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A SOFTWARE DEVELOPMENT PROCESS TAILORING GUIDELINES (SDPTG) FRAMEWORK TO IMPROVE THE QUALITY OF EGOVERNMENT PROJECTS

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KeyWords
eGovernment, Framework, Quality, Software Development Process, Software Development Process Tailoring.

ABSTRACT

eGovernment is a new mode to improve the activities of the public sector. The eGovernment projects are basically software development projects. They provide multiple services to its users, such as increased efficiency, effectiveness, and transparency at a reduced cost. A major critical factor for eGovernment project development is to establish and maintain robust Software Development Process. A number of eGovernment projects have failed due to use of inappropriate software processes, especially in developing countries. The awareness, definition and visibility, regarding the use of the appropriate development process remains limited. eGovernment projects are ongoing, therefore, there is a need to better define its software development process. Personnel, who develop the eGovernment project(s) need to be able to identify challenges, apply effective strategies that support the development, as well as helps to define the appropriate development process. To address the issue, we propose a framework consisting of a set of guidelines for guiding adaptation and instantiation of a project-oriented software development process for eGovernment projects. Our approach is based on the thematic analysis method. The framework consists of thirteen major milestones, along with activities in each milestone. The framework is validated using quality assessment of the activities. In addition, empirical evidence has been provided to underline its significance. This framework is important to eGovernment sector given it helps to analyze the major elements of defining software development process, and to construct effective approaches for identification, definition and management of project-oriented software development process for eGovernment project(s).

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1. INTRODUCTION

Government provides many services to the citizen, businesses and its own departments. These services are vital for its citizens and functioning of the Government itself. ICT has enabled Government across the world to automate delivery of the services in order to make those more efficient, timely and cost effective (Almarabeh & Abuali, 2010; Gorla et al., 2010). Such government service automation projects are broadly categorized as Electronic Government "eGovernment" (Al-Saqqa et al., 2014). Public organizations have used eGovernment initiatives in innovative ways to better serve their citizens (Abbas et al., 2011; Anna & Kei, 2005). Nowadays, there is a keen interest to develop and maintain an effective and efficient software system(s) in the public sector. The eGovernment projects are basically the software development projects, but stands in a broader context as compared to the private sector, w.r.t. ICT roles, activities, and options for development.

A major critical factor for development is to establish and maintain robust software development process (SDP). A number of eGovernment projects have failed due to use of inappropriate software processes that hinder performance and the productivity level. As a result, the governments and the concerned software development organizations are striving towards having suitable and a highly-organized SDP. However "as a concept", the highly-organized software processes can be used by just implementing any well-known and accepted software development methods, it is not so "in practice". Some software development approaches can be suitable for a number of organizations and projects, but not for all, as there is no "silver bullet" that fits all. It is due to the difference in contexts. In addition, the organizations involved in the eGovernment projects often lack knowledge and expertise in identifying the most suitable SDP, and most importantly, how to tailor or adapt the process according to the organizational context in an accurate manner. Each eGovernment project and organization has their own needs, norms and formality levels. Therefore, any existing SDP cannot be used for all eGovernment projects. The processes have to be tailored as per the context. The tailoring of the SDP is not a one-time activity.

eGovernment practitioners need to be able to develop the skills and knowledge to practice SPT and increase the rate of successful eGovernment projects. They need to identify SPT challenges, apply effective strategies, as well as define appropriate SDP for eGovernment project success. However, the available information for SPT for eGovernment project development is limited by managerial reasons. The eGovernment project(s) need to be developed and implemented by considering and overcoming this constraint. Moreover, the context of eGovernment projects changes dynamically, for which SDP must be defined as per the project context. These aspects have not been sufficiently addressed previously.

In this research study, we propose a framework for better SPT in eGovernment projects in order to overcome these process tailoring challenges. The approach is grounded on the process improvement checklist, which has contributed to the development of software projects. The framework represents the properties of successful and sustainable projects. It was validated using quality assessment of the activities. Further, we examine how the framework works for eGovernment projects, by applying it on a project.

1.1. Research Contribution

An extensive framework is proposed to guide about the selection, definition and tailoring of the software process for eGovernment projects. It is prepared on the basis of thorough analysis. The framework is named as Software Development Process Tailoring Guidelines (SDPTG) framework. It comprises of thirteen major milestones: Process Goals and Scope; Sponsorship and resources; Roles and responsibilities; Stakeholder management; Competence and knowledge; Preparation for Process Selection; Deployment management; eGovernment project governance and support; Process monitoring and measurement; Management commitment; Stakeholders' attitude; Trainings; and Communication, and each milestone consists of some important tasks and activities to be performed. The organized nature of the framework assists to select and tailor the project-oriented software development process appropriately, for eGovernment projects. Additionally, it serves as a special guide to the eGovernment sector and its practitioners in order to plan and execute the process tailoring activity properly. On the whole, the defined milestones categorize a number of major activities that might affect the delivery and success of eGovernment projects. To end with, the article provides the validation of the proposed framework. Moreover, the framework has been implemented on an eGovernment project to check the results, which are positive. Summarily, this study proposes a framework (set of guidelines) for process definition for eGovernment projects. It is the aspect which needs to be given full consideration during the project development. The main contributions of this study consist of (1) an extensive framework to tailor the software development process for eGovernment projects, (2) classification of major notions for the defined milestones, (3) identification of critical aspects as crucial for eGovernment process and its success, (4) validation of the framework, (5) the implementation of the framework in order to check its accuracy, and (6) need to understand and carry out the software process tailoring activity effectively for eGovernment projects.

1.2. Research Significance

This study offers an extensive picture of the major aspect in eGovernment project development towards success; which is the project-oriented software development process for eGovernment projects, the resulting framework that is helpful for better project definition and tailoring, the validation and the successful implementation of the proposed framework. The most significant part in project is, of course, the selection and handling of the software development process, its appropriate definition and avoiding the failures, to succeed in the eGovernment project development and implementation. Encompassing all these, this work forms the re-

search implication and can work as a base to the future researchers in academia and the practitioners in industry. The study proposes a framework which defines a number of critical aspects and milestones which must be given due importance in projects, and are presented in comprehensible and practical way. Each milestone of the framework consists of a set of crucial activities. The paper concludes by presenting the results of the proposed framework implemented on an eGovernment initiative. The framework is a significant contribution to eGovernment domain specifically, and to Software Engineering domain in general.

The paper is structured as follows. Section 2 explores the software development process and its significance in eGovernment projects. Section 3 describes the software process tailoring activity. Section 4 and Section 5 states the problem in practice and the rationale to develop a framework. Section 6 provides with the discussion how the framework was developed. In Section 7, the framework is presented with its categories, then each category is discussed with its activities. Section 8 consists of the validation of the framework. In Section 9, the results are discussed after applying the framework on a project. Section 10 concludes the study, and future work is presented.

2. SOFTWARE DEVELOPMENT PROCESS

2.1. Definition

The process is defined as "a sequence of steps performed for a given purpose" (Baharom et al., 2014; Hummel, 2014). Therefore, the process is the series of steps to transform activities for a problem and producing a software product, in the software development. The software process involves certain activities, practices, and methods that are used to develop and maintain the product/project..

In few eGovernment cases, there is no formal method used, it implies that there would have been any implicit software process applied. However, the undefined process, is unable to be controlled, even though it exists.

