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SOFTWARE DEVELOPMENT PROCESS TAILORING CHALLENGES AND SUCCESS FACTORS FOR EGOVERNMENT PROJECTS IN PAKISTAN: A QUALITATIVE STUDY

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Challenge, eGovernment, Project(s), Process definition, Process tailoring, Software development process, Success.

ABSTRACT

In the eGovernment project development, a major aspect that needs significance is the use of the appropriate software development process. However, the selection and tailoring of a proper software development process is still problematic, especially in developing countries. There are a number of factors behind the failure and success of any software process and the projects in eGovernment sector. The paper first presents the discussion on the processes used in the eGovernment sector of Pakistan. Second, it presents the challenges that arise in process tailoring and selection, and success factors which contribute to define proper software process and towards success of the project. Three eGovernment projects were taken for investigation; semi-structured interviews were conducted to gather information Final results are observed on the basis of the qualitative analysis. A list of challenges and success factors were identified which can be of use for software development process tailoring and definition in eGovernment projects. Those factors were verified by literature as well. These challenges and success factors can be useful for organizations engaged with eGovernment project development. The results of this study, particularly using the qualitative technique – allowed us to get an extremely rich insight into the software process definition and tailoring success factors and arising critical challenges for eGovernment projects, helpful for future researchers and practitioners. Future work comprises of developing a framework for eGovernment projects to better define the software process and some more empirical studies in the industry.

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1. INTRODUCTION

Nowadays, there is a keen interest to develop and maintain an effective and efficient software system(s) in the public sector, so that a number of electronic government (eGovernment) benefits could be provided to its users. The government of Pakistan is also trying to digitize their systems and the projects. The government has launched "Digital Pakistan" eGovernment initiative to upgrade entire digital infrastructure of various departments, such as Banking, Railways, Institutions, Businesses, and Fuel Stations ("Digital Pakistan).

A major critical factor for development is to establish and maintain robust Software Development Process (SDP) (Chevers et al., 2017). A number of eGovernment projects have failed due to use of inappropriate software processes that hinder performance and the productivity level, specifically in the developing country, such as Pakistan.

As a result, the governments and the concerned software development organizations are striving towards having suitable and a highly-organized software development process. 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 (Chevers et al., 2017; Li et al., 2006). 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 development process, 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 defined and tailored as per the context. The tailoring and definition of the SDP is not a one-time activity. Each project has its own changing needs and context. Therefore, Software Development Process Tailoring (SPT) has to be performed for each project in the public sector, as per their changing contexts and needs.

The use of appropriate software development process has a number of benefits, e.g., improved quality, less time market, increased productivity, improved flexibility, and last but not least the customer satisfaction (Khan et al., 2017; Elder & Garman, 2008; Heeks, 2006). As a result, it is quite significant to investigate the factors that play vital role in tailoring a software process which further play role in the success and failure of the eGovernment project. However, the domain lacks the identification of the factors which drive towards the successful tailoring of the software development process for eGovernment projects. Therefore, in order to fill the gap, this study aims to investigate those success factors, the challenges that practitioners face while tailoring the software development process and the practices in the context of a developing country, Pakistan.These factors would contribute towards the advancement of knowledge with respect to the eGovernment domain.

The study uses the qualitative approach to collect required information and to analyze results. The interviews were conducted with eGovernment professionals for three eGovernment projects. A total of 30 eGovernment practitioners were interviewed to gather information regarding the software development processes which are used in eGovernment projects in Pakistan, challenges that occur during the process tailoring, the factors which help in better tailoring. The identified factors are validated with the available literature. A conceptual categorization of the identified factors was made, and the results were summarized according to the defined categories. Summarily, we provide results of the empirical investigation regarding major factors which are present in the process tailoring and definition of any eGovernment project.

The findings show that Pakistan is on the way for better development and progress of eGovernment sector. This is due to their awareness regarding the use of defined software development process for eGovernment project(s). The proper understanding of the factors that are critical for success and failure of any software development process and the subsequent project can improve the eGovernment initiatives of the country. In addition, it can help the practitioners in dealing with the occurring situations, and can be helpful to the developing world as well. The customer satisfaction and the competitive advantage can be enhanced as well.

The following paper is structured as: Section 2 discusses the eGovernment and private sector. Section 3 discusses the concept of eGovernment. Section 4 discusses the software development processes that are used in the eGovernment sector of the subjected country. Section 5 gives an overview of used software processes in the eGovernment sector of Pakistan. Section 6 and section 7 states the problem statement and the theoretical foundation for research respectively. Section 8 describes the research methodology. Section 9 introduces the selected projects under investigation. Section 10 provides the findings of the research, including the success factors and challenges along with the categories formed. Section 11 provides with the discussion of the study. Section 12 concludes the study, and future work is presented in section 13.

2. DIFFERENCE BETWEEN EGOVERNMENT SECTOR AND PRIVATE SECTOR

eGovernment projects are essentially the software development projects (Elder & Garman, 2008; Heeks, 2006). However, the context of eGovernment projects differs from private sector software development projects (Heeks.R, 2002; Elder & Garman, 2008; Heeks, 2006). eGovernment projects stand within a broader context (Heeks, 2006); i.e. of citizens, management, public agencies, IT vendors, politics, culture, and so on. It includes and affects all these factors. Not only does eGovernment affect these factors; it is

also affected by these factors (Heeks, 2006). Whereas, this is not the case with the private software development (Heeks, 2006). The difference with respect to context occurs due to fundamental differences in ownership, aim, value, external stakeholders, funding and control (Editorial Board, 2017). There is lack of ownership, lack of definite objectives, lack of responsibility fixing, and shirking of responsibility in government sector (Boye. G, 2002). The authority and responsibility in the government sector is irregular, but these are clear in the private sector (Editorial Board, 2017). The accountability mode, profits, goals, work mode, are all different in government as compared to private sector (Edirorial Board, 2017; Osei-kyei, & Chan, 2017). Private sector is initiated for competitive advantage and adds value in terms of higher revenues (Edirorial Board, 2017). Whereas, eGovernment projects are not built for profit, rather they intend to improve service performance and to reduce costs, etc. (Edirorial Board, 2017). The activities in eGovernment project software development and maintenance is highly complex as compared to private sector (Elder & Garman, 2008). Therefore, eGovernment and private sector are quite different to each other (Elder & Garman, 2008).

