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Effect of Human Related Factors on Requirements Change Management in Offshore Software Development Outsourcing: A theoretical framework

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Abstract: Software development organizations are globalizing their development activities increasingly due to strategic and economic gains. Global software development (GSD) is an intricate concept, and various challenges are associated with it, specifically related to the software requirement change management Process (RCM). This research aims to identify humans' related success factors (HSFs) and human-related challenges (HCHs) that could influence the RCM process in GSD organizations and propose a theoretical framework of the identified factors concerning RCM process implementation. The Systematic Literature Review (SLR) method was adopted to investigate the HSFs and HCHs. Using the SLR approach, a total of 10 SFs and 10 CHs were identified. The study also reported the critical success factors (HCSFs) and critical challenges (HCCHs) for RCM process implementation following the factors having a frequency 50% as critical. Our results reveal that five out of ten HSFs and 4 out of ten HCHs are critical for RCM process implementation in GSD. Finally, we have developed a theoretical framework based on the identified factors that indicated a relationship among the identified factors and the implementation of the RCM process in the context of GSD. We believe that the results of this research can help tackle the complications associated with the RCM in GSD environment, which is vigorous to the success and progression of GSD organizations.

Keywords: Requirement Change Management (RCM); Global Software Development (GSD); Systematic Literature Review (SLR).

1. Introduction

Change is a curious attribute of requirements engineering as compared to different engineering parameters. In real-world eventualities, it is intricate for the software professionals to identify an extensive set of system requirements as circumstances of the current situation and as per need is subject to change [1]. There are many factors, e.g., needs of customers, global competitors, market change, governmental procedures, and many others contributions drastically for altering the system requisites. In a software project, the development of system requisites is the essential slab, and the satisfaction of the challenge directly is determined by the requirements engineering actions. Dynamic change in the process requirements is among the principal side that the software businesses face [2]. Therefore, the requisites change management in software development is foremost and essential in the success of a software project [3]. Consistent with Nurmuliani [4] the modification in requirements can be described as "the trend of requirements to change over time reacting to the developing needs of customers, the organizations, stakeholders, and environment of work." Handling such developing

changes has been verified as a challenge in accumulated software development, and it grew to be more complex in the GSD environment [5]. Because of the routine associated with RCM, it is among the most collaboration-based methods in developing software. The factors that are principal for the success of requirements management focused on communication and coordination between stakeholders. The implications of incorrectly managed or unmanaged requirements changes can lead to calamity for software development. These terrible outcomes can bring about software expenses and overrun time frame, volatile requirements, continuously testing can ultimately reasoned job failure and risky trade [6]. Therefore, the formal requirements change management may also be both challenging and rewarding at a parallel time. GSD is a progressive software development paradigm in which the development activities are performed by a team of knowledgeable personnel positioned in many components of the globe and boost commercially doable merchandise for a corporation [7]. To achieve the economic benefit, there is certainly a growing interest inside the international software industries for making use of applying GSD [8]. In step with a recent survey declaration carried out by Standish group, in the USA around 20% of consumer companies of the prominent 1000 software development companies are expanding their businesses globally. Outsourcing development to supplier companies has grown as gradually important in less rate countries, due to noteworthy reduction in software developing cost [9]. Regardless of the advantages, GSD has several problems for practitioners which have not occurred in collocated projects. Because of development teams being in several physical locations, dissimilarities in ethnicities and time zones adversely impact communication and coordination operations [8] therefore of insufficient communication, skills ability and trust between the developments teams [10], according to a study conducted by Standish Group about thirteen thousand five hundred software products. They explored that 29% products are being run efficiently, 18% merchandises are declared as unsuccessful, and 53% software products are suspicious in the context of GSD [11]. Consequently, the low-grade management of requirements change is one of the critical reasons for low project success. According to Khan [12] the major problem of the low success rate of project in GSD environment is an insufficient concentration given to RCM problems. Several models/frameworks are developed to manage the demanded changes during the software development life cycle. A framework of requirements change management (RCM) proposed by Niazi et al. [10] to apply the specific practices (SP) of capability maturity model integration (CMMI) level 2 (SP1.3-1). Minhas et al. [8] recommended a model to describe change commencement, assessment, and selection procedures of requirements change management. Lai and Ali [13] offered a framework for requirements management to create and manage a requisites warehouse, produce a traceability matrix, and discuss information upon requirements. Sinha et al. [14] presented a tool to assist in communication and coordinated effort activities during RCM. A formal change management process (FCMP) suggested by Bhatti [15] comprise tasks of every stakeholder mentioned at each movement. Khan et al. [12] developed a model for RCM primarily for global software development, which comprises the primary triggers of the RCM method. Kumar and Kumar [16] suggested a model in requirement management challenges faced while distributed software development (RMCFDSD). They well prepared the requirement management work utilizing knowledge management. Niazi et al. [5] recommended a model of global requirements management (GlobReq) that increased the procedure of requirements engineering and change management for software development in a distributed environment. These models and tactics can guide a company to manage the demanded changes in-time, update particular needs, develop the best project, minimize the cost and time of development, and boost customer fulfillment. Nevertheless, practically all of the earlier studies viewed RCM in the background of collocated software development alternatively than GSD, which has hence yielded restrained RCM efforts. Despite the importance of the RCM in a GSD environment, a restricted concern has been given to the development of execution RCM pangrams and the factors that can influence RCM