2.2. Software Development Process in eGovernment

The eGovernment organizations are providing efficient, timely and cost effective services to its users worldwide (Almarabeh and Abuali, 2010; Anna & Kei, 2005; Al-Saqqa et al., 2014; Gorla et al., 2010). Many eGovernment projects have been implemented across the world (Abbas et al., 2011; Anna & Kei, 2005; Heeks, 2006). The eGovernment systems are information systems (IS) in the public sector (Heeks, 2006). The software and information systems' role is increasing in the world (Heeks, 2006). This increasing role necessitates the developed eGovernment project to be of high quality, and can be evolved whenever the usage contexts change (Boehm, 2005; Kruchten, 2013; Li et al., 2006). The high quality system can only be developed by using an appropriate software development process (Larrucea et al., 2016; Raza & Faria, 2016). Therefore, implementation of an optimum, lightweight and adaptive software development process is necessary to build an efficient software system in any private/government organization (Li et al., 2006; Humphrey, 1990; Ogasawara et al., 2014).

Some researchers pinpointed and concluded that "software development process" is an important factor for an eGovernment project's success, discussed as follows:

Heeks (Heeks, 2002) stated that most of the eGovernment projects failure occurs due to the lack of understanding about design-reality gaps w.r.t ITPOSMO dimensions. These dimensions are Information, technology, process, objectives and values, staffing and skills, management, and other resources. He emphasized the role of improvisation, that it should be understood in a better way, w.r.t technology, local capacities and the design. A model was proposed that used contingency theory to understand the concept of design-reality gaps. Participative approaches to implementation can bridge the contextual gap between design and use.

Lowery (Lowery, 2002) extended previous work by analyzing the eGovernment case and have given stress on the development of an eGovernment strategy. He stated that the eGovernment success depends on three key drivers: technology, process, and the people. He further emphasized that the development of an eGovernment strategy must include re-engineering of processes and procedures to support eGovernment initiatives. The strategy should include the key drivers to be addressed.

The process factor from ITPOSMO was considered important by Krishna and Walsham (Krishna & Walsham, 2007). They studied various contexts and identified success factors for eGovernment implementation in developing countries. They have emphasized the importance of need to reorganize existing software development processes, confine processes and practices according to the technologies.

Jeong et. al (2007) considered the eGovernment initiative as a phenomenon that enhances the infrastructure and services to customers. They stated that the technology and business/software development processes alignment is a major factor for executing eGovernment initiatives. In addition, Tseng et. al (2008) explored the managerial issues and found that the software development processes helps in decision making and resolving issues in the eGovernment.

Tsai et. al (2009) discussed the improvement of the eGovernment projects. He have specified the software development process as a

critical element for success in the development life cycle of a project. Further, Herath and Kishore (2010) also considered process from ITPOSMO and stated that modification of software development processes to accommodate clients tools and systems is necessary in order to deliver a successful project.

The ITPOSMO concept was further elaborated by Nawi et. al (2012). He explored various factors w.r.t ITPOSMO using the stakeholder views. He thoroughly assessed the factors of ITPOSMO that influence the eGovernment implementation. Elkadi (2013) have also given emphasis on the eGovernment implementation w.r.t. ITPOSMO. He studied the eGovernment in Egypt and identified the ITPOSMO factors that have strong influence on the eGovernment project.

Napitupulu and Sensuse (2013) and Ramadhan et.al (2013) identified various critical success factors, among those a major factor was stated to be the software development process as one of the critical factors for success. In relation to the previous research, Mergel (2016) studied the relation of the eGovernment and innovation that is produced. He stated that the introduction of a software development process as per the technology and demand is necessary for innovation in the eGovernment domain.

2.3. Essence of Software Development Process

"Software development process" is one of the key research areas for software engineering researchers (Larrucea et al., 2016). The organizations whether private or public must use proper software development methods to develop high quality software that satisfies the client (Dittrich, 2016; Kruchten, 2013). A well-defined software development process provides consistency to organizations and help to improve their work (Humphrey & Kellner, 1989; Valle et al., 2017). The definition and management of the software development process are challenging tasks for practitioners (Connor & Laporte, 2011; Larrucea et al., 2016). Existing research shows that generally organizations do not clearly establish software development processes, and face unnecessary challenges (Larrucea et al., 2016). It is because they face difficulty in defining processes consistent with their business requirements and practices (Larrucea et al., 2016). The use of appropriate software development process for a project gives competitive advantage to organizations (Clarke & Connor, 2015; Lee et al., 2016). The software development process has been considered as an important component of project's success (Lee et al., 2016). As a result, the appropriate software development process focus would increase the success rate and quality of projects (Ramon & Pardo, 2005).

3. SOFTWARE DEVELOPMENT PROCESS TAILORING

3.1. Definition

The software development process tailoring is the activity of modifying a process to meet a specific project requirements (Bass, 2016; Xu & Ramesh, 2015). To create processes from scratch every time is risky and involves high overhead (Xu & Ramesh, 2015). As a result, they are created by adapting present standards and processes (Xu & Ramesh, 2015). The practice of software development process tailoring is also known as the "Software Development Process Definition" and "Software Development Process Instantiation"(Svorst, 2017).

3.2. Essence of Software Development Process Tailoring and the Context

Sometimes, the choice of appropriate methodology might be based on industry supported practices and managerial decisions (Nasir & Sahibuddin, 2011; Vijayasarathy & Butler, 2016). At other times, organizations might rely on some standards to achieve consistency (Vijayasarathy & Butler., 2016). For software process, the factors that matter are: "context, context, and context" (Kruchten, 2013). The software development process is context dependent (Clarke & Connor, 2012; Kruchten, 2013; Xu & Ramesh, 2008). And needs to be tailored as per the context (Clarke & Connor, 2012).

The project context is built by identifying project goals, environmental factors, and the challenges (Xu & Ramesh, 2015). The tailoring strategies interact with this project context, and process tailoring is performed accordingly (Xu & Ramesh, 2008; Xu & Ramesh, 2015). The software development process tailoring process with respect to context is done as follows (Xu & Ramesh, 2008): (i) evaluate environment and project's goals (product goals, project characteristics, process goals, team characteristics, organization characteristics, stakeholder characteristics). (ii) evaluate various challenges the project faces. These challenges might include communication, resource, requirements' management, technical and political challenges. (iii) identify strategies for process tailoring to mitigate challenges. And, (iv) validate, complete, and assess the tailored process. It ensures that tailored process is consistent with project goals and the environment.

The improperly tailored software development process affects the quality of the project (Akbar & Safdar, 2014; Iqbal et al., 2015; Valle et al., 2017). Therefore, process tailoring is a challenging task for the project managers, higher management, and the organizations (Akbar & Safdar, 2014). The appropriate definition and tailoring of the software development process according to the project gives competitive advantage to organizations (Clarke & Connor, 2015; Lee et al., 2016; Xu & Ramesh, 2008). It is so because process tailoring and organizational performance(success) are closely associated (Clarke & Connor, 2015; Lee et al., 2016). The proper context-oriented software development process focus would increase the success rate of eGovernment projects as well (Ramon &

Pardo, 2005).

4. Problem in Practice

Today's users are increasingly using and having access to digital systems, such as eGovernment projects. There are several factors that contribute towards success of any software project (Pereira et al., 2008; Procaccino et al., 2005). Such as resources, requirements, development process, budget, tools, and communication (Damas, 2009; Pereira et al., 2008). One of the most critical factors for software development in any organization is to establish and maintain robust SDP (Baharom et al., 2014; Valle et al., 2017; Xu & Ramesh, 2015). The SDP is the most significant and the "glue" that ties all other related factors together (Chevers et al., 2017).

