

Review

A Conceptual Framework Based on PLS-SEM Approach for Sustainable Customer Relationship Management in Enterprise Software Development: Insights from Developers

Kausar-Nasreen Khattak ¹, Zohaib Hassan ², Syed Shehryar Ali Naqvi ³ , Muhammad Abbas Khan ⁴ , Faiza Qayyum ^{5,*}  and Inam Ullah ^{6,*} 

¹ Department of Computing, Riphah International University, Gulberg Green Campus, Islamabad 44600, Pakistan; kausar.knk@gmail.com

² Suffaah Research Academy, IT Solutions Providing Organization, Peshawar 25000, Pakistan; dev.zohaibmrt@gmail.com

³ Department of Electronics Engineering, Jeju National University, Jeju 63243, Republic of Korea; syedshehryar@stu.jejunu.ac.kr

⁴ Department of Electrical Engineering, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta 87300, Pakistan; muhammad.abbas@buitms.edu.pk

⁵ Department of Computer Engineering, Jeju National University, Jeju 63243, Republic of Korea

⁶ Department of Computer Engineering, Gachon University, Sujeong-gu, Seongnam 13120, Republic of Korea

* Correspondence: faizaqayyum@jejunu.ac.kr (F.Q.); inam@gachon.ac.kr (I.U.)

Abstract: Due to its significant relevance in outsourcing, the global software industry, such as enterprise software development organizations, accepted the implementation of global software development (GSD). Customers play a pivotal role in any industry, and effective customer relationship management (CRM) is instrumental in ensuring client satisfaction while developing software projects. However, software organizations operating globally often need more insight into their customers' perspectives. These challenges give rise to a major combination for the success of the GSD projects. Organizations working globally face the key challenge of the implementation of CRM. The main objective of this paper is to investigate and understand the challenges faced by global software development organizations when implementing customer relationship management (CRM) in their enterprise software projects. This paper aims to assess how these CRM implementation challenges impact the value of enterprise software products in the context of global software development (GSD). To achieve this objective, the study employs the partial least squares-structural equation modeling (PLS-SEM) approach and conducts a systematic literature review (SLR) to identify relevant challenges. Additionally, this paper presents a conceptual framework based on the identified challenges and validates it through surveys and qualitative research with software outsourcing companies in Pakistan. The research provides valuable insights from the perspective of software developers and aims to offer practical guidance for the successful application of CRM in outsourcing.

Keywords: PLS-SEM; customer relationship management; CRM organization; enterprise software industry; distributed software development



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1. Introduction

Global software development (GSD) is the term used to describe the fast-paced, cutting-edge, and efficient technologies that enable businesses to explore outsourcing and offer software project marketing [1]. It is currently required in the software development cycle as well. Establishing the information technology (IT) influence on places and breaking it down geographically are cited by GSD [2,3]. The benefits of outsourcing include low costs, access to valuable resources, efficient scheduling, and continuous software development [4,5]. Despite abundant scientific proof in software engineering, there are several obstacles to outsourcing because of socioeconomic and civilizing differences. The variations above

significantly impact project operations, coordination and collaboration, communication, and trust aspects in outsourcing. Furthermore, this issue has a negative impact on the success rate of projects [6,7].

Several developing countries, such as China, Pakistan, and India, have to deal with sophisticated marketing and outsourcing strategies in order to complete projects at comparatively low costs [8]. In the future, outsourcing firms and various marketing activities will value the GSD quality system, which focuses primarily on customer satisfaction [9]. Up to Now, outsourcing has caught the interest of users and other developers alike in producing great software on a smaller budget. However, that is to disclose many challenges because of the scattered consumers, geographically distributed partnerships, environmental backdrop, and socioeconomic and linguistic distinctions. In the framework of GSD, software-related initiatives are held to a high standard by renowned research subjects [10]. The term standard is cited to the potential of software that attains consumers' needs of functional and nonfunctional conditions [11]. In addition to the software organization, the technical section introduces research and framework to enhance the project quality [12]. The previously mentioned research clarifies the factors that impact the relationship management process. These studies shed light on the problems developers have with customers that affect customer relationship management (CRM). CRM problems have a detrimental influence on relationships between customers and organizations, particularly in companies operating in a GSD environment [13]. The software production sector has noted that the quality of software projects can be enhanced by implementing maintenance and growth tactics [14]. Different methods have been introduced from the customer satisfaction perspective to build on the software quality [15].