practices in a GSD environment [17]. Consequently, the value of RCM in a GSD context encouraged us to develop preliminary software requirements change management and implementation improvement model (SRCMIIM) that might assist the GSD organizations in modifying and increasing their RCM activities. With this study, we have argued a preliminary phase in the development of the framework. In today's research, the challenges and limitations that might have an awful impact on RCM procedures in a GSD environment are discussed. In this article, we discussed a brief overview of the challenges while the RCM process in a GSD environment. The systematic literature review process (SLR) can be utilized to show the findings of this research. Recognizing the challenges can expand RCM activities by helping professionals deal with these problems before implementation in a GSD environment. Furthermore, it could also help complete GSD tasks and enhance relations among globally distributed organizations. In this research, we certainly have resolved the following study questions.

- RQ1: What are the human-related success factors, as investigated in the literature for RCM process implementation in GSD environments?
- RQ2: What are the human-related challenges, as investigated in the literature, for RCM process implementation in the GSD environment?
- RQ3: What are the most critical success factors and challenges investigated from the articles?
- RQ4: How should create a theoretical model for success factors and challenges of the RCM process?

The rest of this paper is divided as follows: Section 2 presents the brief literature review. Section 3 illustrates the methodology and applied techniques in this research. Section 4 shows the results and comparison, and we conclude this paper in the conclusion section.

2. Research methodology

A systematic literature review (SLR) method was used to address the study questions as discussed in Section 1. SLR is a protocol-based research method that is used to examine, classify, and assess the current literature related to a specific study theme by using inclusion and exclusion criteria [18]. As per Kitchenham [19], the SLR findings are less biased and more thorough than the informal literature review. Kitchenham [19] discussed SLR protocol in a three-phase that consist of planning the review, conducting the review, and reporting the review.

2.1. Phase 1: planning the review

2.1.1. Research questions

The addressed research questions are discussed in section 1.

2.1.2. Data sources

Appropriate depositories were recognized in the light of former research understanding and suggestions provided by Chen et al. [20]. The data sources included: "IEEE Xplore," "ACM Digital Library," "Springer Link," "Wiley Inter-Science," "Science Direct," "Google Scholar." The digital libraries are different in terms of their searching capabilities; the search strings were used accordingly.

2.1.3. Search strings

A wide-ranging search procedure was performed to search the current literature related to our research questions. In the search process, the keywords and their synonyms derived from the research questions were selected from the existing published articles of RCM, and GSD [18] add some more literature]. The main keywords and their synonyms are concatenated using the

logical "OR" and logical "AND" operators to make the search string. The digital sources were searched using the following research string: "("Factors" OR "Aspects" OR "Items" OR "Elements" OR "Drivers" OR "Motivators" OR "Variables" OR "Characteristics" OR "Parameters" OR "Features") AND ("barriers" OR "obstacles" OR "hurdles" OR "difficulties" OR "impediments" OR "hindrance" OR "challenges") AND ("RCM" OR "requirement change management" OR "RE" OR "requirement engineering", "requirement management", OR "requirement changes", OR "requirements volatility", OR "requirements creep", OR "Requirement collection", OR "requirement elicitation" OR "CMM" OR "CMMI", "requirement updating" OR "requirement change management process evaluation", OR "requirement process assessment" OR "RCM process assessment" OR "requirement change management practices", OR "impact of requirement change management", OR "effect of requirement change management") AND ("Global software development" OR "GSD" OR "Distributed software development" OR "Multisite development" OR "Offshore software development" OR "Outsourcing" OR "Multisite software development" OR "Global software teams" OR "Collaborative software development" OR "Collaborative software engineering".))"

2.1.4. Inclusion criteria

Each selected article should be written in the English language. Every primary article should be in conference, journal, or book chapter. We underlined the articles which are related to RCM process activates in GSD condition. We have given more attention to the articles in which the challenges of RCM are discussed in the context of GSD. Those study literature need more significance that gives empirical as assessments supported with case studies.

2.1.5. Exclusion criteria

We avoided those articles in which the author has not considered the challenges in RCM or RE activities. Those studies were also avoided in which there is no detailed information about the RCM procedure. Duplicate articles were not considered as well. Furthermore, those papers were disallowed too, which were not in English.

2.1.6. Quality assessment

The quality assessment (QA) of the selected papers was performed simultaneously with the data extraction phase. A checklist was created to evaluate the quantitative and qualitative assessment of the selected primary studies. The instructions gave by [21], the format of this checklist was given in Table 1. The QA checklist comprises five questions (QA1-QA5). For every provided item (QA1-QA5), the assessment was made as i) "An article is holding the answer to the checklist questions was assigned 1 point, ii) "An article is holding partial answers to the checklist questions was assigned 0.5 points", iii) "The article is not holding any answers to the checklist questions were assigned 0 points."