Even though research on SPT is not new and a number of studies have been devoted to software development process tailoring in the developed nations, but there is a lack of a holistic overview of the current SPT practices in eGovernment sector that offers adequate information of managerial aspect in developing countries. Most of the authors have focused only on the organizational aspect of SPT. Few of them stated that SPT needs to be performed (Bass, 2016; Xu & Ramesh, 2015). Some others stated that contextual factors are important for correct definition of process (Clarke & Connor, 2012; Kruchten, 2013; Xu & Ramesh, 2008). Some has pinpointed few challenges that occur in process tailoring (Gregory et al., 2016; Raza & Faria, 2016). Nevertheless, it is clear that SDP has not been very well described in relation to eGovernment projects, as it is an integral area in the evolving field of software development (Herath & Kishore, 2010; Mergel, 2016; Tsai et al., 2009). To the best of author's knowledge, the models provided for SPT are concerned with the development phase and codes. However, they are outdated, as SPT is mostly concerned with managers (Xu & Ramesh, 2008). The managerial aspect of SPT for eGovernment projects in developing country is still unavailable. The documented experience is therefore lacking.

The managers of eGovernment project(s) need to be aware and capable of identifying appropriate SDP and the effect it will have on the success and outcome of the project. The success of eGovernment projects require the managers being capable of identifying, defining and tailoring, and managing project-oriented SDP, as well as guiding individuals of the effect such defined SDP have on the outcome of eGovernment project.

5. Rationale for Software Development Process Tailoring Guidelines (SDPTG) Framework

The need for a defined SPT has received ample attention; however the research investigating regarding the abilities and awareness of eGovernment practitioners to properly address this concern is rather limited. As practitioners, especially managers deal with SPT and its effects on projects, they require a set of guidelines or structure to assist them in identifying, defining and managing it. In order to address it, a SDPTG framework has been proposed to assist them. The framework is intended to identify major milestones along with critical activities for those milestones and categories, which will help to improve the skills and knowledge of eGovernment practitioners in carrying out SPT. The milestones and activities provide vital information that can be used and followed for discussion and action. It is critical as the practitioners in eGovernment projects have to work within given procedures and policies when defining and managing SDP as well as instructing individuals for practicing SPT.

6. Process for Developing the SDPTG Framework

The frameworks are helpful to practitioners and researchers to implement theoretical concepts. The Framework Method given by Gale et. al (2013) was adapted to create the SDPTG framework. Framework was initiated from Natalja's (Nikitina & Kajko, 2012) process improvement checklist and using the empirical analysis of few case studies of eGovernment projects, the authors incite to build a comprehensive framework in the field.

An extensive literature is available on SDP and some on process tailoring from the viewpoints of a number of stakeholders, however, no framework is currently available to support the development teams in identifying and managing SPT activities, specifically in the eGovernment domain.

The process that was followed to establish the key ideas and activities in the framework consisted of the posteriori approach. The relevant information was explored using the literature review and analysis of case studies of eGovernment projects to identify key concepts. Interviews were conducted to gather information in case studies. The themes were identified commonly due to some unfamiliar terms, repetition, similarities, differences, and theory-related data. The collected information was analyzed to identify the themes. A number of concepts are used to describe themes in the data, such as labels, codes, thematic concepts, clusters and categories. There are a number of methods to analyze qualitative data, we primarily used the thematic analysis approach to generate themes and concepts to build the framework. The development of the SDPTG framework consisted of following stages:

- Stage 1: Literature search on software development process definition and tailoring to find common ideas. It continued until the redundant information was found. The key terms were identified and drafted after approved by the researchers. This helped to form questionnaire for interviews in the empirical investigation (Case Study). An initial draft of the framework was compiled, having key terms.

- Stage 2: Interviews were conducted to assess the process tailoring practice in eGovernment projects. Concepts and themes were identified and refined after continuous discussions. The concepts were grouped and an appropriate heading was given accordingly. A new draft was proposed consisting of a number of categories and clusters named 'milestones'.
- Stage 3: The refinement of the framework was performed in this stage, by re-evaluating the collected information to check the researchers' and interviewees' understandings of the defined clusters. In addition, the relevant activities for each milestone were defined and proposed.

The SDP selection and changes highly depends on the managers, the strategic and managerial decisions (Pereira et al., 2008; Vasconcellos et al., 2017). The SPT is often left to the expertise of the project managers, since there are no standard guidelines for it (Bass, 2016; Vasconcellos et al., 2017). By providing the eGovernment practitioners a framework (a set of guidelines) for defining the right SDP and handling issues accordingly, can be quite valuable.

7. THE SOFTWARE DEVELOPMENT PROCESS TAILORING GUIDELINES (SDPTG) FRAMEWORK

The Software Development Process Tailoring Guidelines Framework, illustrated in Figure 1. has been developed and proposed to provide a new foundation and direction to assist researchers to understand and eGovernment practitioners to act on this important phenomenon in development and implementation of any eGovernment project.

Chevers et al., (2017) stated that it would be a great help to software development if the practitioners have more information and knowledge about the improvement of software development process, and this proposed framework intends to assist the practitioners in developing in-depth understanding and knowledge of the phenomenon, specifically the ones involved in the eGovernment projects.

In Fig. 1, the left side of the framework represents the major clusters, and the right side illustrates the key activities and characteristics. Each activity has a sign assigned to it, which represents the importance of the particular activity. The signs depict that either a particular activity should be performed or not. The plus (+) sign says that the activity must be present, whereas, the minus (-) sign says that the activity needs to be minimized or removed when tailoring the SDP.

There are thirteen major categories or clusters for SDPTG framework, each focusing on a particular aspect of the management for defined SDP. These categories represent the managerial guidelines for conducting and controlling SPT effort. The clusters are as follows: Process Goals and Scope; Sponsorship and resources; Roles and responsibilities; Stakeholder management; Competence and knowledge; Preparation for Process Selection; Deployment management; eGovernment project governance and support; Process monitoring and measurement; Management commitment; Stakeholders' attitude; Trainings; and Communication. The framework consists of ninety nine activities representing the properties to achieve a successful eGovernment projects. The activities are placed in the cluster according to its relevance and the highest influence on the constancy of the software process concept. Each of the thirteen clusters and milestones of the framework are described in detail below in Tables 1–13.

Table 1: Activities for Process Goals and Scope

Cluster 1:Process Goals and Scope
Activity/Goal
1.1: Prepare a project plan for the eGovernment project that shows the performance measures
1.2: Define the vision and major goals of project explicitly and disseminate those to main stakeholders
1.3: Create stable and realistic goals
1.4: Get consensus on process definition from key stakeholders
1.5: Define the scope of the eGovernment project clearly
1.6: Evaluate and modify the scope of eGovernment project continuously, when needed
1.7: Ensure that the project goals are well understood by all stakeholders
1.8: Overcome the issue of lack of understanding the software development process goals