Consequently, the vital stakeholders of any project are customers [16], and the key to the success of any organization model is the customer relationship. Therefore, to significantly improve the software standard, the requirements management of the stakeholders is essential. A widespread subject of study among software development firms refers to managing CRM, which is also an active area of research among CRM academics in academia [17]. CRM focuses on apps and forming a consortium to monitor and oversee relationships with current and future clients to improve client relations management and support trading magnification [18–20]. Today, organizations try to grow businesses and aspire to boost their business. Consequently, the CRM structure possesses a foundation for client relation evaluation in the present marketing traffic by progressing client electronic data processing. The expectations of CRM structure could encourage software industries to enhance their relationship with their customers; in this way, industries will upgrade and expedite the reaction to the client's demands [21,22].

Industries are pushed to outsource solutions to achieve high trading and marketing attention. Several obstacles, including racial disparities, topographic isolation by geography, and vernacular concerns, are faced by industries when using CRM while outsourcing in dispersed environments. The burgeoning application of CRM in outsourcing software development called for fully-fledged broad marketing and acquiring worthy dominance above the marketing contender. Probing and assembling the pertinent client's knowledge, the CRM structure successfully purveys deals, evolves leads, develops relationships with clients to retain buyers and grows marketing with the customizing facility. Many researchers verified that the CRM approach substantially upgrades customer relationships [23]. Even with the significance of CRM in several aspects, none of the comprehensive research probes the barriers affecting CRM implementation while outsourcing from the viewpoint of the developers. In our previous research [24], the focus was on the client perspective; our research is based on the developer perspective, which has not been targeted before.

The present study focuses on marking the challenges that impact the implementation of CRM for industries outsourcing and putting forward the conceptual framework depending on the barriers to be recognized. In addition, recognizing the barriers to successfully implementing CRM permits software companies to control the incompetent execution of CRM and business hazards to pull CRM back on track.

The emphasized subscription of the suggested research is enumerated as follows:

- Develop an SLR to comprehensively and precisely identify the critical challenges to sustainable CRM in enterprise GSD.
- Perform empirical research to dictate the challenges affecting sustainable CRM execution in enterprise GSD.
- Prepare a questionnaire based on the knowledge of domain IT specialists to collect responses (data) from the applicants of the IT companies constructed on enterprise GSD.
- Develop a conceptual framework based on the PLS-SEM approach using accumulated data of the identified challenges through a questionnaire to empirically picture the effect of CRM within the GSD context to enhance the software's quality.
- Furthermore, several quantitative experiments are performed to substantiate the execution of the suggested conceptual framework using the responses from the questionnaire.

The present study is categorized in the following sections: Existing research associated with CRM is covered in Section 2. A detailed research methodology of the suggested research study is described in Section 3. The investigation outcomes were thoroughly examined, and the findings of the proposed research are in Section 4. Furthermore, a detailed discussion is stated in Section 5, highlighting the suggested study's importance and effectiveness. In the end, Section 6 terminates the present research with subsequent work.

2. Related Work

In marketing, CRM plays a pivotal role in ensuring the survival and growth of businesses. As described by Zafar et al. [25] and Chen et al. [26], CRM is implemented through organic consolidation. This consolidation involves bringing together various aspects of trading, advertising, and resource facilities. The objective here is to avoid any perceived showmanship and, instead, focus on systematic initiation steps. Furthermore, Babar et al. [27] and Shen et al. [28] emphasize that CRM encompasses a set of marketing procedures and strategies to understand an organization's clients from a unique perspective. This understanding allows companies to differentiate their products and services competitively. CRM is the central system for enhancing and managing customer relationships productively, as highlighted by Li et al. [29]. Research has shown that customer experience holds significant importance. Al-Gasawneh et al. [30] revealed that three out of every four customers are willing to invest in an organization if they have had a positive experience. Interestingly, the cost of acquiring new customers is five times higher than retaining existing ones, underscoring the importance of CRM in any company's marketing strategy. CRM is a robust and well-organized process for establishing and nurturing customer relations. It is a key driver for gaining and utilizing customized customer knowledge, as emphasized by Shah et al. [31].