Table 1. Study quality assessment criteria

QA questions	Checklist questions
QA1	"Do the adopted research strategies address their research questions?"
QA2	"Does the research discuss any challenge in RCM?"
QA3	"Does the research discuss RCM framework and its implementation in GSD?"
QA4	"Is the collected data related to RCM in GSD?"
QA5	"Are the identified results related to justification of the research questions?"

2.2. Conducting the review

2.2.1. Primary study selection

The research articles found during primary study selection were refined using the tollgate approach proposed by Afzal et al. [22]. This approach consists of five steps shown in Table 2.

- Step 1 (S-1): "searching for relevant articles using search terms."
- Step 2 (S-2): "inclusion and exclusion based on title and abstract."
- Step 3 (S-3): "inclusion and exclusion based on introduction and conclusions."
- Step 4 (S-4): "inclusion and exclusion based on full text."
- Step 5 (S-5): "final selection of primary studies to be included the SLR."

Initially, 778 articles were collected from the selected digital repositories by using the search starting (section 2.1.3) and apply inclusion criteria (Sections 2.1.4) and exclusion criteria (Sections 2.1.5). By adopting the tollgate methodology, [22] a total of 25 primary studies were shortlisted. A list of the selected primary articles is given in Appendix-A. Each of the selected primary studies was labeled with [SP], which will show their usage in the SLR.

Table 2. Tollgate Approach

DS	S-1	S-2	S-3	S-4	S-5	% of final Selected articles (N=25)
ACM Digital Library	65	47	25	9	2	8
IEEE Xplore	197	101	67	39	8	32
Wiley Inter Science	81	53	15	7	2	8
Springer Link	73	49	21	9	3	12
Science Direct	109	67	41	16	3	12
Google Scholar	253	111	73	19	7	28
Total	778	428	242	99	25	100

2.2.2. Data Extraction

To answer the research questions, we extracted the following data from each of the selected studies. Publication year (section 2.3.2), user research methods (section 2.3.2), Study title (appendix-A) Two independent external analysts randomly selected four articles at the first phase (S-1) of the tollgate process [22] and then applied the selection phases (S-2 to S-5) of the tollgate procedure and the QA criteria. A comprehensive list of 25 selected articles is given in Appendix-A.

2.2.3. Data synthesis

Using the tollgate approach, lists of success factors and challenges of the RCM process were created using data obtained from 25 primary selected articles. The evaluation of study questions was assessed by utilizing the data obtained from those selected articles.

2.3. Reporting the review

2.3.1. Quality attributes of the selected studies

The scores for each of the selected primary studies determined from the five QA questions (section 2.1.6) are shown in appendix-A. An entirety of the scores allocated for each of the QA questions is the final QA score for every study shown in appendix-A. The tollgate approach was already used to remove improper studies. According to appendix-A, 82

2.3.2. Used research methods and publication years in the selected primary studies

The total selected primary studies comprised of 6(24%) questionnaire surveys (QS), 8(32%) case studies (CS), 2(8%) grounded theories (GT), 4(16%) content analysis (CA), 2(8%) action research (AR) and 3(12%) mixed methods (MM) studies as shown in Fig. 1. Through frequency analysis, it has resulted that the highest used research methodology is the case study, and the second most common adopted research methodology is question survey to address the influencing factors of the RCM process in the context of the GSD environment. Figure 1 shows the increasing trend of publication in the domain of RCM and GSD.