3. EGOVERNMENT CONCEPT

The eGovernment is defined as: "the application of information and communication technologies (ICTs) to improve public services" (Sundgren, 2005). This general definition covers various aspects, such as people, process, technology and resources, and for this thesis serves as an appropriate foundation as it depicts necessity to think regarding a number of factors in eGovernment projects. The concept of eGovernment is shown in Figure 1. A lot of aspects and relationships need to be considered when implementing eGovernment. An important aspect for eGovernment projects' development and implementation is the "Software Development Process" aspect (Mergel, 2016). SDP is the "set of activities and guidelines that lead to the production and maintenance of a software product. It includes the basic software engineering activities related to requirements engineering, design, implementation, testing, and maintenance, as well as any other activities that result in software products such as software prototyping, software modification, reuse, and system re-engineering" (Software Porcess Models,). The implementation of eGovernment services is not just about simply re-engineering process (Ndou, 2004). There are various software development processes prevalent in the public sector now days, discussed in next sections.

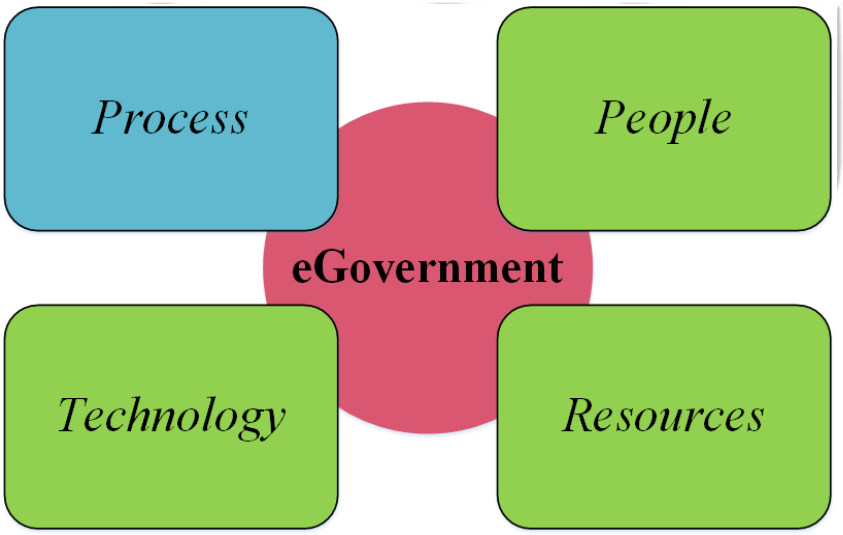

Figure 1: eGovernment Concept

4. SOFTWARE DEVELOPMENT PROCESSES USED IN EGOVERNMENT PROJECTS

The eGovernment projects are generally developed under two paradigms of software development: the traditional and the agile. Both are used in practice currently. A number of software development processes are used in the public sector for project development. The traditional software development processes such as waterfall model is old and usually does not cope with the iterative environment of the project and the organization, as they focus on the solution prior to the development. Such approach has been considered quite often having focus on competition, disaggregation, and outsourcing of the eGovernment project(s) (Mergel, 2016). The eGovernment managers follow the strict performance-oriented model and try to anticipate the result. It often leads towards failure, especially in eGovernment projects. Therefore, some of the organizations use adaptive and agile methods in the public sector (Mergel, 2016). The agile software development process is considered as an improvement in various contexts. However, some public sector organizations still use the traditional software development processes to execute their projects. The traditional and agile soft-

ware development processes in the eGovernment sector of Pakistan are briefly discussed below.

4.1. Traditional Software Development Processes

The traditional software development processes that are in use in the eGovernment projects in Pakistan are:

4.1.1. Waterfall model

The main activities of waterfall model used by the organizations in eGovernment projects are: Specification, Design, Integration and Testing, Acceptance phase, and Deployment. In the eGovernment domain, the Waterfall software development model can be successful if the requirements are understood properly at the start of the project, and does not change throughout the project. It reduces the project risks and failure rate. Such heavyweight processes can be suitable when multiple teams are available at various locations and there is strong control to validate main parts of the eGovernment project.

4.1.2. Rational Unified Process (RUP)

The main activities of the RUP approach are: Inception, Elaboration, Construction, and Transition. For the projects developed and implemented in the eGovernment sector, the organizations that follow the RUP model use the same standard iterative approach for their project development. In eGovernment project(s), the responsibilities of all team members are assigned properly before the development starts. In addition, the project members and the stakeholders both are involved during the entire process. The organizations using RUP software process guarantees that all involved and concerns have a common language and have the same view on approaching the software project.

4.1.3. Spiral model

The Spiral software development process approach includes four quarters, which are: Quarter 1: Determine objectives, alternatives and constraints; Quarter 2: Evaluate alternatives, identify, resolve risks; Quarter 3: Develop, verify next level product; and Quarter 4: Plan next phases. The Spiral software development process is extensively used in the eGovernment sector because of its better performance in the service-driven environment. Some eGovernment organizations prefers the spiral model as it reduces the failure risks significantly and is able to incorporate latest technology and novelty in the process and consequently in the project.

4.2. Agile methodologies

The Agile software development involves the processes produced by creative and extremely skilled practitioners (Dybå & Dingsøyr, 2008). Agile approach does not involve the fact that problems are specified and the optimum solutions are present. Such characteristic is different to the traditional approach. The agile depends on the people and their creativity (Dybå & Dingsøyr, 2008). There is no strict method to be followed in agile; rather a "light" approach to handle the project is present. The progress of the process and the project relies on the understanding of the stakeholders involved.

The Agile software development approach has following core values (Dybå & Dingsøyr, 2008):

- "Individual thoughts and their interactions are more important than processes and tools"
- "Delivering working and tested software instead of ample documentation"
- "Instead of contract negotiation, collaboration with the client is needed"
- "Being ready for and responding to changes instead of following a strict plan"

The agile method is quite useful and feasible process, and has received considerable attention from the eGovernment field, providing multiple benefits to users. The public sector uses agile software development processes because of its emphasis on communication, people, and response to changes. In agile development approach, four types of processes are used mostly by the public sector. These are discussed as under.

4.2.1. Extreme Programming (XP)

The basic four principles of XP are: "Communication", "Simplicity", "Feedback" and "Courage" (Beck, 2004). There are twelve XP practices, also known as best practices, which encompass the four core values of XP. Absence of these practices entails the software process to be a non-XP process. These practices are: The planning game, Small releases, Simple design, Testing, Refactoring, Pair Programming, Collective ownership, Continuous integration, On-site customer, Coding standards, 40-hour week, and System metaphor.

4.2.2. Scrum

The Scrum approach consists of some key practices. These are "Cross-functional teams of eight or fewer team members", "Sprints

are fixed iterations which should take 30-days",“The work within each sprint is planned and fixed”, “The teams are self-organizing and are self-directed, however, a Scrum Master mentors and manages the teams”, “All the work, such as, requirements, workload, design activities, are noted in the Product Backlog”, “The Product Owner manages the Product Backlog”, “The main communication method contains a daily 15-minute meeting” “Scrum heavily focuses on time-boxing”, and “Scrum is an iterative approach which allows requirements, architecture and design to emerge over time” In the eGovernment sector, Scrum is used in various projects.