As mentioned by Li et al. [32], GSD has many benefits for developers and clients. Still, it also has drawbacks because of dispersed consumers, such as environmental conditions, language barriers, and cultural differences. These challenges, arising from the customer's side, might severely influence the CRM process outlined in the earlier literature research presented by [33]. As noted by Dikert et al. [34], these issues may negatively affect interactions between customers and organizations, adding more obstacles to the CRM practices of businesses working in a GSD environment. Because of the abovementioned issues, businesses using a GSD framework have additional challenges that may negatively impact organizational and customer interactions. On the other hand, several research projects have been made to improve software development operations in colocated software houses and organizations operating in a global setting, as noted by Dubois et al. [35,36].

Furthermore, several studies [37,38] have provided various viewpoints on CRM. For instance, some authors [39] have delved into the factors influencing CRM success and its potential benefits. Researchers have examined case studies where Business Process Re-engineering (BPR) and companies' efforts have contributed to successful CRM implementation [40]. However, it is worth noting that BPR and organizational learning have primarily focused on business. Another study conducted empirical research and proposed

a successful CRM framework comprising key success factors: process alignment, standardized client data, organizational support, efficiency, client satisfaction, and profitability [41]. These success factors were explored from the developer's perspective, and a framework was developed based on their findings [42]. Considering the developer's viewpoint, these eight critical success elements identified in the research fall within the technical and organizational aspects. In a different study aimed at successful CRM implementation in colocated settings, measurements were taken from technological, socio-economic, and organizational perspectives [43]. Additionally, the study revealed that factors like communication influence the evolution of client-vendor relationships and trust [44]. These components significantly impact CRM from both angles, as highlighted by these authors. The global significance of CRM has been widely recognized.

The importance of CRM in establishing and maintaining lasting customer relationships cannot be overstated. However, there needs to be more exploration into the factors that impact the effectiveness of CRM on a global scale. Recognizing this gap, our current research aims to identify the challenges faced by CRM in a globally dispersed context. In today's business landscape, a customer-centric approach is gaining prominence [7]. Organizations are implementing CRM strategies to acquire, expand, and retain the right customers [45]. CRM is crucial in enhancing relationships between clients and vendors, promoting personalized services, and overall organizational improvements. Successful CRM implementation can assist organizations in achieving customer loyalty and retention [46]. Global organizations understand customers' importance and strive to provide adequate customer service. While several studies have explored different aspects of CRM [46–48], and some have looked into barriers to CRM implementation, these examinations have primarily been conducted in colocated contexts. Researchers have discussed the theoretical concept of client-vendor relationships influenced by various factors without experimental validation [49]. Therefore, our research considers these factors, along with others identified in the literature, that significantly affect CRM. Moreover, we approach these challenges from the perspective of developers. While previous research has touched upon the global environment's impact on CRM [50], our study aims to bridge the gap by considering various factors influencing CRM and experimentally testing their implications for software management organizations.

Existing literature underscores the significance of CRM within a global context. It highlights the importance of CRM and sheds light on the challenges developers face when aiming to expand their businesses, enhance competitiveness, and achieve consistent success in the highly competitive software world. Similar findings were seen in research by Roh et al. [51]. In today's fast-paced business market, contemporary software businesses must thoroughly analyze their CRM tactics. They must devise efficient strategies to consistently investigate dynamic marketing patterns and swiftly address the changing needs of their clientele. By implementing CRM and its alignment with organizational goals within a GSD environment, firms may achieve notable improvements in productivity.

In [52], authors conducted a systematic review to explore success factors and barriers in the context of software process improvement (SPI) within GSD organizations. The motivation behind globalizing software development is a competitive advantage, but it introduces unique challenges. The study identifies nine success factors and six barriers relevant to SPI in GSD. Four critical success factors include management commitment, staff involvement, allocated resources, and pilot projects. In contrast, four critical barriers encompass lack of resources, inexperienced staff, organizational politics, and time pressure. The research aims to assist GSD organizations in successfully implementing SPI programs, recognizing key elements for success, and understanding significant barriers to overcome in pursuit of enhanced software development processes. Similarly, in [53], authors examined the impact of GSD practices on the release planning of packaged software. By employing qualitative research techniques, including Focus Group and a Delphi Study, the author generates two challenges in software release planning, one considering the adoption of GSD practices and the other not. The findings indicate that GSD introduces

complexities to previously seemingly resolved challenges, such as “Project monitoring and control” and “Quality management”. In contrast, traditional challenges like “Requirements prioritization” and “Stakeholders Management” do not significantly affect GSD environments. Ultimately, the study underscores that GSD substantially influences software release planning, particularly in terms of personnel and human resources management, necessitating a reevaluation of challenges specific to packaged software release planning in GSD contexts.