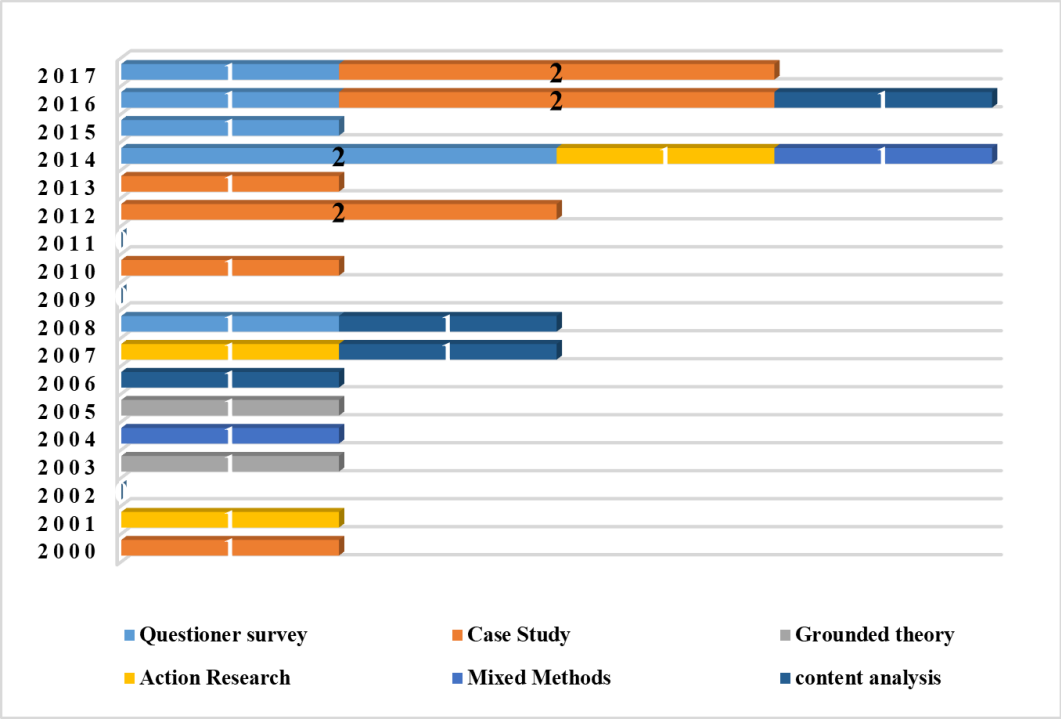

Figure 1. Used Research methods and publication years of the selected articles.

3. Results and discussions

This section shows the results acquired from the SLR study concerning each of the research questions

3.1. Human related success factors identified using SLR

A total of 25 articles of primary studies were selected in the SLR, and 10 SFs were investigated from the selected articles. In the response of RQ1, frequencies and percentages of the investigated SFs were determined, shown in Table 3 and Figure 3.

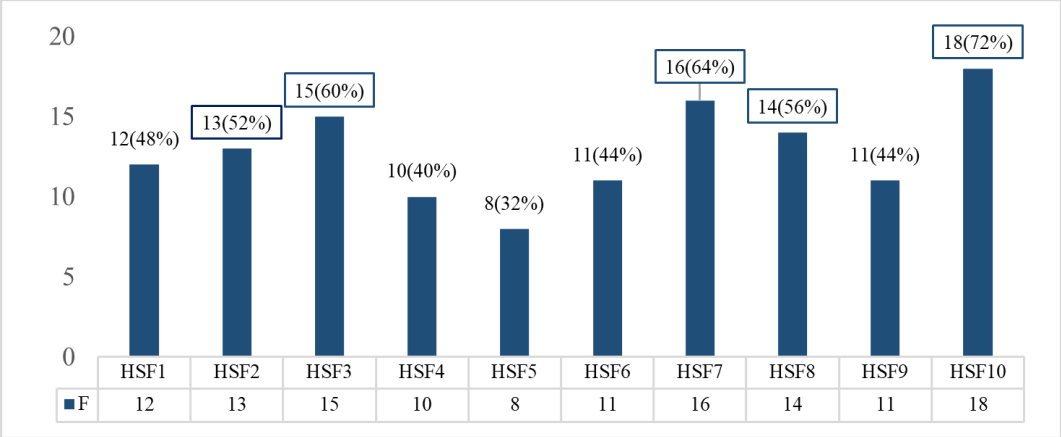

Figure 2. Frequency analysis of the identified human related success factors.

Table 3. Identified success factors

S.NO	success factors	Frequency (N=25)	Percentage of occurrence
HSF1	Management support	12	48
HSF2	Strong relationship with practitioners	13	52
HSF3	Information sharing	15	60
HSF4	RCM expertise	10	40
HSF5	Roles and responsibilities	8	32
HSF6	Effective RCM leadership	11	44
HSF7	RCM process awareness	16	64
HSF8	Skilled human resources	14	56
HSF9	Confidence of development team members	11	44
HSF10	3Cs(communication, coordination &control)	18	72

3.1.1. HSF1 (Management support, 48%)

As indicated by Ebert et al. [SP4], management support supports, funds, realizes, and contributes to senior and junior level management of an organization in RCM process activities. Khan et al. [SP23] stated that management's involvement and dedication are essential for successfully implementing the RCM process. Also, Lavazza [SP10] suggested that management involvement could effectively elicit the demanded requirements. However, based on the above argument, we have created the following hypothesis. H1: Management support has a particular association with RCM procedure execution in GSD.

3.1.2. HSF2 (Strong relationship with practitioners, 52%)

As stated by khan et al. [SP25], "strong association between team members is the degree to which they can effectively coordinate and communicate to implement the RCM program." A strong association is a crucial component to adequately do the RCM related activities and tasks [SP11]. Besides, it leads to better team management, decision making, risk management, and team management [SP4]. Consequently, as per the demonstration showed after results, the given hypothesis is created. H2: Strong association with professionals has an optimistic impression on implementing the RCM process in GSD.

3.1.3. HSF3 (Information sharing, 60%)

Firesmith et al. [SP5] characterize most of the data imparting as "the level to which the distributed group members coordinate to share the majority of the data regarding those activities of RCM process." Williams et al. [SP2] underlined that correct information sharing among the geographically distributed sites could help the group members implement the RCM process optimistically. Khan et al. [SP22] confirmed that team members could successfully contribute to RCM process activities, particularly in light of the information and knowledge sharing [SP1]. So, we hypothesize that: H3: Information sharing has an optimistic effect on the execution of RCM process activities in GSD.