4.2.3. DYNAMIC SYSTEMS DEVELOPMENT METHOD (DSDM)

The approach defines the project management, prototyping, estimating, testing, risk management and quality assurance aspects of the software development. It aims to deliver the software projects quickly. It comprises of five major stages: “Feasibility study”; “Business study” ;“Functional model iteration”; “System design” ; and “Build iteration and implementation”.

There are certain principles associated to DSDM process that must be considered in order to get a project successful with DSDM. Those principles are listed below:

- “Active user involvement is imperative”
- “DSDM teams must be empowered to make decisions”
- “The focus is on frequent delivery of products”
- “Fitness for business purpose is the essential criterion for acceptance of deliverables”
- Iterative and incremental development is necessary to converge on an accurate business solution”
- “All changes during development are reversible”
- “Requirements are baselined at a high level”
- “Testing is integrated throughout the lifecycle”
- A collaborative and co-operative approach between all stakeholders is essential”

The DSDM software development process is used by fewer eGovernment organizations.

4.2.4. FEATURE DRIVEN DEVELOPMENT (FDD)

FDD involves five processes: “Develop an overall model”;“Build a features list” ;“Plan by feature” ;“Design by feature” ;“Build by feature”. The features within the FDD must have the following characteristics: Small; according to the systems’ stakeholders; can be collected into business-related groupings; prioritized; schedulable; have an associated cost; and can be grouped into short iterations.

Another agile method in use by the eGovernment sector is the FDD process. The organizations use this approach due to a major factor associated with the FDD that differentiates it from other agile approaches is the ‘management of projects’. The eGovernment projects are mostly dependent on the management aspect.

4.3. SUMMARY

Summarily, the analysis of the waterfall software development process shows that it is not a right selection for the dynamic nature of the eGovernment projects. It is due to the rigidity that waterfall has. In addition, it extends to the fact that the requirements of eGovernment projects can be identified priori in exceptional cases only. However, the Spiral software development model tackles this problem due to its iterative nature. The spiral model aims at the assessment, analysis and prevention of the risks in the eGovernment projects. The analysis concludes that it is a very heavyweight process and cannot be applied to all eGovernment projects. The RUP development process incorporates adapting services, and gives emphasis on the architecture of the eGovernment project. However, the RUP process is a traditional heavyweight process and is unsuitable for eGovernment projects with small teams.

The agile software development processes were employed in the eGovernment domain in response to the classical and traditional software processes. The government organizations give strong emphasis on small and self-organizing teams in Scrum. XP helps the eGovernment organizations to be more customer-centric. DSDM and FDD are also helpful to be targeted towards the customer. These software development processes are quite lean; however, there is unpredictability in the control by the organizations in the public sector. Therefore, results get different than expectations. The traditional approaches are rigid and require additional effort, and the agile approaches are dynamic and lean, however lacks complete support for the project.

5. OVERVIEW OF USED SOFTWARE DEVELOPMENT PROCESSES

Software development processes mostly used in the eGovernment projects were analyzed in the previous sub-sections. This subsection provides the main characteristics, the strengths and weaknesses that have been analyzed in this study. First the differences between the traditional (waterfall, Spiral, and RUP) and the agile process (XP, Scrum, DSDM and FDD) groups is given, then the overview of the weaknesses, strengths and the major characteristics of software development processes in eGovernment projects are given. The differences between the two groups are given in Table 1.

In eGovernment development, the major difference between the two process categories is the understanding of projects and the environment. The traditional processes aim to have everything specified in the stable environment. However, the agile approach view things that changes do occur, in the dynamic environment. It implies different approaches for both regarding the management of the project and the team in the eGovernment sector. A thorough analysis has been done to identify both categories regarding the eGovernment domain. Table 2 and Table 3 depict the major characteristics, strengths and weaknesses of traditional and agile process categories in the eGovernment domain respectively.

Table 1: Differences in traditional and agile development

	Traditional Processes	**Agile Processes**
Major Assumption	The system is fully specifiable and predictable and is built with extensive planning	The system is developed by teams using continuous design, improvement and testing based on rapid feedback
Management Style	Command and control, hierarchy	Collaboration and Leadership
Knowledge Management	Explicit	Tacit knowledge
Communication	Formal	Informal
Organizational structure	Aimed at large teams. Bureaucratic and highly formalized	Flexible, cooperative and social action
Quality Control	Heavy planning and strict control	Continuous control
Control	Process centric	People centric
Role Assignment	Individual — favors specialization	Self-organizing teams — encourages role interchange ability
Customer's Role	Important	Critical
Project cycle	Guided by tasks or activities	Guided by product features

Table 2: Analysis of Traditional software development processes in eGovernment projects with characteristics, strengths and weaknesses

Traditional Software Development Process in eGovernment Projects		
Main Characteristic(s)	**Strengths**	**Weaknesses**
• Sequential • Extensive planning • Strict compliance • Codified software process • Rigorous reuse • A lot of documentation • Big sized design up-front	• Straightforward method • Systematic design • Structured nature • High predictability • High stability • High assurance	• Slow adaptation to changing needs • Possibility of over budgeting • Possibility of being behind schedule • Problematic to produce the set of requirements completely • Low productivity • Less collaboration

	• Lengthy development

Table 3: Analysis of Agile software development processes in eGovernment projects with characteristics, strengths and weaknesses

Agile Software Development Process in eGovernment Projects		
Main Characteristic(s)	**Strengths**	**Weaknesses**
• Incremental and Iterative • Customer oriented • Collaboration • Frequent delivery • People centric • Fast and Light development	• Short development model • High customer satisfaction • Low defects • Easy and fast adaptation to business requirements • Increased benefits • Less planning • Improved team communication • High productivity	• Reduced Documentation • Dependency on implicit knowledge • Not suitable for critical projects • Inadequate for highly stable projects • Dependency on experienced team • Not appropriate for large scale projects

6. PROBLEM STATEMENT

The significance and need for a defined software development process and tailoring of the process is accepted worldwide (Khan et al., 2017; Elder & Garman, 2008; Heeks, 2006). However, existing research has addressed private sector development only. The research with respect to software development process is scarce in the eGovernment domain. Moreover, the critical factors of a software process tailoring activity that drive the eGovernment project towards success or failure are missing, as a result, a collection of significant factors that must be considered by practitioners, especially the managers , for better tailoring of the software development process in eGovernment project.