To the best of our knowledge, previous research has yet to delve into the viewpoint of developers working in a GSD environment. Additionally, empirical studies need to be conducted to explore the potential factors that might negatively impact the implementation of CRM in the GSD industry. It is, therefore, essential to look at the difficulties in implementing CRM in this particular market. By doing this, we can recognize and resolve the issues preventing CRM from successfully integrating into GSD. With an emphasis on the developer’s point of view, our research constitutes a ground-breaking attempt to create a theoretical foundation for the efficient application of CRM in the GSD environment. Additionally, our research has brought to light several difficulties companies face while interacting with clients in a GSD context. Some of these difficulties are time zone variations, linguistic obstacles, a lack of experience and industry knowledge, problems with coordination, and physical separation between teams.

The current study focuses on developing the worldwide CRM of software companies by addressing all the issues mentioned above through an organized plan. Therefore, by improving the organization’s financial situation, the study that has been given will eventually increase consumer loyalty and retention.

3. Research Methodology

The methodology and procedure are presented in detail in this portion of the present study. The research methods involved in this study include adopting an SLR and conducting an empirical study to highlight the challenges globally scattered organizations face in implementing CRM. An experimental study is being considered to gather data from CRM participants involved in outsourcing, while an SLR is utilized to present the research findings in an unbiased way.

3.1. Systematic Literature Review

SLR is a rigorous publication and appraisal practice to inscribe issues probing, assessing, and affiliating the outcomes applicable to every research, inscribing additional research queries. The SLR is an assessment of mapping out questions that utilize structured and comprehensive practices to associate, determine with censorious assess pertinent research, and to investigate data from studies incorporate in the review [54].

The main objective of SLR is to convey a thorough explanation of the present publication’s concerns to examine the distribution analysis of the adopted framework based on classification study as presented in Figures 1 and 2. SLR comprises three steps, as described in [45]:

1. The first step is planning the review, used to determine the plan that is developed to conduct SLR.
2. The second and main step of SLR is conducting the review. To procure data from the literature, some search strings are developed.
3. The last step is reporting the review. All the upshots of the preceding steps are described in this step. The last phase is reporting the review. In this phase, all the results of the preceding stages are reported. Researchers set off an SLR technique for different domains [23].

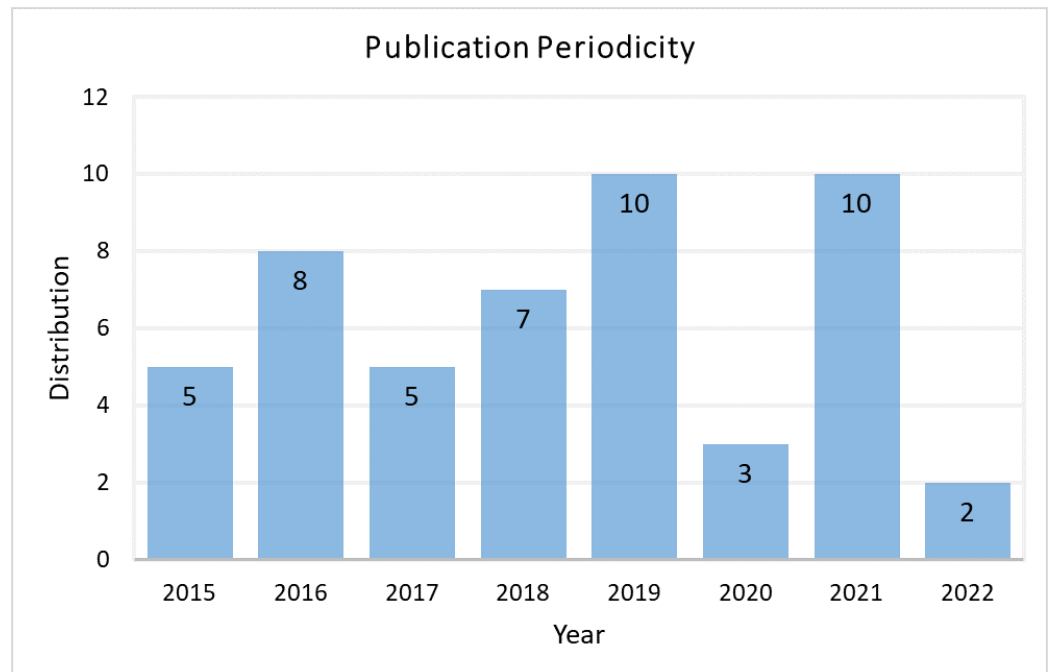


Figure 1. Annual dispersion of articles for the suggested investigation.

