for software process improvement is introduced to check various gradual assessments which allow gathering comprehensive knowledge depending on software in Small Enterprise Organizations (SMEs).

ABC (Activity Based Costing) model [15] used to reshape software process according to goals and objectives of the organization and secondly evaluate the performance of software process accordingly. IDEAL model is proposed in [17] based on the experience of large organizations which helps in the software improvement in small organizations.

mainly emphasize on training than documentation aspects. For software process improvement in term of evaluation and monitoring methodology is used and proposed in [18].
3. SOFTWARE PROCESS IMPROVEMENT (SPI) MODELS

In the following Table 1: we reviewed different models, approach or concept they used and their salient features in terms of Software Process Improvement. In table 2: we make comparison according to the criteria discussed in [3].

**Table 1: Software Process Improvement (SPI) Models**

<table>
<thead>
<tr>
<th>Sr.#</th>
<th>SPI Models/Technique</th>
<th>Approach used</th>
<th>Salient features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PIT – Process [3]</td>
<td>Describe formal process elements applying to build Software Development Process</td>
<td>• This model includes complete picture of process versioning management support.</td>
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<td></td>
<td></td>
<td></td>
<td>• Include two views the static view (shows structure of concepts) and dynamic view</td>
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<td></td>
<td>(identifies structure such as how work is organized).</td>
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<td>2.</td>
<td>MECA [4]</td>
<td>Provide continuous approach in term of requirement elicitation and quality assurance and customer satisfaction process.</td>
<td>• It is inspired from Plan, Do and Check Act (PDCA) model.</td>
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<td></td>
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<td></td>
<td>• Provide footprints for organizations to improve maturity level like CMMI.</td>
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<td>3.</td>
<td>QFD technique [6]</td>
<td>Approach used to consider the voice of the customer’s requirements.</td>
<td>• Customer voice is according to the recommendations from CMMI reports, organization needs and requirements and benchmarks.</td>
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<td>4.</td>
<td>EBM Model [9]</td>
<td>It captures and manages the software engineering items or objects which are being reused.</td>
<td>• EBM model guides software development process improvement in organizations.</td>
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<td></td>
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<td></td>
<td>• This model is easy to understand and automate because of modular representation schema.</td>
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<td></td>
<td></td>
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<td>• EBM is used by software engineers in SE organizations.</td>
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<td>5.</td>
<td>PQMM [11]</td>
<td>PQMM is detailed and practical quality measurement model.</td>
<td>• Measure process before they put into practice.</td>
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<td>• PQMM is developed on the similarity of process and software.</td>
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<td></td>
<td>• It facilitates the measurement of process quality in terms of maintainability, reliability and functionality and usability.</td>
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<td>6.</td>
<td>Software Process Management Model [13]</td>
<td>Use six sigma approaches including theories and tools.</td>
<td>• Aim is to provide a high quality product through implementing continuous improvement in SDLC</td>
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<td>7.</td>
<td>ABC Model [15]</td>
<td>Combine Activity Based Costing, Balanced scorecard and CMM into SPI.</td>
<td>• Redesign the effective Software Development Process in line of goals and strategies of the organization.</td>
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<td>• Evaluate and measure the performance of the SDP.</td>
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<td>8.</td>
<td>IDEAL model [17]</td>
<td>Provides a structural approach for continuous improvement.</td>
<td>• Developed by SEI.</td>
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<td>• Provide path of action which make up software process improvement.</td>
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</table>
4. SPI SUCCESS AND RESISTANCE FACTORS

4.1 Success Factors:

In [5] after critical evaluation of the survey, some success factors are being chosen for software process improvement.

- Involvement of Leadership
- Participation of Employees in SPI
- Commitment of Management about Improvement
- Focus on Training of SPI
- Business Orientation Session
- Focus on Organizational Process
- Lack of quality conscious People

4.2 Resistance Factors:

Following are resistance factors described in [8] that opposed organization when improving the software process since when overcome these factors helps to reduce some severity defects [12]

- Lack of management commitment in the organization
- Lack of Stakeholders’ participation
- Lack of skills and professional experience
- Lack of leadership
- Lack of backup by top management
- Lack of sufficient training
- Lack of organizational policies
- Lack of quality policies
- Lack of capability in imposing cultural requirements
- Lack of consistency between software processes improvement projects and the organization strategic objectives.
- Lack of focus on the organizations most urgent requirements
• Unrealistic expectations for the Software Process Improvement model
• Inadequate and unproductive evaluation of the existing software process
• Existence of a SPI project team not mainly focused on direction and technical support
• Concurrent focus on many improvement areas

5. CONCLUSION

In this paper we reviewed different software process models and techniques that are helpful in process improvement of any software. Then we make comparison on the criteria set by [3] what functionalities these models are providing?. In the end we analyze success and resistance factors that are critically involved in organizations during process improvement. These factors are related to managerial, organizational, team training, business goals of prescribed organizations and can be helpful to consider when there is a high need of software process improvement.

REFERENCES