7. THEORETICAL FOUNDATION FOR RESEARCH

On the basis of the overall analysis, it can be stated that it is difficult to select an appropriate software development process for the eGovernment projects. The software development processes rely on people. Therefore, it is not easy to make a suitable choice of software development process corresponding to the context and the organization. No model seems suitable for all types of eGovernment projects; therefore, a selection should always be made incorporating the tailoring practice for the projects. A number of critical factors might provide guidance on tailoring software development process and may assist in achieving the project success. The literature of the public administration determines that public services have achieved remarkable attention during the past decades. With such perceptions, the importance of the project-oriented eGovernment systems have increased, which means that the organizations need to identify the procedure and ways to provide projects that are successful and are oriented towards customer needs. Theoretical foundation related to software development process tailoring in the eGovernment sector is scarce (Mergel, 2016), so it is significant to assess the empirical cases where tailoring the process have been introduced in the eGovernment organizations to provide theoretical findings that would provide support to further research and suggestions for practitioners.

8. RESEARCH METHODOLOGY

The qualitative method is used to for this study. The qualitative examination is helpful in studying data in the natural settings (Bradley et al., 2007). Case study method has been used as the primary method to gather the relevant information of the eGovernment projects. Case study intends to reveal the details from the participant's viewpoint (Ridder, 2017; Yin, 2013).

The participants were the individuals who were involved in the development of the selected eGovernment projects, comprising of client, vendor and the executive role. The participants of the eGovernment projects were purposely sampled (N=30) from multiple projects, having varying roles and experiences. The participants were project managers, project directors, team leads, senior analyst, program managers, and coordinators. Ten participants from each project were selected. Face-to-face semi-structured interviews were conducted, consisting of 30-35 minutes duration. The interview sessions consisted of general questions about the used processes, and specific ones regarding the critical factors that define the success or failure, i.e. the success factors and the challenges that occur in process tailoring. The data collection came to an end when the saturation for those critical factors was reached. The analysis was performed accordingly, and the factors were validated through the available literature.

9. SELECTED EGOVERNMENT PROJECTS

This research consisted of investigating three case studies in order to underpin the relevant information, which are implemented in the Khyber Pakhtunkhwa Province of Pakistan. The case studies were conducted to find the required information about the challenges that occur in process tailoring and the success factors which define the success, an important aspect for eGovernment project success. The selected projects are briefly described.

- ***Special Branch Information System (SBIS)***

The SBIS project under study is working successfully and fulfilling all requirements of concerned department of Special Branch. Special branch is a huge affiliated police department. The project intended to control the terrorism in the country. It improved the efficiency of the department after digitization.

- ***Prison Management Information System (PMIS)***

The PMIS project under study is working successfully and helping to maintain the complete database for the prisoners' information, and its quick retrieval of the required information. The automation of the prison system has increased the efficiency and the transparency.

- ***e-Police***

The e-Police project was developed to overcome the difficulties which people face while registering complaints at the police station. Initially, the process of registering the complaints was manual and cumbersome. However, after the automation, the system is running successfully and has provided easy access to users. The automated project is providing different functionalities to the police department.

10. FINDINGS

This section presents the findings of this research study, i.e., list of success factors for tailoring the software development process and the challenges that occur in eGovernment project(s) of Pakistan.

10.1. CHALLENGES IN SOFTWARE DEVELOPMENT PROCESS TAILORING

Different challenges and barriers surrounding the eGovernment domain are known. One of those challenges is the inappropriate software development method for a project, as a single method cannot be suitable for all projects. Therefore, some tailoring to the standard software development method is required.

In current turbulent industry, the organizations must always tailor their SDPs to achieve their business requirements and the set project goals. Creating a process from scratch for a project takes in high overhead and is risky, so the organizations usually tailor the existing SDP as per the project context. However, the domain still lacks the understanding of various factors. Therefore, the research community must give attention to the critical factors that might drive the project towards success or failure, and should be known to the researchers and to the industry.

There exist various challenges that might occur in the Software process tailoring. The identified challenges from the case studies are mentioned below.

10.1.1. CHALLENGES IN EGOVERNMENT PROJECTS UNDER INVESTIGATION

This section talks over the challenges identified in the three eGovernment projects by associating ideas that came out of the data. The challenges and barriers of the SPT and definition in the projects discussed provide lessons that eGovernment practitioners can learn and develop a baseline for management strategies.

A thorough analysis of the interview data was done to identify why the SDT and the definition for eGovernment projects become challenging. In this analysis, forty four critical challenges were found that occur in the industry. The identified challenges have been classified into five main categories, identified after interviewing the practitioners. These are managerial, resource, technical, communication and political challenges. The classification is shown in Table 4. These main categories are described, to understand the challenges that exist when defining the software development process for the public sector.

Table 4: Software Development Process Challenges with respective categories

Category	Challenge(s)
Managerial Challenges	Lack of management commitment, Lack of management support, Staff/management turnover, Excessive Workload, Delay on action plan implementation, Weak Leadership, Lack of Documentation, Insufficient coverage of Risk Management Activities, Lack of Requirements Management, Lack of up-front planning, Poorly defined Roles and Responsibilities, Lack of ownership
Resource Challenges	Poorly allocated resources/Lack of resources, Inexperienced staff/Project team with limited experience/expertise, Time pressure, Budget and Schedule constraints, Lack of implementation tools and standards, Team size Issue
Technical Challenges	Lack of technical support, Lack of understanding SPI goals, Lack of training, Lack of SPI awareness, Lack of formal methodology, Poor organizational infrastructure, Traceability issues, Lack of relevant skills, In-familiarity with technology, Technical difficulty/complex technology, Requirements and scope risks, Large size of project
Communication challenges	Less information sharing, Weak relationship among teams, Cultural differences, Lack of trust, Lack of feedback, Distance from client, Lack of 3Cs (Communication, coordination and control)- from team or management, Getting Stakeholder Buy In/ involving them in the decision-making process, Inability to specify requirements
Political Challenges	Less stakeholder participation, Organizational politics, Lack of sponsorship, Poor Regulatory Compliance, Lack of user support