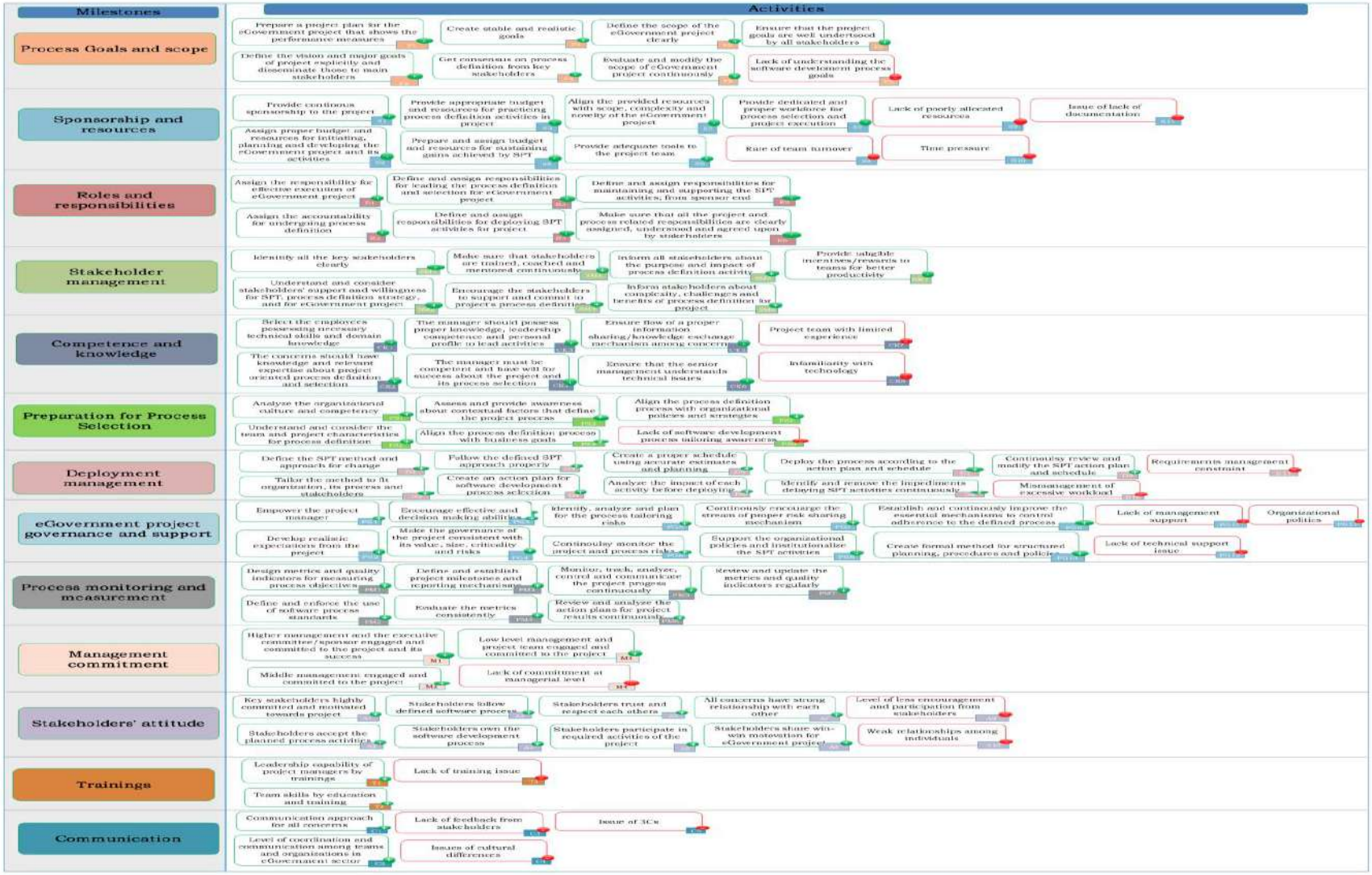

Figure 1. Software Development Process Tailoring Guidelines (SDPTG) Framework

Table 2: Activities for Sponsorship and resources

Cluster 2: Sponsorship and resources
Activity/Goal
2.1: Provide continuous sponsorship to the project
2.2: Assign proper budget and resources for initiating, planning and developing the eGovernment project and its activities
2.3: Provide appropriate budget and resources for practicing process definition activities in project
2.4: Prepare and assign budget and resources for sustaining gains achieved by SPT
2.5: Align the provided resources with scope, complexity and novelty of the eGovernment project
2.6: Provide adequate tools to the project team
2.7: Provide dedicated and proper workforce for process selection and project execution
2.8: Reduce the rate of team turnover
2.9: Evade lack of poorly allocated resources
2.10: Manage the time pressure
2.11: Remove the issue of lack of documentation

Table 3: Activities for Roles and responsibilities

Cluster 3: Roles and responsibilities
Activity/Goal
3.1: Assign the responsibility for effective execution of eGovernment project
3.2: Assign the accountability for undergoing process definition
3.3: Define and assign responsibilities for leading the process definition and selection for eGovernment project
3.4: Define and assign responsibilities for deploying SPT activities for project
3.5: Define and assign responsibilities for maintaining and supporting the SPT activities; from sponsor end
3.6: Make sure that all the project and process related responsibilities are clearly assigned, understood and agreed upon by stakeholders

Table 4: Activities for Stakeholder management

Cluster 4:Stakeholder management
Activity/Goal
4.1: Identify all the key stakeholders clearly
4.2: Understand and consider stakeholders' support and willingness for SPT, process definition strategy, and for eGovernment project
4.3: Make sure that stakeholders are trained, coached and mentored continuously
4.4: Encourage the stakeholders to support and commit to project's process definition
4.5: Inform all stakeholders about the purpose and impact of process definition activity
4.6: Inform stakeholders about complexity, challenges and benefits of process definition for project
4.7: Provide tangible incentives/rewards to teams for better productivity

Table 5: Activities for Competence and knowledge

Cluster 5: Competence and knowledge
Activity/Goal
5.1: Select the employees possessing necessary technical skills and domain knowledge
5.2: The concerns should have knowledge and relevant expertise about project oriented process definition and selection
5.3: The manager should possess proper knowledge, leadership competence and personal profile to lead activities

5.4: The manager must be competent and have will for success about the project and its process selection
5.5: Ensure flow of a proper information sharing/knowledge exchange mechanism among the concerns
5.6: Ensure that the senior management understands technical issues
5.7: Do not hire project team with limited experience
5.8: Remove unfamiliarity with technology

Table 6: Activities for Preparation for Process Selection

Cluster 6:Preparation for Process Selection
Activity/Goal
6.1: Analyze the organizational culture and competency
6.2: Understand and consider the team and project characteristics for process definition
6.3: Assess and provide awareness about contextual factors that define the project process
6.4: Align the process definition process with business goals
6.5: Align the process definition process with organizational policies and strategies
6.6: Reduce the lack of software development process tailoring awareness

Table 7: Activities for Deployment management

Cluster 7:Deployment management
Activity/Goal
7.1: Define the SPT method and approach for change
7.2: Tailor the method to fit organization, its process and stakeholders
7.3: Follow the defined SPT approach properly
7.4: Create an action plan for software development process selection
7.5: Create a proper schedule using accurate estimates and planning
7.6: Analyze the impact of each activity before deploying
7.7: Deploy the process according to the action plan and schedule
7.8: Identify and remove the impediments delaying SPT activities continuously
7.9: Continuously review and modify the SPT action plan and schedule, when needed
7.10: Reduce the rate of mismanagement of excessive workload
7.11: Remove the requirements management constraint continuously

Table 8: Activities for eGovernment project governance and support

Cluster 8:eGovernment project governance and support
Activity/Goal
8.1: Empower the project manager
8.2: Develop realistic expectations from the project
8.3: Encourage effective and decision making abilities
8.4: Make the governance of the project consistent with its value, size, criticality and risks
8.5: Identify, analyze and plan for the process tailoring risks, if arise
8.6: Continuously monitor the project and process risks
8.7: Continuously encourage the stream of proper risk sharing mechanism
8.8: Support the organizational policies and institutionalize the SPT activities
8.9: Establish and continuously improve the essential mechanisms to control adherence to the defined process
8.10: Create formal method for structured planning, procedures and policies

8.11: Overcome the risk of lack of management support
8.12: Reduce lack of technical support issue
8.13: Avoid organizational politics