3.1.4. HSF4 (RCM expertise, 40%)

Damian et al. [SP3] and Aranda et al. [SP13] describe that RCM expertise as the extent to which the practitioners implement the demanded requirement effectively and efficiently. Khan et al. [SP25] emphasized that the RCM process's success depends on the practitioners' expertise. However, RCM process implementation is an intricate but significant activity for successfully executing software projects, which prerequisites of expert's team members to implement the demanded changes effectively and efficiently [SP11, SP25]. Hence, we created the following hypothesis. H4: RCM expertise has a positive association with the execution of the RCM process in GSD.

3.1.5. HSF5 (Roles and responsibilities, 32%)

Williams et al. [SP2] reported that the work of particular tasks and the practitioners' liabilities help execute the RCM process effectively. Moreover, Firesmith et al. [SP5] suggested that the group members' roles and responsibilities must be clearly defined, which is vital for controlling the misconceptions during the implementation of process activities of RCM. H5: roles and responsibilities have a positive relation with RCM process execution in GSD.

3.1.6. HSF6 (Effective RCM leadership, 44%)

Ahmed et al. [SP17] emphasized that the change management board should have the capability to encourage the practitioners to implement the demanded changes correctly. Furthermore, Lavazza [SP10] and Zhu et al. [SP16] underlined that making the right decision at the right time is very significant for managing the demanded changes effectively at low cost and time. Hence effective leadership is a critical factor for the success of the RCM process in GSD. Therefore, we develop the following hypothesis. H6: effective RCM leadership has a bright influence on the execution of the RCM process in GSD.

3.1.7. HSF7 (RCM process awareness, 64%)

Mavin et al. [SP20] explained RCM process understanding. Following this understanding, organizations' superior management takes RCM certification activities and imparts group members with training opportunities. Arrangement of RCM practices to implement the new RCM processes in cooperation [SP13]. So, it is significant to stimulate the group members by conducting and participating in the awareness workshops related to the execution of the RCM process's improvement. For this purpose, we have created the following hypothesis. H7: RCM process awareness is vital for the successful execution of the RCM process in GSD.

3.1.8. HSF8 (Skillful human resources, 56%)

Different specialists have examined the skillful worker's critical level for RCM activities [SP3, SP7, SP8]. Minhas et al. [SP21] accentuated competent humans' inducting containing specialized

certifications and related experiences in software engineering, management, and other related areas. They considered the skillful employees as the backbone of the GSD businesses. Hence, we theorize that: H8: Skillful human resource is a critical factor for successfully implementing the RCM process in GSD.

3.1.9. HSF9 (Confidence of development team members, 44%)

Firesmith et al. [SP4] indicated that the successful implementation of RCM process activities is an assurance to meet the customer expectations that make the team members confident as the project is running in the right direction [SP13 SP21]. Furthermore, Mavin et al. [SP20] emphasized that proper deployment of RCM process phases makes the team members confident as all the activities are executing appropriately. So, we developed the following hypothesis. H9: Confidence of development team members has a positive affiliation with the RCM process implementation in GSD.

3.1.10. HSF10 (3Cs "communication, coordination control", 72%)

Khan et al. [SP23] outlined 3Cs as the method of expertise spreading among the distributed group members and boosting this interface. Practical communication ways are claimed to help improve the RCM process. Communication transferring the information among team members, working together on an assignment for a specific purpose [SP3]. Control means "the procedure of holding continuous goals, strategies, principles and quality levels" [SP3]. The control handles the main structural components essential for the execution of the RCM process (i.e., budget, time, and quality needed to fulfill the client expectations [SP25]. H10: 3Cs "Communication, coordination control" having a constructive connection with RCM process in GSD.

3.2. Human related challenges identified using SLR

From the total of 25 primary selected studies total 10 CHs were identified. To answer RQ2, the frequencies and percentages of the investigated CHs were calculated shown in Table 4 and Fig.**??**.

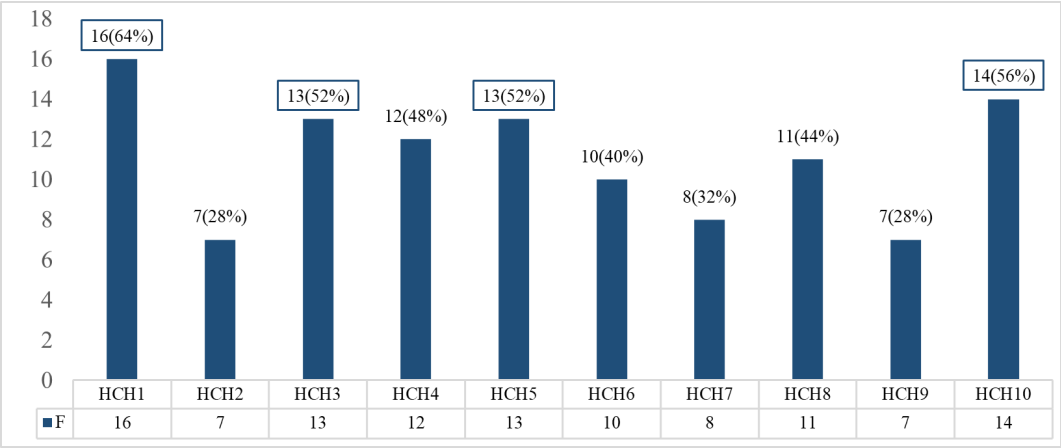

Figure 3. Frequency analysis of the identified humane related challenging factors.