Issues faced in eGovernment Projects

Issues	SBIS	PMIS	ePolice
Managerial	Lack of management commitment Lack of management support Excessive Workload Delay on action plan implementation Lack of Documentation In-sufficient coverage of Risk Management Lack of Requirements Management Lack of up-front planning Lack of ownership	Staff/management turnover Excessive Workload Lack of management commitment Delay on action plan implementation Lack of Documentation Lack of Requirements Management In-sufficient coverage of Risk Management Activities Lack of up-front planning Weak Leadership	Excessive Workload Lack of management commitment Staff/management turnover Delay on action plan implementation Lack of Documentation In-sufficient coverage of Risk Management Lack of Requirements Management Lack of up-front planning Lack of ownership
Technical	Lack of understanding SPI goals Lack of formal methodology Poor organizational infrastructure Lack of relevant skills Requirements and scope risks Large size of project Poorly defined Roles and Responsibilities	Lack of technical support Lack of understanding SPI goals Lack of training Lack of SPI awareness Poor organizational infrastructure Requirements and scope risks Traceability issues Technical difficulty/complex technology Poorly defined Roles and Responsibilities	Lack of technical support Lack of understanding SPI goals Lack of SPI awareness Lack of formal methodology Poor organizational infrastructure Lack of relevant skills Requirements and scope risks Large size of project Infamiliarity with technology
Communication	Less information sharing Lack of feedback Distance from client Lack of 3C's (Communication, coordination and control)- from team or management Getting Stakeholder Buy In/ involving them in the decision-making process Inability to specify requirements	Less information sharing Lack of feedback Distance from client Getting Stakeholder Buy In/ involving them in the decision-making process Inability to specify requirements Weak relationship among teams	Cultural differences Lack of trust Lack of feedback Distance from client Lack of 3C's (Communication, coordination and control)- from team or management Getting Stakeholder Buy In/ involving them in the decision-making process
Resource	Time pressure Team size Issue Budget and Schedule constraints	Poorly allocated resources/Lack of resources Time pressure Budget and Schedule constraints Team size Issue	Time pressure Budget and Schedule constraints Lack of implementation tools and standards Team size Issue Poorly allocated resources/Lack of resources Inexperienced staff/Project team with limited experience/expertise
Political	Less stakeholder participation Lack of sponsorship Lack of user support	Organizational politics Poor Regulatory Compliance	Less stakeholder participation Poor Regulatory Compliance

Figure 2: Challenges in Projects

Semi-structured interviews were conducted to gather information regarding the challenges that were faced when defining and tailoring the SDP for the eGovernment projects, named SBIS,PMIS and ePolice. Ten participants for each project were interviewed. The challenges occurred in each project is depicted in Figure 2.

10.1.2. DISCUSSION OF CHALLENGES

The only challenges discussed in the following sections are the ones which were present in the investigated projects.

- **MANAGERIAL CHALLENGES**

The managerial challenges usually occur due to inaccurate, unstable, and inexperienced people at the managerial level. These challenges arise when the managers lack commitment and support for the project and the concerns. The managers do not stay longer in the organization and switch very often. A major challenge that affects the project is not following the action plan properly, which is usually due to the weak leadership and no documentation at the team level. The risk handling is a major task for managers to carry out, which, if left out cause project failures. All the project requirements must be elicited and specified properly as well, as lack of requirements management can create several difficulties in the development of the project in the public sector. The planning and roles assignment ought to be specified because the lack of these, drive projects to be a challenging one. Another major factor that falls in this category is the responsibility to take ownership, if neglected, gives poor results for the project.

- **TECHNICAL CHALLENGES**

The technical challenges result due to the technology and tools in use. The project becomes challenging if there is less supportive technology, and goals are not understood properly. Lack of training regarding the use of tools and technology might create several hurdles in development. The less awareness about software process instantiation and improvement is another issue that affects the progress. The formal methodology should be present and used for each eGovernment system, if not, the system might face challenges. If the tools and technology are inappropriate, the infrastructure also gets affected. The traceability issues, skills issue, use of unknown technology, and the project size issue also relates to the technological concern.

- **RESOURCE CHALLENGES**

The resource issues occur when there is a lack of required resources. These resources can be human or abstract. The poorly allocated human resources create problems in development. In addition, the inexperienced staff with less experience is also a resource issue, i.e. the experience is a resource for the project, which if absent causes issues. The time, budget, schedule and tools are key resources as well. If these are not properly managed, the project is a failure.

- **COMMUNICATION CHALLENGES**

The communication challenges are the problems in attaining effective mechanism for communication purpose, with all stakeholders. The issues that arise due to poor communication mechanism includes less sharing of information, weak bonds among teams, cultural differences, trust issues, less feedback from concerns, distant communication, poor coordination and control, and poor specification of requirements.

- **POLITICAL CHALLENGES**

Political challenges occur due to the unexpected actions and decisions that intensely disturb the development and execution of the project. The less participation from stakeholders might affect the progress. The organizational politics should be minimized, as it is a major drawback for eGovernment project development. If there is less sponsorship and compliance is not done properly, the project can be challenging. In addition, user support is another important factor, if ignored, the project is not according to the expectations.
The project managers should understand, evaluate and address these challenges for proper tailoring of the SDP and better eGovernment project development.

10.1.3. IDENTIFIED CHALLENGES CONFIRMED BY LITERATURE

The identified challenges have been confirmed by the literature to form the basis for further investigation. The identified challenges have been shown with their citations in the Table 5.

Table 5: Challenges in Software development process tailoring with citations

Sr. No	Challenge	Reference	Citations
1	Lack of management commitment	(Gregory et al., 2016; Niazi.M, Ali. M, & Verner. J, 2010; Xu & Ramesh,2008)	3
2	Lack of management support	(Ali et al., 2017; Gregory et al., 2016; Larrucea et al., 2016; Niazi et al., 2010; Xu & Ramesh, 2008.; Xu & Ramesh, 2015)	6
3	Staff/management turnover	(Xu & Ramesh, 2015, Khan et al., 2017, Xu & Ramesh, 2008, Ramasubbu, 2014, Khan et al., 2016)	5
4	Excessive Workload	(Ali et al., 2017)	1
5	Delay on action plan implementation	(Ali et al., 2017; Gregory et al., 2016)	2
6	Weak Leadership	(Gregory et al., 2016; Ramasubbu, 2014; Xu & Ramesh, 2015)	3
7	Lack of Documentation	(Gregory et al., 2016; Niazi et al., 2010; Xu & Ramesh, 2008)	3
8	In-sufficient coverage of Risk Management Activities	(Choudrie et al., 2017; Gregory et al., 2016; Ibrahim et al., 2016; Khan & Subhan, 2014; Xu & Ramesh, 2015)	5
9	Lack of Requirements Management	(Emam & Koru, 2008; Flora et al., 2014; Xu & Ramesh,2008)	3
10	Lack of up-front planning	(Gregory et al., 2016; Ramasubbu, 2014; Xu & Ramesh, 2008.; Xu & Ramesh, 2015)	4
11	Poorly defined Roles and Responsibilities	(Ramasubbu, 2014; Xu & Ramesh, 2015)	2
12	Lack of ownership	(Choudrie et al., 2017)	1
13	Poorly allocated resources/Lack of resources	(Ali et al., 2017; Emam & Koru, 2008; Gregory et al., 2016; Khan & Keung, 2016; Khan & Subhan, 2014; Larrucea et al., 2016; Niazi et al., 2010; Xu & Ramesh, 2008; Xu & Ramesh, 2015)	9
14	Inexperienced staff/Project team with limited experience/expertise	(Xu & Ramesh, 2015, Khan et al., 2017, Flora et al., 2014, Xu & Ramesh, 2008, Niazi et al., 2010, Khan et al., 2016)	6
15	Time pressure	(Ali et al., 2017; Khan & Keung, 2016; Niazi et al., 2010; Xu & Ramesh, 2008; Xu & Ramesh, 2015)	5
16	Budget and Schedule constraints	(Ali et al., 2017; Emam & Koru, 2008; Flora et al., 2014; Larrucea et al., 2016; Xu & Ramesh, 2008.; Xu & Ramesh, 2015)	6
17	Lack of implementation tools and standards	(Ali et al., 2017; Khan & Subhan, 2014; Niazi et al., 2010; Ramasubbu, 2014; Xu & Ramesh, 2008.; Xu & Ramesh, 2015)	6
18	Team size Issue	(Ibrahim et al., 2016; Xu & Ramesh, 2008.; Xu & Ramesh, 2015)	3