Table 9: Activities for Process monitoring and measurement

Cluster 9:Process monitoring and measurement
Activity/Goal
9.1: Design metrics and quality indicators for measuring process objectives
9.2: Define and enforce the use of software process standards
9.3: Define and establish project milestones and reporting mechanisms
9.4: Evaluate the metrics consistently
9.5: Monitor, track, analyze, control and communicate the project progress continuously
9.6: Review and analyze the action plans for project results continuously
9.7: Review and update the metrics and quality indicators regularly, if required

Table 10: Activities for Management commitment

Cluster 10:Management commitment
Activity/Goal
10.1:Higher management and the executive committee/sponsor must be engaged and committed to the project and its success
10.2:Middle management must be engaged and committed to the project, if any
10.3:Low level management(if any) and project team must be engaged and committed to the project
10.4: Reduce lack of commitment at managerial level

Table 11: Activities for Stakeholders' attitude

Cluster 11:Stakeholders' attitude
Activity/Goal
11.1:Key stakeholders must be highly committed and motivated towards the project
11.2:Stakeholders should accept the planned process activities
11.3:Stakeholders must follow defined software process
11.4:Stakeholders must own the software development process
11.5:Stakeholders must trust and respect each others
11.6:Stakeholders must participate in required activities of the project
11.7: All concerns must have a strong relationship with each other
11.8: Stakeholders must share win-win motivation for eGovernment project
11.9: Reduce level of less encouragement and participation from stakeholders
11.10: Remove weak relationships among individuals

Table 12: Activities for Trainings

Cluster 12: Trainings
Activity/Goal
12.1: Improve the leadership capability of project managers by trainings
12.2: Enhance the team skills by education and training
12.3: Try to minimize the lack of training issue

Table 13: Activities for Communication

Cluster 13:Communication
Activity/Goal
13.1: Establish a communication approach for all concerns
13.2: Increase the level of coordination and communication among teams and organizations in eGovernment sector
13.3: Reduce the issues that occur due to cultural differences
13.4: Minimize the concern of lack of feedback from stakeholders
13.5: Evade the issue of 3Cs

These clusters (milestones) and their relevant activities illustrate the procedure for better SPT and its compliance can be beneficial in the project success. These are described in detail in the following subsections.

7.1. Process Goals and Scope

It includes the governmental and technical objectives set to define the SDP. It involves the plans, goals and scope, formed to carry out the process definition and tailoring the activity efficiently. Table 1 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Prepare a project plan for the eGovernment project that shows the performance measures: a plan to assess how well the process and the project are achieving its set objectives is an essential component for success. The managers should review plans to assess the performance, and any improvement is required or not.
- Define the vision and major goals of project explicitly and disseminate those to main stakeholders: There should be a proper vision and clear goals for the software process definition, whenever a new process has to be defined. Summarily, the managers should specify the desired result that is to be achieved by their SPT effort.
- Create stable and realistic goals: The unchanging and realistic objectives are key to success. The managers need to discuss and set stable goals that must be convincing as well.
- Get consensus on process definition from key stakeholders: The stakeholders are a significant component of the eGovernment project, and their consent has the same significance. Therefore, to achieve success in process definition and consequently in the project development, there should be a mechanism to get key stakeholders' consensus for SPT.
- Define the scope of the eGovernment project clearly: The scope and size of every eGovernment project vary significantly. The scope for the project needs to be defined appropriately accordingly.
- Evaluate and modify the scope of eGovernment project continuously, when needed: The project scope assessment, evaluation and improvement are a continuous process that defines the success of the development process and the project. Therefore, for proper SPT, the scope needs to be evaluated and modified whenever required.
- Ensure that the project goals are well understood by all stakeholders: All the concerns must be aware of the defined goals, as misunderstood objectives can create obstacles in the project development. Therefore, the managers must ensure that all the set objectives and goals are understood by the stakeholders to tailor the SDP correctly.
- Overcome the issue of lack of understanding the software development process goals: In case, the process goals are not properly understood, the software process tailoring becomes a challenge. Therefore, the lack of consideration and understanding regarding the development process objectives must be evaded and minimized for better project-oriented tailoring of SDP.

7.2. Sponsorship and Resources

It includes the human resources, tangible resources, technical resources, and the sponsors that are essential for the support for process and the smooth development and execution of the eGovernment SDP and the project. Table 2 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Provide continuous sponsorship to the project: There are some characteristics which are considered to indicate the SDPT success, the continuous sponsorship is one of those. The managers should be considerate regarding the presence and provision of continuous sponsorship for the eGovernment project.

- Assign proper budget and resources for initiating, planning and developing the eGovernment project and its activities: The core of any SDP is the effective initiation and planning. Therefore, the managers in eGovernment projects must allocate proper budget and resources to initiate, plan and develop the process.
- Provide appropriate budget and resources for practicing process definition activities in project: An appropriate amount of budget and some resources must also be associated to the process definition activities which have to be performed for project-oriented SPT.
- Prepare and assign budget and resources for sustaining gains achieved by SPT: A proper budget and resources should also be assigned for supporting improvements made by the tailoring activity for the SDP.
- Align the provided resources with scope, complexity and novelty of the eGovernment project: The human resources assigned to the eGovernment project must be made aware of the complexity, scope and newness of the software process and the project. So that each activity in SDPT is performed accordingly.
- Provide adequate tools to the project team: The SDP in the eGovernment projects are designed using the adequate tools and technologies. Therefore, the project team must be provided appropriate tools for better SPT.
- Provide dedicated and proper workforce for process selection and project execution: The activities of SDP selection and carrying out the eGovernment project effectively are quite complex. So, a proper committed and devoted team should be assigned for these activities, to minimize failure rate.
- Reduce the rate of team turnover: The turnover of the employees is a great drawback for project development. The managers should make efforts to minimize the rate of staff turnover within the organization and in the eGovernment project as well.
- Evade lack of poorly allocated resources: Managers are responsible for allocating the resources accurately to the project and the process activities. If not allocated properly, the development let downs the efforts and project. So, the management should try to remove the issue of poorly allocated resources.
- Manage the time pressure: The managers should also minimize and handle the time pressure effectively.
- Remove the issue of lack of documentation: The proper documentation is considered a valuable resource for further development. Lack of documentation can cause various ambiguities; therefore, this issue should be removed. The managers should be concerned about the proper documentation.

7.3. Roles and Responsibilities

It includes the roles and the responsibilities for creating, monitoring, and applying the SPT and definition activities. Table 3 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined:

- Assign the responsibility for effective execution of eGovernment project: There should be a responsible person at the managerial level who intends to carry out the eGovernment project effectively. Thus, such huge responsibility should be assigned properly and to the experienced one, so that the project executes effectively.
- Assign the accountability for undergoing process definition: The individuals engaged and leading the SDP definition should take accountability and ownership of the activity. The managers should assign the accountable individuals for it.
- Define and assign responsibilities for leading the process definition and selection for eGovernment project: The managers should also state and give responsibility of leading the SDP definition phenomenon to an experienced and motivated employee.
- Define and assign responsibilities for deploying SPT activities for the project: There should be properly assigned responsibility for organizing and deploying the process tailoring activities for eGovernment project. This could lead to high success rate.
- Define and assign responsibilities for maintaining and supporting the SPT activities; from sponsor end: The responsibility to support and sustain the process tailoring activities by the sponsor, i.e. the executive team, should be defined and allocated appropriately to execute the activities effectively and efficiently.
- Make sure that all the project and process related responsibilities are clearly assigned, understood and agreed upon by stakeholders: The stakeholders are the central component of the project development, their consent and approval is necessary for effective results. Therefore, the eGovernment project managers should make sure that the process and project responsibilities are assigned and agreed by all important stakeholders. This activity of confirmation by all stakeholders increases the success rate.