Table 4. Identified challenges

S.NO.	challenges	Frequency (N=25)	Percentage of occurrence
HCH1	Lack of communication	16	64
HCH2	Cultural difference	7	28
HCH3	Lack of trust	13	52
HCH4	Different knowledge levels	12	48
HCH5	Lack of RCM process improvement knowledge	13	52
HCH6	Language barriers	10	40
HCH7	Inexperienced staff involvement	8	32
HCH8	Lack of time pressure management	11	44
HCH9	Informal communication	7	28

3.2.1. HCH1 (Lack of communication, 64%)

The RCM practitioners faced communication as a critical challenge due to GSD organizations' geographically distributed nature [SP23]. Lack of communication is also a cause of decreasing trust level and recurrent reaction. It creates many misunderstandings, minimizes coordination, and lesser control on RCM activities [SP11]. Therefore, considering all the above things, we developed the given theory. H11: Lack of communication has a negative association with RCM process implementation activities in GSD.

3.2.2. HCH2 (Cultural difference, 28%)

Worldwide distributed software development locations might reveal cultural differences as well. So it is essential to conquering these cultural differences for effective execution of the RCM process. Group members may not negotiate mutually about necessary things because of their different native languages, and they are located at different sites [SP25]. Moreover, misconceptions might happen among different teams, creating confusion and sometimes compromising circumstances [SP21, SP23]. So we hypothesize that: H12: Cultural difference has an association with the implementation of RCM process activates in GSD.

3.2.3. HCH3 (Lack of trust, 52%)

It is essential but not easy to create trust and certainty among RCM professionals working in the GSD context [SP22, SP25]. It is presented in Table 4 that 52% of the already selected studies discussed "lack of trust" and considered it as a fundamental challenge for the RCM process. It might strengthen if promoting team building activities should be exercised the inter-team communication that must maximize the trust level among team members [SP22]. Hence, upon the discussion base, we developed the given hypothesis. H13: Lack of trust has a negative impact on the implementation of the RCM process in GSD.

3.2.4. HCH4 (Different knowledge levels, 48%)

Eckhardt et al. [SP18] stated that in the GSD environment team members are belong to different continents, which causes the variation in knowledge due to the difference in tools and technologies used, market demand, the difference in culture, etc. Furthermore, Ghosh et al. [SP14] underlined that the different knowledge negatively affects impact analysis and RCM process planning. So, we hypothesize that: H14: Different knowledge levels have adverse effects on RCM process implementation in GSD.

3.2.5. HCH5 (Lack of RCM process improvement knowledge, 52%)

Eckhardt et al. [SP18] concentrated on the experienced and skilled RCM professionals for the RCM process improvement program. They recommended that professionals must have all understandings and knowledge of RCM activities for RCM process improvement. Khan et al. [SP22] emphasized that lack of knowledge about RCM process improvement could not strengthen; however, it might emasculate all RCM activities. Hence, we have suggested the given hypothesis. H15: Lack of RCM process improvement knowledge has a destructive influence on the RCM process execution in GSD.

3.2.6. HCH6 (Language barriers, 40%)

Goknil et al. [SP6] suggested that customers' pure requirement collection is the main issue in RCM in the GSD environment because of language barriers. Khan et al. [SP23] reported that language barriers between teams in different continents caused inefficient management of the demanded changes. However, we hypostasize that: H16: Language barriers are serious challenges while the execution of the RCM process activates in GSD.

3.2.7. HCH7 (Inexperienced staff involvement, 32%)

About 32H17: Inexperienced staff involvement negatively affects the RCM process implementation in GSD.

3.2.8. HCH8 (Lack of time pressure management, 44%)

Kobayashi et al. [SP8] underlined that RCM is not a preplanned activity in the software development life cycle. However, it is demanded unexpectedly, which is a problem to manage within the time schedule contracted with the customer for the project's final delivery. Mavin et al. [SP20] reported that managing the time to complete the RCM process is vital to deliver the project in-time to the customer. Therefore, based on the above discussions, we created the given hypothesis. H18: Lack of management about time pressure has a negative effect on the RCM process in GSD.

3.2.9. HCH9 (Lack of informal communication, 28%)

Damian et al. [SP3] highlighted the need for a successful RCM execution process in GSD. They suggested that Most experts of RCM, having worked in the field of GSD, recognize that the lack of informal communication in RCM process execution could hinder the fruitful implementation of RCM activities [SP12]. As the RCM process demanded rich communication, but very few odds of informal communicates exit due to the geographically distributed nature of development in GSD, which is a crucial challenge, to get the pure expectation of customer and this commination gap is hinder in the success of RCM process [SP23, SP25]. H19: Lack of informal communication has a negative effect on the RCM process implementation in GSD.