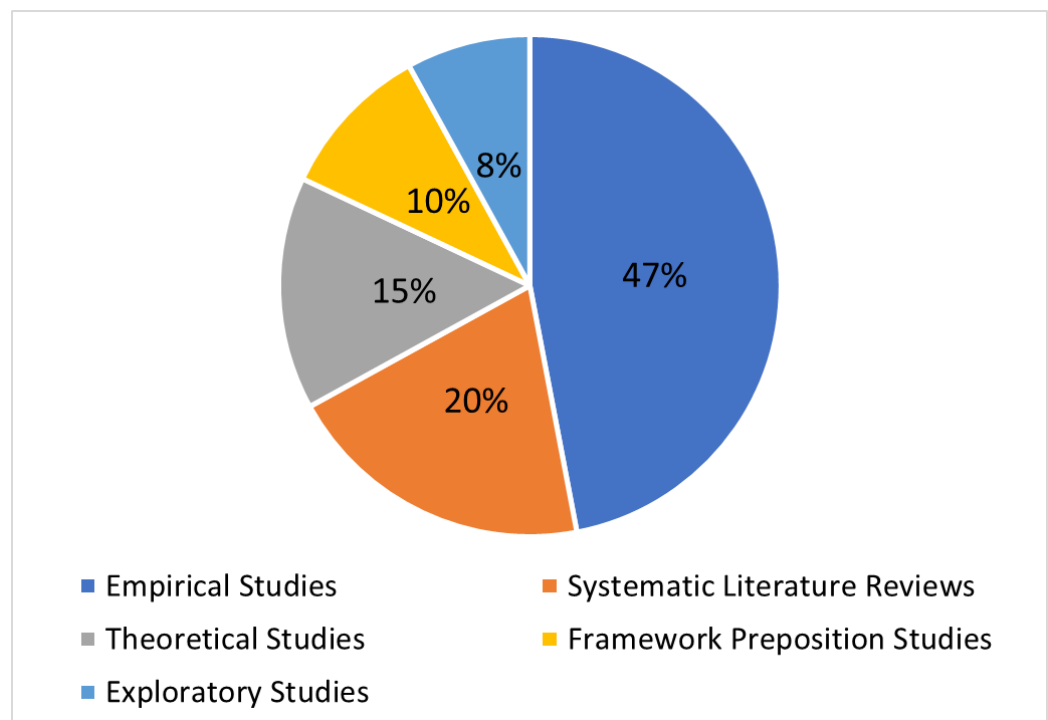


Figure 2. Distribution analysis of the adopted framework based on classification study.

3.1.1. Strategizing the Review

The preparation of the review encompasses the crucial constituents, which comprise research inquiries, databases, keyword exploration phrases, exclusion and inclusion principles, and quality criterion directives for selecting pertinent studies.

Research Questions

Establishing research questions is vital to conducting an SLR, as they provide the framework for the entire literature review process. The present research has formulated a

set of research queries that encompass the complete concept of the literature review, and these research questions are provided below:

R-Q1: How do cultural differences impact CRM in the context of GSD? Given that GSD involves working with individuals from different countries and cultures, it is important to understand how cultural differences affect customer relationships and how companies can mitigate these effects.

R-Q2: How do cultural factors specific to Pakistan affect CRM practices in the context of GSD? Given that Pakistan has a unique cultural context, it is essential to understand how cultural values and practices may influence how Pakistani software development firms approach CRM in GSD.

R-Q3: How can inconsistencies between the elements identified in the SLR and those uncovered in an empirical study be reconciled? Inconsistencies can create confusion and lead to conflicting recommendations for industry practitioners. Exploring methods for reconciling these inconsistencies and developing a more cohesive understanding of the factors that influence CRM is important.

Data Repositories

A substitute method is occupied to investigate assorted electronic data sources, electronic libraries, and process pertinent research information. The already stated and those libraries are adopted attentively based on current research and a suggestion recommended by [45]. Present research covered data sources given below:

- Elsevier;
- Willey Online Library;
- Science Direct;
- Google Scholar;
- ACM Association for Computing Machinery;
- IEEE Xplore Library.