7.4. Stakeholder Management

It includes the planning and controlling the stakeholder related aspects effectively. The stakeholders are the lifeblood of any project and its effective project interactions. Table 4 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Identify all the key stakeholders clearly: The stakeholders are an integral part of any business or project. Therefore, it must be made sure that all concerned stakeholders are identified properly. It is an important activity to be performed in order to define the SDP correctly and to deliver a successful eGovernment project.
- Understand and consider stakeholders' support and willingness for SPT, process definition strategy, and for eGovernment project: The stakeholders' willingness and support for major activities of process definition, its strategy, and the project is considered an important pre-requisite for eGovernment project success. Therefore, this should be understood and considered while defining the software process and developing the eGovernment project.
- Make sure that stakeholders are trained, coached and mentored continuously: The involved stakeholders had to be mentored, trained, and coached sufficiently. There should be proper mechanisms for providing training and mentoring to stakeholders. As, it is rightly said that well trained individuals could improve the process definition activities and achieve sustainable results.
- Encourage the stakeholders to support and commit to project's process definition: The managers must make sure that they have a mechanism to motivate and encourage the stakeholders to provide adequate support and show commitment to the project-oriented SDP definition. The committed individuals improve the likelihood of project success.
- Inform all stakeholders about the purpose and impact of process definition activity: The stakeholders must be conveyed regarding the purpose and influence of the SDP definition activity and its impact on the project.
- Inform stakeholders about complexity, challenges and benefits of process definition for project: The stakeholders should also be conveyed regarding the challenges, advantages and the complex nature of the process definition activity.
- Provide tangible incentives/rewards to teams for better productivity: The motivation of employees can directly be controlled by providing various benefits and incentives to them. For better definition and selection of the SDP for eGovernment project, the managers need to offer incentives and rewards to the employees for increased productivity and better results.

7.5. Competence and Knowledge

It includes the aspects of effective knowledge, aptitude, skills and competency of the involved personnels in the eGovernment projects. Table 5 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Select the employees possessing necessary technical skills and domain knowledge: Having suitable and up to date knowledge is the need of the hour, especially in the eGovernment projects. Therefore, the management of the project should find and select suitable personnels having required skills and knowledge. So that the process definition activity and project development is carried out effectively.
- The concerns should have knowledge and relevant expertise about project oriented process definition and selection: The selected personnels must possess experience and knowledge regarding the SDP definition, so that ambiguities are removed.
- The manager should possess proper knowledge, leadership competence and personal profile to lead activities: An important thing to be considered is that the manager of the project or the organization must have suitable and appropriate knowledge to lead the project and execute it efficiently. In addition, competency is required at all levels in every mature organization, hence, competent managers should be present in the team to execute the activities and deliver eGovernment project properly.
- The manager must be competent and have will for success about the project and its process selection: The competency in process selection and definition is also required for managers. So, they must possess a firm will power to define and deliver as envisioned.
- Ensure flow of a proper information sharing/knowledge exchange mechanism among the concerns: A proper mechanism to share and exchange relevant knowledge should be present in order to support and maintain better project development in the eGovernment domain. The information needs to be shared in an effective manner among the concerned people.
- Ensure that the senior management understands technical issues: There are some technical issues which need to be under-

stood and dealt effectively. The senior managers must possess the capability to make sure that all relevant technicalities and their issues are understood, considered and removed properly for better definition.

- Do not hire project team with limited experience: The lack of experience or limited experience is among the most critical factors for project failure. Therefore, the managers must ensure that the project team does not have limited expertise.
- Remove unfamiliarity with technology: A major technical aspect of appropriate SDP definition and better eGovernment project development is the technology. Therefore, the technology must be familiar with the team. If there is any kind of unfamiliarity with technology, it should be removed right way through educating the concerns.

7.6. Preparation and Process Selection

It includes the aspects of the SPT and selection which builds the foundation of the project-oriented SDP for eGovernment projects. Table 6 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Analyze the organizational culture and competency: For effective SDP selection, the organizational culture and competency of the organization are important aspects to be considered. The managers must understand and analyze the culture and competency of the organization, so that there is no loop hole in the progress of the project and the organization.
- Understand and consider the team and project characteristics for process definition: There are various factors associated with the team and the project, such as team size, team distribution, project size, and project domain, which must be understood and considered while tailoring the generic SDP. Therefore, the managers ought to understand, consider and analyze these characteristics.
- Assess and provide awareness about contextual factors that define the project process: The contextual factors are the core component for project-oriented SDP definition and selection. So, there should be proper assessment and awareness regarding the critical contextual factors for the project. Managers are considered liable for these actions.
- Align the process definition process with business goals: The vision and mission defines the business goals. In order to achieve success in SDP definition, the process of software development must be aligned with the set business goals. The higher management is made accountable for this activity.
- Align the process definition process with organizational policies and strategies: The SDP definition practice must also be aligned with the policies, plans and strategies set by the organization. It helps to improve the success rate of the process definition and of the eGovernment project respectively.
- Reduce the lack of software development process tailoring awareness: If there is less awareness regarding the SPT and definition for a project, then it can reduce the likelihood of success. Therefore, such lack of awareness must be dealt and removed effectively.

7.7. Deployment Management

It includes the phases of planning to deployment of the system in the particular environment. It must be handled and designed effectively for better results. Table 7 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Define the SPT method and approach for change: The procedure for SPT must be defined in advance to ease the deployment phase.
- Tailor the method to fit organization, its process and stakeholders: The SPT needs to be done considering the fact that it is suitable and acceptable to the organization, the stakeholders and its process. The managers need to make sure that these fit all.
- Follow the defined SPT approach properly: The properly followed procedure for SPT contribute to the effective output. So, it must be ensured that the team follows the defined approach for process tailoring.
- Create an action plan for software development process selection: A proper and suitable action plan should be formed and followed for SDP definition and selection.
- Create a proper schedule using accurate estimates and planning: The management must plan and create an appropriate schedule for effective process definition and deployment of defined SDP. An easy way to conduct this activity is to use estimation approach for the better schedule.
- Analyze the impact of each activity before deploying: The influence of every activity must be assessed properly before de-

ployment.

- Deploy the process according to the action plan and schedule: In the deployment phase, each process deliverable must be deployed as per the set plan and the schedule.
- Identify and remove the impediments delaying SPT activities continuously: There are various weaknesses which decrease the progress of the tailoring activity. These impediments must be identified and removed continuously so that delays are avoided.
- Continuously review and modify the SPT action plan and schedule, when needed: There must be a proper mechanism to review and change the SPT and definition action plan and schedule regularly, so that inaccuracies are removed.
- Reduce the rate of mismanagement of excessive workload: At times, excessive workload creates a lot of barriers in deployment and its management. There should be proper check and balance for the workload, and effective management to reduce any mishandling issue.
- Remove the requirements management constraint continuously: A major limitation in the project development is related to the requirements management, such as inefficiency in requirements management. Such constraints need to be minimized and eliminated continuously, so that the desired output is achieved.