3.2.10. HCH10 (Lack of training and coaching, 56%)

The RCM process implementation might not be successful if the GSD organizations do not offer the necessary training to RCM professionals [SP25]. Because of lack of training, the implementation team members of the RCM process could not be capable of evaluating the genuine necessity of RCM process improvement [SP23]. It may be noteworthy to the RCM professionals to have robust understandings of RCM process implementation principles, structures, and methods such as CMM, CMMI [SP13]. H20: Lack of training and coaching has a negative association with RCM process implementation in GSD.

4. Critical Factors

Niazi [23], introduced an idea of the critical factors for identifying the prerequisite information of a CEO. The idea is upon the observation factors obtained from articles about management. Niazi [23] described critical factors and suggested that organizational management has to pay attention to those factors to boost their business outputs. Lacking sufficient interest in those factors can weaken the output of a business [24]. Hence, critical factors can vary because it depends on the individual's current position in a company and executives' geological position. Critical factors might vary from time to time [23]. We utilized the given criteria to identify the critical level of a particular factor: It will consider as a critical factor if factor frequency in both literature and an empirical study is 50

4.1. Critical human-related success factors

The following are the SFs that are declared as critical: HSF2 (Strong relationship with practitioners), HSF3 (Information sharing), HSF7 (RCM process awareness), HSF8 (Skilled human resources), SHF10 (3Cs "communication, coordination control).

4.2. Critical human-related challenges

By following the above-stated criteria, the critical challenges are: HCH1 (Lack of communication), HCH3 (Lack of Trust), HCH5 (Lack of RCM process improvement knowledge), HCH10 (Lack of training and coaching).

5. Proposed theoretical frameworks

The Proposed frameworks (shown in fig.4) are based upon the identified SFs, CHs, and their association with the RCM process implementation, as already presented in sections 3.1 and 3.2. The framework comprises twenty independent variables (i.e., SFs and CHs) and only one dependent variable (i.e., humans-related RCM process implementation in GSD). Besides, one moderating variable is also acknowledged (i.e., organization size). The study of software engineering has already been stated that the SSOs, MSO, and LSOs have several functional variances. LSOs mainly adopt formal standards and models to implement demanded requirements changes, while the SSOs and MSOs are mainly used informal process due to budget limitation [24]. In this research, we have explored that whether small, medium and large organizations execute the RCM process differently [25]. So, it is necessary to investigate the importance of organization size concerning RCM implementation. Hence, to examine the relationship between organizational size and RCM process success, the following hypotheses have been developed. • H20: The stated SFs and CHs influence the implementation of RCM process activities for LSOs to a greater level than SSOs and MSOs. It is presented in Fig. 4 that every SF has a positive association for dependent variable and reported CHs have negative affiliation. The framework is showing a relational prospect of the independent, moderating and dependent variables. The affiliation of the variables is shown in view of the proposed hypotheses.

6. Threats to validity

The first author of the study selected the central part of the study during the SLR process. Nevertheless, we endeavored to reduce this risk by noticing any vague matters and discussed them jointly. However, a high risk exists about an individual researcher might be unfair and continually obtain incorrect data. Anyhow, co-authors were engaged to check at various random stages in SLR.

While selecting primary studies and data extraction, we already executed the inter-rater unwavering quality tests to decrease the researcher's bias. However, it might not be reasonable to verify each article by another critic. We obtained numerous articles missing enough information about organization size while the data extraction, e.g., from 25 articles, only 14 articles discussed

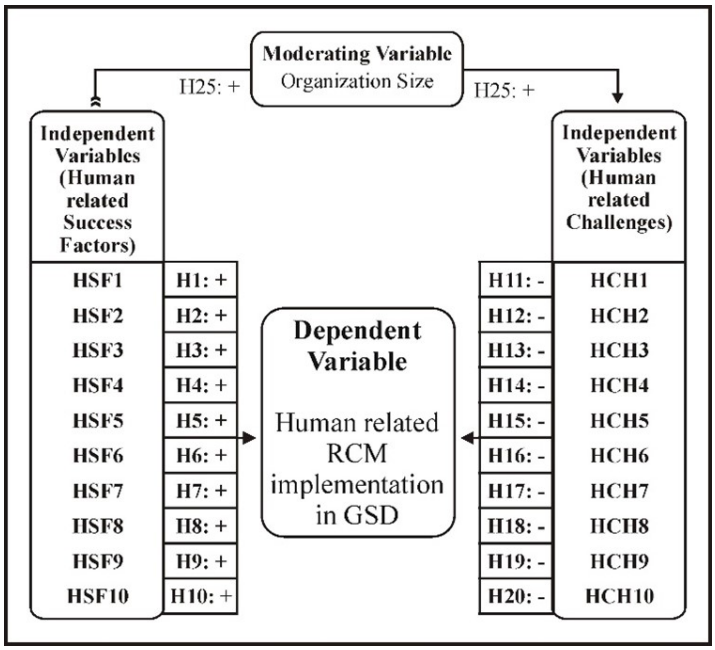

Figure 4. Proposed Theoretical Framework.

organization size in detail. We could not fully highlight images about our whole 25 test in the dissection related to the organizational size because of this constraint. Because of inadequate resources, we cannot say that we bring utilized every last one of assessable advanced libraries, e.g., Scopus. However, most of the digital libraries were used and obtained the literature by generalized searching. At last, numerous related research articles may have been skipped because of the vast number of claimed publications with regards to RCM and GSD. However, just like other published SLRs, it is not a deliberate omission [[26], [27]].