Search Strings

Keywords are extracted in this research review and substituted from existing literature and mature search strings for research questions. The Boolean operators '&' and '||' were utilized to construct the search string to combine relevant keywords. Exploration of online databases was conducted with these queries ("Challenges" || "Barriers" || "Problems" || "Factors" || "Hurdles" || "Difficulties") && ("GSD" || "Distributed Software Development" || "DSD") && ("Customer Relationships Management" || "CRM").

Inclusion Criteria

Conditions are given below which are included in this research.

- All studies related to CRM activities in the context of GSD, particularly those that examined barriers to the implementation of CRM, were included in this research.
- In the context of this research, empirical studies were given preference over other types of studies because they involve gathering data through direct observation or experimentation. Empirical studies provide more reliable and objective evidence compared to other types of studies, such as case studies or literature reviews that rely on subjective interpretations.
- The present article appraised every research that covers CRM-related business while outsourcing, especially dealing with challenges towards CRM execution.
- Experimental research evaluation studies were selected.
- The time period for including studies in this SLR was set from 2015 to 2022 to ensure that the review includes the most current and relevant studies. Including studies from a specific time period helps to avoid outdated or irrelevant information that may no longer reflect current practices or technologies.
- Research available in English and possessing full text was selected.

Exclusion Criteria

The articles that were light on the following criteria were eliminated:

- Other language Reports and the absence of complete text accessibility were eliminated.
- Studies and reports that declined inspections of CRM while outsourcing were excluded from the article.
- Studies review challenges other than CRM while outsourcing was also eliminated.
- Duplication of identical research was also eliminated.
- Manuals, web pages, and empty articles were eliminated.

Quality Benchmarks for Selecting Relevant Studies

This chosen research quality was determined through the assessment. All phases were effectuated simultaneously, i.e., quality evaluation and information, evidence, and statistics assembly. The data selection was assessed by generating a quality checklist quantitatively and qualitatively. Informal external analysis was also implemented to substantiate the standard adequacy of selected studies. During the time of developing the checklist, the following instructions were kept in mind [23]. The quality criteria items are given below:

Q-A checklist questions:

- Q-A1: Do the articles address riposte to research queries?
- Q-A2: Does the investigator investigate the challenges of outsourcing?
- Q-A3: Does the research articulate CRM in outsourcing?
- Q-A4: Are the discoveries accorded in the articles?

In support of the given questions Q-A1 to Q-A4, the estimation is executed according to the following points;

- Articles that covered all of the research inquiries were granted a score of Point 1.
- A total of 0.5 points were set for given studies addressing inadequate answers to questions.
- A total of 0 points were marked in studies as inadequate to address any of the given questions.

3.1.2. Conducting The Review

The following procedures were included in the process of conducting the review.

Determination of Articles

The initial stage is the tollgate method, where 1902 articles were picked out for investigation through search strings from the digital databases. Addition and elimination were performed depending on the subject, hypothetical, introduction, and complete narrative; 50 articles were selected and added to the study. In addition, Figure 3 presents the tollgate approach of the proposed research study.

The selected data were filtered additionally by applying the tollgate method [23]. The tollgate method comprises five stages as shown the Table 1.

- Stage 1 (S1): Searching for suitable studies.
- Stage 2 (S2): Inclusion exclusion depends on the subject and abstract.
- Stage 3 (S3): Inclusion exclusion depends on the introduction along with the conclusion.
- Stage 4 (S4): Inclusion exclusion depends on the full text.
- Stage 5 (S5): In this stage, selected data are included in the SLR.

Extraction Data

First, answering the research questions in the present research evaluation, the authors screen each study title, category, and technique. Paying attention to the selected phases of the tollgate approach, the present study's authors extract the concluded initial data to perform an SLR. The tollgate methodology commenced by selecting studies that were deficient in relevance during the preliminary phase. In the subsequent stage, studies were handpicked and disregarded by emphasizing the heading and summary. Subsequently, in

the third phase, publications were extracted while highlighting the prologue and resolution. The fourth phase of the tollgate process involved including and eliminating articles based on the entire text. Finally, the ultimate phase consisted of the selection of primary studies.