19	Lack of technical support	(Ali et al., 2017; Gregory et al., 2016; Larrucea et al., 2016; Niazi et al., 2010; Ramasubbu, 2014; Xu & Ramesh, 2008; Xu & Ramesh, 2015)	7
20	Lack of understanding SPI goals	(Gregory et al., 2016; Khan & Subhan, 2014; Niazi et al., 2010; Ramasubbu, 2014; Xu & Ramesh, 2008)	5
21	Lack of training	(Ali et al., 2017; Choudrie et al., 2017; A. S. Khan & Subhan, 2014; Niazi et al., 2010; Xu & Ramesh, 2008.)	5
22	Lack of SPI awareness	(Ali et al., 2017; Khan & Subhan, 2014; Niazi et al., 2010; Xu & Ramesh, 2008)	4
23	Lack of formal methodology	(Xu & Ramesh, 2015, Khan et al., 2017, Gregory et al., 2016, Niazi et al., 2010, Ramasubbu, 2014, Khan et al., 2016)	6
24	Poor organizational infrastructure	(Ali et al., 2017; Ramasubbu, 2014; Xu & Ramesh, 2015)	3
25	Traceability issues	(Xu & Ramesh, 2015)	1
26	Lack of relevant skills	(Emam & Koru, 2008; Larrucea et al., 2016; Xu, Xu & Ramesh, 2008; Xu & Ramesh, 2015)	4
27	In-familiarity with technology	(Emam & Koru, 2008; Larrucea et al., 2016; Xu & Ramesh, 2008.)	3
28	Technical difficulty/complex technology	(Emam & Koru, 2008; Ibrahim et al., 2016; Ramasubbu, 2014; Xu & Ramesh, 2015)	4
29	Requirements and scope risks	(Emam & Koru, 2008; Xu & Ramesh, 2015)	2
30	Large size of project	(Gregory et al., 2016; Xu & Ramesh, 2015)	2
31	Less information sharing	(Ali et al., 2017; Ghobadi & Mathiassen, 2015; Gregory et al., 2016; Larrucea et al., 2016; Ramasubbu, 2014)	5
32	Weak relationship among teams	(Ali et al., 2017; Gregory et al., 2016; Larrucea et al., 2016; Xu & Ramesh, 2015)	4
33	Cultural differences	(Ali et al., 2017; Choudrie et al., 2017; Gregory et al., 2016; Larrucea et al., 2016; Xu & Ramesh, 2008)	5
34	Lack of trust	(Ali et al., 2017; Ibrahim et al., 2016; Niazi, Ikram, Bano, Imtiaz, & Khan, 2013; Ramasubbu, 2014)	4
35	Lack of feedback	(Ali et al., 2017; Larrucea et al., 2016)	2
36	Distance from client	(Ali et al., 2017; Xu & Ramesh, 2008)	2
37	Lack of 3Cs (Communication, coordination and control)- from team or management	(Ali et al., 2017; Gregory et al., 2016; Ibrahim et al., 2016; Khan & Subhan, 2014; Niazi et al., 2010; Ramasubbu, 2014; Xu & Ramesh, 2008; Xu & Ramesh, 2015)	8
38	Getting Stakeholder Buy In/ involving them in the decision-making process	(Emam & Koru, 2008; Ibrahim et al., 2016; Xu & Ramesh, 2008)	3
39	Inability to specify requirements	(Xu & Ramesh, 2015)	1

40	Less stakeholder participation	(Emam & Koru, 2008; Gregory et al., 2016; Xu & Ramesh, 2015)	3
41	Organizational politics	(Ali et al., 2017; Khan & Keung, 2016; Khan & Subhan, 2014; Niazi et al., 2010; Xu & Ramesh, 2015)	5
42	Lack of sponsorship	(Ali et al., 2017; Gregory et al., 2016; Khan & Subhan, 2014; Larrucea et al., 2016; Niazi et al., 2010)	5
43	Poor Regulatory Compliance	(Choudrie et al., 2017; Xu & Ramesh, 2008)	2
44	Lack of user support	(Emam & Koru, 2008; Larrucea et al., 2016; Xu & Ramesh, 2015)	3

10.2. CRITICAL SUCCESS FACTORS FOR SOFTWARE DEVELOPMENT PROCESS TAILORING

The critical success factors (CSFs) means the concerns that if addressed properly, substantially increase the chances of success of the project (Ahimbisibwe et al., 2017). There exist various factors linked to SPT, discussed in next section.

10.2.1. CRITICAL SUCCESS FACTORS IN EGOVERNMENT PROJECTS UNDER INVESTIGATION

This section discusses the critical factors which contributed towards the success of the eGovernment projects, SBIS, PMIS and ePolice. These CSFs for the SPT and definition in the projects discussed provide a roadmap to the eGovernment practitioners to incorporate these into their plan and execute in a better way for success.

The interviews were conducted to find the factors which helped the practitioners to achieve success in the mentioned eGovernment projects. In this analysis, thirty one critical success factors were stated, and were classified into eight main categories/clusters identified after interviewing the practitioners. The categories for CSFs are attitude, communication, education and knowledge, management and execution, measurement and control, process standards and strategy, resources, understanding and awareness. The classification is shown in Table 6. These main categories are described, to understand the success factors which contribute the SPT for the public sector.