7.8. eGovernment Project Governance and Support

It includes the aspects of the eGovernment project support and control for the development. The eGovernment projects are mainly controlled by the executive teams; however, various other individuals also own some activities and provide support as well. Table 8 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Empower the project manager: The managers should be authorized and empowered enough so that he/she can perform on the set vision, and eliminate the difficulties which occur in the project development and SPT. This encourages revolution, novelty and innovation in the eGovernment initiatives.
- Develop realistic expectations from the project: The anticipation and expectations of a project should be practical. So that no fake or unrealistic activities are performed and outputs are genuine.
- Encourage effective and decision making abilities: There should be proper encouragement to promote personnels having high expertise and capabilities for better decisions making. The managers need to encourage such individuals, as they are real asset for the process definition and project success.
- Make the governance of the project consistent with its value, size, criticality and risks: The project value, its size, risks and significance should always be mapped and made consistent with the control of the eGovernment project. The managers are highly responsible for such activities to reduce failure rate and increase cost-effectiveness.
- Identify, analyze and plan for the process tailoring risks, if arise: The challenges and risks occurring in the SPT practice are very frequent. The managers should always be prepared to identify, assess and handle such arising issues in order to make effective selection and tailoring of the SDP. They must have a plan to cater these risks and improve the process for tailoring activity.
- Continuously monitor the project and process risks: The managers must be aware of all occurring challenges and barriers related to the process and the project. They must handle and monitor these carefully so that risks are minimized in time, if any.
- Continuously encourage the stream of proper risk sharing mechanism: The team and managers ought to encourage a proper risk sharing mechanism within the organization and with the external stakeholders as well. It helps to reduce conflicts and issues, improves software development process definition phenomena and reduces failure rate.
- Support the organizational policies and institutionalize the SPT activities: The better the tailoring activities are monitored and controlled, better the resultant software development process is formed. The organizational policies play a vital role in institutionalizing and monitoring the tailoring activities, therefore, these policies must be given due importance to improve the success of the process and the project.
- Establish and continuously improve the essential mechanisms to control adherence to the defined process: The managers must plan, built and implement a proper mechanism to streamline the control and compliance of the defined SDP for the

particular eGovernment project. The mechanism need to be monitored and improved continuously for better outcomes.

- Create formal method for structured planning, procedures and policies: There should be a proper formal procedure to make plans, policies and rules for project development and process definition. The formal method needs to be structured so that it can be used for new processes and projects as well.
- Overcome the risk of lack of management support: A major factor for eGovernment projects' success is the management support, if overlooked, might give poor results. Therefore, for better and improved tailoring of the SDP, there must be proper consideration for not overlooking management support. This issue must be overcome effectively.
- Reduce lack of technical support issue: The technical support is another major factor that must be given importance while defining SDP. The managers need to reduce lack of technical support for the process and the eGovernment project.
- Avoid organizational politics: There are several individuals, who have self-serving attitude and behaviour, known as the organizational politics. Such behaviors serve personal interests rather than the organizational interests. This kind of organizational politics must be controlled and avoided within the working environment to overcome failures.

7.9. Process Monitoring and Measurement

It includes and states the significance of multiple SDP standards, metrics, and quality indicators for eGovernment projects and their development processes. Table 9 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Design metrics and quality indicators for measuring process objectives: The managers and the organizations should make proper metrics and quality indicators to measure the progress and the defined objectives. The success cannot be guaranteed until any gauging or a measurement phenomenon is not applied. Therefore, this activity must be performed to achieve success.
- Define and enforce the use of software process standards: The SDP standards are very important for software development process success, as they help to measure the process activities properly. Hence, a proper robust mechanism should be in place to monitor the process. In order to confirm that the SDP is followed properly by all stakeholders, the SDP standards must be defined and enforced, and controlled by the managers.
- Define and establish project milestones and reporting mechanisms: The managers need to define and create the project milestones to execute the project deliverables effectively. It helps to plan and handle the set objectives correctly. In addition, there should be a proper mechanism for reporting the updates and modifications, if any.
- Evaluate the metrics consistently: The success is based on the use of defined metrics and assessment, which derive the enhancement in the process for the project. Therefore, these metrics must be checked, evaluated and valued on the regular basis, by the management.
- Monitor, track, analyze, control and communicate the project progress continuously: The proper follow-up for the project execution is a necessary element for assessing progress. The managers should identify, consider, monitor, and convey the project progress regularly to the concerns. It increases the trust level and improves development.
- Review and analyze the action plans for project results continuously: The detailed plan for carrying out the project activities should be reviewed and assessed on a regular basis. The managers ought to be aware of this critical activity to define the SDP appropriately.
- Review and update the metrics and quality indicators regularly, if required: The set standards, metrics and quality indicators for the process should be reviewed and modified/updated whenever needed. This activity helps to set up to date metrics and quality standards. The higher management should be liable for it.

7.10. Management Commitment

The commitment at the managerial level is an integral element for any project to be successful. It includes the significance of management commitment at all levels. Table 10 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Higher management and the executive committee/sponsor must be engaged and committed to the project and its success: The commitment of the higher management and the executive roles impact the project results. The eGovernment projects are highly dependent on these roles; therefore, they should be involved in activities of the SPT and project development. A strong commitment from them might put positive affect on the eGovernment project results.

- Middle management must be engaged and committed to the project, if any: The managers at the middle level, as well, should be involved and committed to the project activities and its results. They also have effect on the project results. Their involvement and commitment might have positive affect on the eGovernment project results.
- Low level management (if any) and project team must be engaged and committed to the project: The managers at the lower level are also important. They should also be involved and committed to the project activities and its results.
- Reduce lack of commitment at managerial level: The issue of lack of commitment occurs very often in the eGovernment projects, as there are multiple stakeholders and conflicts arise. Therefore, proper management should be there to handle this issue and make high commitments at the managerial levels.

7.11. Stakeholders' Attitude

The various activities of the project development depend on attitude of the concerns. The positive attitude indicates positive results, whereas negative attitude indicates unexpected results. Table 11 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Key stakeholders must be highly committed and motivated towards the project: All the main stakeholders should be committed and motivated for better eGovernment project development. The stakeholders are vendor, client and the supervisory committee. All these should be highly involved in the project activities, as they have strong influence on the project results.
- Stakeholders should accept the planned process activities: The stakeholders should be ready to accept the SDP activities that are planned by the development organization. It reduces conflicts and issues.
- Stakeholders must follow defined software process: All stakeholders should be confident about the plans set by the managers, and they should follow the defined SDP properly. In such setting, there are less conflicts and attitude issues.
- Stakeholders must own the software development process: The SDP should always be retained and preserved by all the stakeholders.
- Stakeholders must trust and respect each other: There should be a working environment that is full of respect, trust and conviction. The concerns should be respectful to each other, which increases the motivation level.
- Stakeholders must participate in required activities of the project: The stakeholders should participate willingly in the required activities of the development process and the project. Managers should encourage this phenomenon to improve the individual participation and motivation of the stakeholders.
- All concerns must have a strong relationship with each other: The stakeholders working together should have a strong bond with each other. Therefore, the managers should encourage and make arrangements for better environment, so that the concerns have strong relationship, which results in highly effective results.
- Stakeholders must share win-win motivation for eGovernment project: All the stakeholders should have good relationship with others, so that they have win-win motivation and develops a win-win situation.
- Reduce level of less encouragement and participation from stakeholders: The lack of participation should be reduced by managers. Every stakeholder should be highly involved and should participate in the activities actively. In addition, they should be encouraged to work in a motivated and efficient manner.
- Remove weak relationships among individuals: The managers should make effective efforts to remove weak relationships among the stakeholders, as weak bonds create differences among concerns and consequently affects the definition and tailoring activities of the SDP and the eGovernment project.