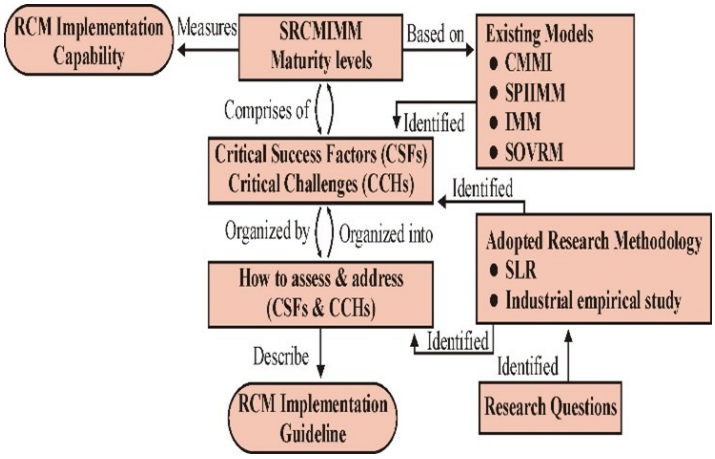

Figure 5. Proposed structure of the SRCMIMM.

7. Conclusion and Future work

Most software organizations are being globalized in their developing practices. The fast growth of GSD appealed to us to investigate human-related success factors and challenges that can undermine the RCM process activities in a GSD environment. We have used the SLR approach to recognize the success factors and challenges from the 25 selected studies. A total of 10 HSFs and 10 HCHs were taken out from the selected primary literature. 5 out of 10 SFs and 4 out of 10 HCHs are declared as critical. The

critical factors may be beneficial as guides for the RCM process implementation in GSD organizations. Besides, all the investigated SFs and CHs were categorized based on the organizations' size: SSO, MSO, and LSO. The findings demonstrated that MSOs and LSOs present more similarities than differences of HSFs and HCHs for implementing RCM activities in a GSD context. Moreover, the SSOs experienced a little different HSFs and HCHs as compared to MSOs and LSOs. The classification of the HSFs and HCHs offers an overview of the factors faced in implementing the RCM process in SSOs, MSOs, and LSOs This classification will help both practitioners and researchers address the particular category of the factors implementing the RCM process in the GSD environment. Furthermore, we develop a theoretic framework of the investigated HSFs and HCHs based on RCM process implementation discussed in the literature. We think that this study's results can be useful to address difficulties related to RCM process implementation activities, which is important to GSD organizations' success and progress.

This study's primary purpose is to develop a software requirement change management process implementation improvement model (SRCMIIP). This model will help the GSD organizations to access and measure the RCM related activities. Therefore, in the future, we have planned to empirically validate the identified human's related challenges, success factors, and best practices which are vital to address the investigated challenges and success factors as explained in Figure 5.

Besides, we have planned to conduct a real-world practitioners' survey to identify the more challenges and success factors of the RCM process in GSD. Furthermore, through the survey of real-world practitioners, the hypothesis of this study's proposed theoretical frameworks will also access.

Appendix A

ID	Reference	QA1	QA2	QA3	QA4	QA5	Total
SP1	[28]	1	0.5	0.5	1	1	4
SP2	[29]	1	1	0	1	0.5	3.5
SP3	[30]	0.5	1	1	1	1	4.5
SP4	[31]	1	0	1	1	1	4
SP5	[32]	0.5	0	1	1	0.5	3
SP6	[33]	0	1	1	1	0.5	3.5
SP7	[34]	1	0.5	1	1	1	4.5
SP8	[35]	0.5	0.5	1	1	0.5	3.5
SP9	[36]	1	1	0.5	0.5	1	4
SP10	[25]	1	1	0.5	0.5	0.5	3.5
SP11	[37]	0	0.5	0.5	1	0	2
SP12	[38]	1	0.5	1	1	1	4.5
SP13	[39]	1	0	1	1	1	4
SP14	[40]	0.5	1	1	0.5	1	4
SP15	[41]	0.5	1	1	.05	0.5	3.5
SP16	[11]	1	0.5	1	1	1	4.5
SP17	[42]	0	1	1	1	0.5	3.5
SP18	[43]	0.5	1	1	1	1	4.5
SP19	[44]	1	0.5	1	1	0.5	4
SP20	[45]	0	1	1	1	1	4
SP21	[8]	0.5	1	0.5	0.5	0.5	2.5
SP22	[12]	0.5	1	0.5	1	0	3
SP23	[46] .	1	0	0.5	1	1	3.5
SP24	[47]	1	1	0.5	1	0.5	4
SP25	[48]	0.5	1	1	1	1	4.5

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