Table 6:CSFs for Software Development Process Tailoring

Cluster	SPT Success Factor
Attitude	Shared win-win motivation, Proper Risk Sharing mechanism, Ownership and Responsibility for activities, Motivated team, Sufficient Trust among stakeholders, Management Involvement in Development process Belief and Willingness Management was willing to take risk
Communication	Effective communication
Education and Knowledge	Proper Training. Knowledge Exchange, Proper SP Instantiation Awareness, Use of Process Experts, Stakeholders were continuously mentored and coached
Management and Execution	Effective decision making abilities, Effective Top management support, Adequate Technical support, Management commitment
Measurement and Control	Effective management control, Appropriate Tracking and control, Senior management monitored progress
Process Standards and Strategy	Defined Metrics for software development process, Formal and Structured Planning, Procedures and Policies
Resources	Skilled human resource for the project, Clear roles and responsibilities/Dedicated Resources, Updated tools and technology

Understanding and Awareness	Understood size of project, Understood cultural differences, Effective stakeholder participation/Involvement, Goals well understood by all stakeholders, Managers possessed experience and expertise in SPI

Semi-structured interviews were conducted to gather information regarding the CSFs which helped in case of SBIS, PMIS and ePolice eGovernment projects for better definition and tailoring of the SDP. The CSFs for each project is depicted in Table 7.

The results of the evaluation of the SDT success factors in projects (The meaning of the symbols used in the table: "+" stands for this factor contributed towards our project success/it was present in the case, "-"stands for this factor did not contribute towards the project success/it was not present in the project case, and "±" stands for this factor was present to some extent in the project).

Table 7:CSFs in the studied Projects

SPT Success Factor	Evaluated eGovernment Project		
	SBIS	PMIS	ePolice
Resource Factors			
Skilled human resource for the project	+	+	+
Updated tools and technology	+	+	+
Clear roles and responsibilities/Dedicated Resources	+	+	+
Communication Factors			
Effective communication	+	+	+
Management and Execution Factors			
Effective decision making abilities	-	+	+
Effective Top management support	±	+	±
Adequate Technical support	+	+	+
Management commitment	+	+	+
Understanding and Awareness Factors			
Understood size of project	+	+	±
Understood cultural differences	+	+	+
Effective stakeholder participation/Involvement	+	+	+
Goals well understood by all stakeholders	-	±	-
Managers possessed experience and expertise in SPI	±	+	+
Attitude Factors			
Shared win-win motivation	+	+	+
Proper Risk Sharing mechanism	+	-	±
Ownership and Responsibility for activities	+	+	+
Motivated team	+	+	+
Sufficient Trust among stakeholders	+	+	+
Management Involvement in Development process	±	±	+
Belief and Willingness	+	+	+
Management was willing to take risk	-	±	-
Education and Knowledge Factors			
Proper Training	-	+	-
Knowledge Exchange	+	+	+
Proper SP Instantiation Awareness	+	+	+
Use of Process Experts	+	-	±
Stakeholders were continuously mentored and coached	±	+	+

Measurement and Control Factors			
Effective management control	+	+	+
Appropriate Tracking and control	+	+	+
Senior management monitored progress	+	±	+
Process Standards and Strategy Factors			
Defined Metrics for software development process	-	-	-
Formal and Structured Planning, Procedures and Policies	+	+	+

10.2.2. DISCUSSION OF CRITICAL SUCCESS FACTORS (CSFS)

The major CSFs identified from the projects were analyzed and categorized accordingly. These are mentioned in following sub-sections.

- **RESOURCE FACTORS**

The resources are the production factors, which are the building blocks of the project. The resource factors such as human resource, tools and technology are prerequisites of the project success. The skills and dedication in the human resource are an integral element for delivering projects as per the plan. Other factors for success in the resources category are to use up to date tools and the latest technology. These success factors were the part of projects discussed..

- **COMMUNICATION FACTORS**

The effective communication among the internal teams, managers and the external stakeholders is an important success factor that contributes to the success of SDP, and the project. Communication factors can be numerous, however, the only factor in communication factors cluster in this research investigation was found to be effective communication.

- **MANAGEMENT AND EXECUTION FACTORS**

Management and execution factors refer to plan, organize, lead and control the project properly. The decisions made by the management should be effective so that there is a smooth project execution. Managers should provide proper support and high commitment to the team, and to the project. In addition, they must include adequate technical support within the project. These are the few management and execution factors that interviewees stated for their projects.

- **UNDERSTANDING AND AWARENESS FACTORS**

These factors depict that there should be proper understanding and awareness regarding the major aspects of the project, so that a successful eGovernment project delivery could be made easy. These include understanding project size, culture and its differences. Also, the stakeholder involvement and goals must be understood. Another major factor is that managers should have experience, and they understand and are aware of the software process instantiation phenomenon. The projects depicted these above mentioned success factors.

- **ATTITUDINAL FACTORS**

The word attitude encompasses the characteristic of social behavior and reaction. The attitude towards any component of the project must be positive. Such as, the team members and the stakeholders should have win-win motivation attitude. There should be an appropriate risk sharing mechanism, and managers should take risks and handle it positively. The concern should be liable for multiple activities and should take the ownership for a particular act. In addition, attitude of motivation and trust within the team is an important component for project success. Another important attitude factor is that the management should be highly involved in the development process and its activities. These are some of the CSFs that made the eGovernment projects to be successful.

- **EDUCATION AND KNOWLEDGE FACTORS**

These factors include having proper education and information regarding various components of the eGovernment project(s). There should be a mechanism to train employees, and the team should have the correct training to carry out the project activities properly. A factor in education and knowledge cluster is to share relevant knowledge with other concerns as well. The instantiation process should be known to the team and every member needs to be aware of the activities. Another important factor in this cluster is to include process experts in the process definition for the project for better results. And, the stakeholders should be coached and mentored continuously. These CSFs identified from investigated projects adds up a decent knowledge of authors and the readers.

- **MEASUREMENT AND CONTROL FACTORS**

The measurement and control factors are associated with the mechanism of proper measurement and control at all levels of eGovernment project development. Some major factors that are specified for this cluster consists of a proper and effective control from the management, proper tracking of activities and monitoring at the management level, which are quite significant as entire project progress depend on proper measurement and control of the project.

- **PROCESS STANDARD AND STRATEGY FACTORS**

The cluster process standard and strategy factors put emphasis on the fact that there must be definite metrics for the presence of formal method. In addition to this, structured and appropriate planning has been a major factor for process definition, which, when incorporated in the project results with the required output. There should be proper policies, laws and procedures to develop and implement the defined SDP in eGovernment project. These CSFs were significant in the projects.

10.2.3. IDENTIFIED CSFS CONFIRMED BY LITERATURE

The identified CSFs have been confirmed by the literature for better results. The identified CSFs have been shown with their citations in the Table 8.