7.12. Trainings

The trainings for the personnels involved are highly important. The considerable amount of education and training needs to be conducted regularly. Table 12 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Improve the leadership capability of project managers by trainings: The training programs should be employed to reduce failures and improve the project activities effectively. The managers and team leads should be given required training so that they possess all the preferred leadership qualities and capabilities to plan and execute the project milestones properly. The training sessions for managers and team leads enhances their aptitudes and abilities.
- Enhance the team skills by education and training: The training is also mandatory for the teams, so that their skills and abilities are improved to the extent that they can deliver their project tasks efficiently. The managers should be concerned about

their team education and trainings.

- Try to minimize the lack of training issue: There should be a proper mechanism to plan and conduct trainings for the concerns. Lack of training results in less experienced personnels and consequently gives reduced project value.

7.13. Communication

The communication channel and a structured method for disseminating the information is important. Insufficient communication might result in lack of clarity of the SPT and the eGovernment project. Table 13 identifies the key activities for this cluster. Below are the relevant activities of this cluster defined.

- Establish a communication approach for all concerns: A proper communication channel should be present in the organization and for the project stakeholders to convey the information. The managers should be responsible for arranging and establishing such proper method for effective communication for concerns.
- Increase the level of coordination and communication among teams and organizations in eGovernment sector: There should be frequent communication and coordination among the team members, stakeholders and the organizations. An effective communication mechanism should be implemented within the eGovernment project.
- Reduce the issues that occur due to cultural differences: A number of issues arise due to the cultural differences, such as a language problem, understanding issue, and behaviors that people have. Such issues need to be removed for better project development and process definition in the eGovernment domain.
- Minimize the concern of lack of feedback from stakeholders: The proper and regular feedback from the stakeholders is a necessary part for the project development, especially in the eGovernment project. It implies that the concerns should give feedback actively and share their ideas. Therefore, lack of feedback from the stakeholder is an issue that should be removed for improved development and better results.
- Evade the issue of 3Cs: The consistency, clarity and courtesy are the 3Cs of effective communication. The issue arises when these get affected and any of these is not incorporated properly while communicating. Therefore, the inconsistency, ambiguity and non-courtesy highly affect the SDP and the project. The managers should encourage 3Cs in the organization and try to evade the related issues.

The activities in each cluster are elements that fulfill a particular scoped function. In the SDPTG framework, all these activities contribute to form a well-structured, optimal, and systematic process definition method. Much consideration has been put to identify the relevant activities and placing these in the most optimal cluster. It is believed that they together can intensely contribute to a well-structured, optimal and a systematic approach to the SPT and selection.

8. VALIDATION OF SDPTG FRAMEWORK

The validation of the proposed framework was performed in this step. The validation of the developed framework is an imperative element to check the effectiveness of the proposed framework. The validation could assist the project managers in their decision making. The validation aims to find whether the given framework is performing as intended or not. Therefore, this section used the survey method for quality assessment and validation of the framework, using the matrices for evaluating the score and weights for each activity in the framework. The scores were given out of 5 (like-art scale 1-5), and weights were given out of 2 (from 0 to 2), according to the significance of the activity as per the respondent(s) from Directorate of IT (DoIT). Five professionals from DoIT were asked to evaluate the framework and give their response on the matrices' form. All the activities specified in the framework were considered important and were given higher scores and weights, which made all the activities of the SDPTG framework to be accepted. All of the five respondents agreed to the framework and its significance. The evaluation and validation of our framework indicate that it is quite valuable and can be useful for the project managers in defining and selecting the appropriate SDP according to the eGovernment project context.

9. APPLICATION OF PROPOSED SDPTG FRAMEWORK ON EGOVERNMENT PROJECT

This section presents the results obtained by applying the framework to the eGovernment project. The information was collected using interviews and observations for the project.

9.1. eGovernment Project Overview

The selected project was the E-Office eGovernment project, an application developed by the National Information Technology Board (NITB), is helping the Government departments to go paperless. It is aimed at improving internal efficiencies in an organization through electronic administration.

The physical file movement of official files and documents consumes a lot of time and requires continuous monitoring from the desk to desk before the final decision is made by the senior officials. Consequently, many crucial decisions get delayed due to the slow movement of files and/or unavailability or absence of the senior officials in the government offices. In addition, the hazards of theft and missing of files is also common in most of the government offices. The immediate need in such a scenario is to have a system in place where an authorized employee could locate the required documents and/or files in the shortest possible time.

E-Office is a step forward into an era of paperless administration in the government offices. It is a digital workplace solution that replaces the existing method of manual handling of files and documents with an efficient electronic system. The application can update and share files with other relevant users and eventually store them with proper references. The electronic system has its inherent advantages such as data stored digitally with audit trails for every transaction being done. Regular backups and Disaster Recovery systems (DRS) are in place which ensures that the Government files are not damaged in case of any mishap.

9.2. Results of E-Office Project after applying Framework

The framework has been applied on E-Office project, and the results are discussed. The result of the use of particular activities from each cluster is being reflected in the project, and how much the activity was considered significant. It includes to what extent these activities were used for defining the SDP for the specified project. The assessment of the project confirmed that the SDPTG framework correctly reflected the appropriate SPT and the success of the eGovernment project.

A considerable amount of activities, 80 out of 99 activities of the SDPTG Framework were fully performed in the project, and 17 activities were partly performed. Whereas, only 2 activities were there which were not performed, however, slight consideration was given to those 2 as well. The project was a straight success after using the SDPTG framework. The manager of the project was interviewed to assess the outcomes of the project, and hence the results of this research study were generated.

The project director was interviewed regarding the E-Office performance after the use of SDPTG framework. The interviewee stated, "E-Office aimed to cater to the need for effectiveness and transparency in the governmental processes and service delivery mechanisms, and have achieved its objectives efficiently and effectively. A major help was provided by your framework". During the conversation, some key performance indicators for the E-Office project was known, analyzed and are reported as under:

- Active Users 6760
- DR Poll up to 500 million
- Up to Rs. 300 million savings on stationary
- Up to 80% Operating Time-saving
- Up to 80% increase in efficiency

The SDP quality affects the project delivery and project quality. Various researchers have emphasized the significance of the SDP and the aforementioned quality. Sommerville stated some SDP characteristics which signify multiple features of the quality (Sommerville, 2009), such as understandability, visibility, robustness, rapidity, etc. Those characteristics depict the quality of the software process. Therefore, the attributes were investigated for the defined SDP of the E-Office project as well, and the response to all the attributes were "Yes", i.e. the new defined SDP has all the quality attributes.

9.3. E-Office Application's Conclusion

The results of applying the framework for E-Office were positive. The project turned out to be a successful one. It automated core business of government services to increase accuracy, effectiveness, transparency, good governance, and accountability along with cost-effective services.

10. Conclusion and Future Work

This research aimed to propose a comprehensive framework that can be helpful to minimize challenges in software development process tailoring of eGovernment projects, and hence can serve as a foundation to guide the future process tailoring practices. To respond to it, the SDPTG (Software Development Process Tailoring Guidelines) framework has been proposed, validated and implemented using empirical investigation. The proposed framework states that the milestones and their respective activities are integral to be considered in software process tailoring, for success of eGovernment projects. It is capable of minimizing challenges and increasing the likelihood of better performance and competitive edge. The framework provides a number of advantages, such as improved effectiveness and efficiency, increased understanding and flexibility, reliability, and is highly acceptable. The proposed framework provides individuals involved in eGovernment project development with the ability to efficiently incorporate the framework into a number of eGovernment and Information system projects, as it has shown its applicability in industrial setup. The limitation of this study is that the investigation consisted of some critical projects', using interviews, and a lot of reluctance was shown by a number of the respondents.

The future work consists of investigating more cases by applying this proposed framework to generalize and comprehend it further. We expect that this research study will contribute to further activating effective eGovernment sector.

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