Table 8: Software development process tailoring CSFs with citations

Sr.No	SPT Success Factor	Reference	Citation
1	Shared win-win motivation	(Khan & Keung, 2016; Khan & Subhan, 2014)	2
2	Proper Risk Sharing mechanism	(Khan et al., 2017; Khan & Subhan, 2014)	2
3	Ownership and Responsibility for activities	(Dingsoyr et al., 2016; Khan et al., 2017; Khan & Subhan, 2014)	3
4	Motivated team	(Dingsoyr et al., 2016; Khan & Subhan, 2014)	2
5	Sufficient Trust among stakeholders	(Khan & Keung, 2016; Khan et al., 2017)	2
6	Management Involvement in Development process	(Khan & Keung, 2016; Khan & Subhan, 2014; Lee et al., 2016)	3
7	Belief and Willingness	(Khan & Keung, 2016; Khan & Subhan, 2014, Khan et al., 2017)	3
8	Management was willing to take risk	(Khan et al., 2017; Ogasawara et al., 2014)	2
9	Effective communication	(Khan et al., 2017; Khan & Subhan, 2014; Lesser & Ban, 2016)	3
10	Proper Training	(Khan & Keung, 2016; Khan & Subhan, 2014; Lee et al., 2016; Ogasawara et al., 2014)	4
11	Knowledge Exchange	(Khan & Keung, 2016; Khan et al., 2017; Khan & Subhan, 2014; Lee et al., 2016)	4
12	Proper SP Instantiation Awareness	(Khan & Keung, 2016; Khan & Subhan, 2014, Khan et al., 2017)	3
13	Use of Process Experts	(Khan & Subhan, 2014; Lesser et al., 2016)	2

14	Stakeholders were continuously mentored and coached	(Khan et al., 2017; Khan & Subhan, 2014)	2
15	Effective decision making abilities	(Lee et al., 2016; Ogasawara et al., 2014)	2
16	Effective Top management support	(Ahimbisibwe et al., 2017; Grant, 2017; Khan & Subhan, 2014; Lee et al., 2016)	4
17	Adequate Technical support	(Grant, 2017; Lee et al., 2016; Lesser et al., 2016)	3
18	Management commitment	(Ahimbisibwe et al., 2017; Khan & Keung, 2016; Khan et al., 2017)	3
19	Effective management control	(Grant, 2017; Khan & Subhan, 2014)	2
20	Appropriate Tracking and control	(Ahimbisibwe et al., 2017; Khan et al., 2017; Khan & Subhan, 2014; Gordon & Connor, 2016)	4
21	Senior management monitored progress	(Lesser et al., 2016)	1
22	Defined Metrics for software development process	(Lesser et al., 2016)	1
23	Formal and Structured Planning, Procedures and Policies	(Khan & Subhan, 2014; Lesser et al., 2016)	2
24	Skilled human resource for the project	(Dingsoyr et al., 2016; Khan & Keung, 2016; Khan et al., 2017; Khan & Subhan, 2014)	4
25	Clear roles and responsibilities/Dedicated Resources	(Khan & Keung, 2016; Khan & Subhan, 2014, Dingsoyr et al., 2016)	3
26	Updated tools and technology	(Dingsoyr et al., 2016; Khan & Keung, 2016; Khan & Subhan, 2014)	3
27	Understood size of project	(Ogasawara et al., 2014)	1
28	Understood cultural differences	(Khan & Subhan, 2014; Lee et al., 2016)	2
29	Effective stakeholder participation/Involvement	(Khan & Keung, 2016; Khan et al., 2017; Khan & Subhan, 2014)	3
30	Goals well understood by all stakeholders	(Ahimbisibwe et al., 2017)	1
31	Managers possessed experience and expertise in SPI	(Ahimbisibwe et al., 2017; Khan et al., 2017)	2

The identified CSFs for SDP tailoring in the current context of eGovernment largely support the existing and future researchers and practitioners.

10.3. SUMMARY

The identification of critical success and failure factors is an essential element of successful SPT in the public sector. This section dis-

cussed major challenges in process tailoring and the success factors that were present and contributed in the better software development process tailoring of three eGovernment projects. The relative significance of the identified factors is assessed and findings are confirmed with the data in the literature.

11. Discussion

Presently, there is a lack of research which has observed the aspect of software development process tailoring, its success factors and the challenges which affect the tailoring and definition practice, for the eGovernment project(s). To the best of our knowledge, present studies have not given emphasis in the eGovernment project development context. As there is an increased awareness regarding the software process tailoring, it is important to comprehend the critical factors which affect the software development process tailoring success or failure, and the eGovernment project as well, in particular. The findings provide with an extensive outline (list) of major critical success factors and challenges to be considered in software process tailoring, definition and selection in order to increase the success rate, for eGovernment projects. The factors which mainly influence the appropriate definition and tailoring of the software development process are identified. The analysis led to five (5) important categories of challenges, with forty four (44) major challenges, and eight (8) major categories of success factors with thirty one (31) success factors respectively.

It is believed that the lists of challenges and success factors, provided in this study, for eGovernment projects are the overall complete lists of factors that have an impact on software development process tailoring of eGovernment projects. Therefore, the findings are significantly valuable for practitioners and researchers. The researchers and future practitioners can easily access these extensive, complete, and methodically established initial lists, consisting of the major factors, that might be used as the reference agenda for eGovernment projects in the definition and tailoring of software processes. It is a significant agenda that can be used as reference in the eGovernment domain. The major aspects that have substantial influence on project development must be identified and outlined properly. The practitioners can consult these factors to understand the major determinants of process tailoring in eGovernment project development, and to improve the practice of software process definition and tailoring. The executives and the managers in the domain can observe various notions while making software development process decisions. As a result, the provided categories and their respective factors for challenges and success are quite beneficial for eGovernment practitioners. Additionally, the findings can help to improve the software development process resulting in a project-oriented software development process in the eGovernment sector.

12. Conclusion

Using the empirical investigation, two extensive lists of forty four challenges and thirty one success factors have been identified, for software development process tailoring activity. These identified factors may drive the eGovernment project towards success or failure. The stated critical challenges and success factors in this study can act as the guide for organizations involved in the eGovernment project development to execute their projects successfully. The identified challenges and success factors have also been validated through the information in the literature, specified in Table 5 and Table 8 respectively. The foremost objective behind this validation was to provide an adequate understanding of the process tailoring practices in the context of software development. The findings of this research work can possibly result into dealing with the development of the eGovernment project(s) effectively, which can lead towards achieving the customer satisfaction and the competitive advantage and better progression of the organization and the country.

13. Future Work

The results of this research work might be useful for future researchers in the eGovernment sector in relation to the process tailoring activity and project development. The following topics can potentially be part of this study in the future: (1) developing a framework for better definition and tailoring of eGovernment software processes, (2) validity of the above-mentioned success factors and challenges using empirical investigation in the context of any other country, (3) identification of some additional critical factors with respect to success and failure from industry, and (4) comparison of various challenges and success factors on the basis of different countries and regions.

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