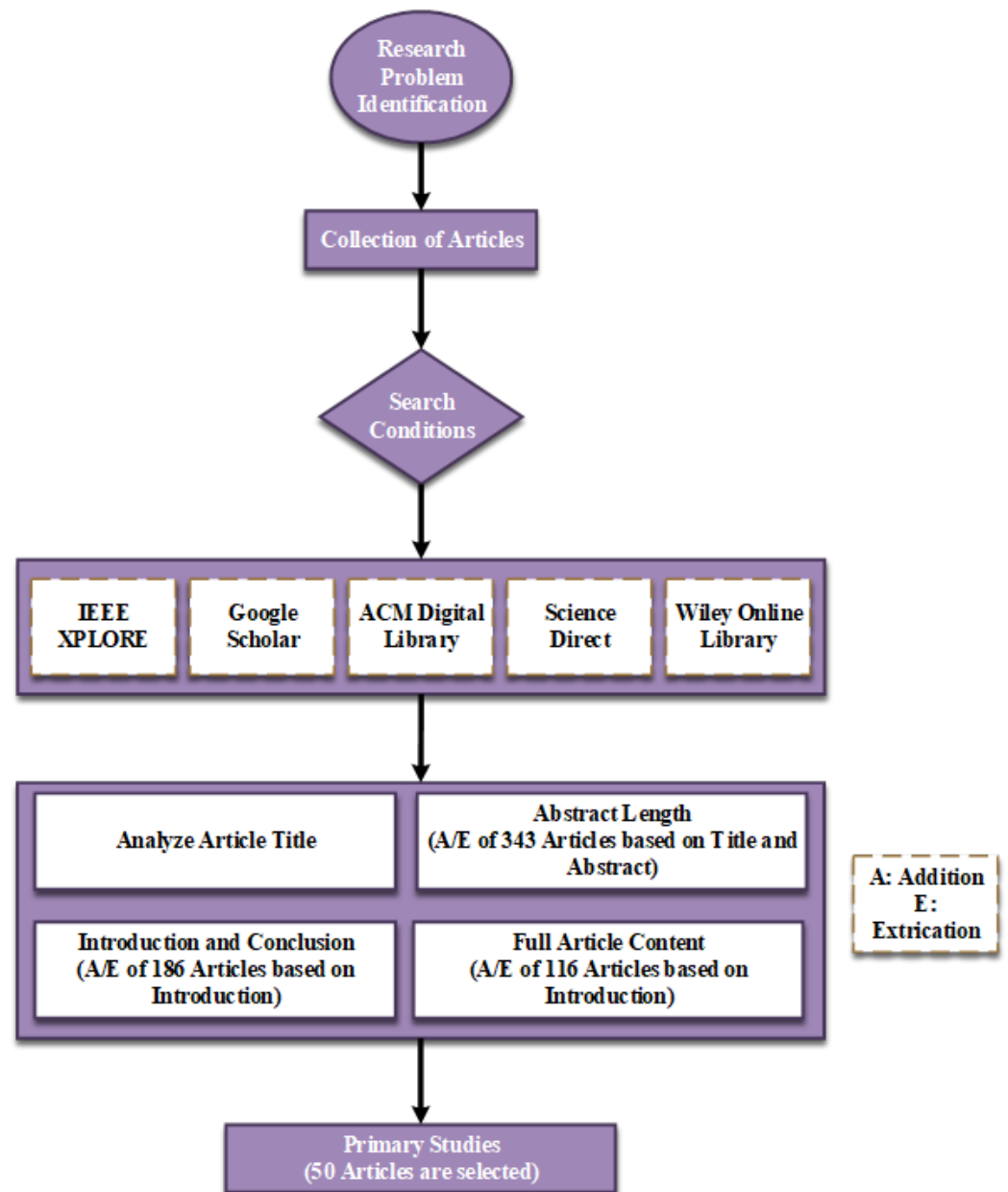


Figure 3. An intricate diagrammatic representation of the suggested Tollgate approach.

Table 1. Tollgate approach based selection of relevant studies.

Source	S1	S2	S3	S4	S5
ACM Library	32	16	12	6	6
Google Scholar	890	74	51	29	21
IEEE	521	120	59	38	20
Science Direct	316	83	42	25	16
Wiley Online Library	123	40	15	12	2
Wiley Online Library	20	10	7	6	1

Data Amalgamation

Various issues are recognized that badly influence the advanced implementation of CRM in the context of GSD. So lastly, in the selection of initial articles, a list of factors is extracted, and the research queries were also appraised from extracted studies.

3.1.3. Reporting The Review

This reporting stage comprises required portions.

- (a) Quality evaluation;
- (b) Temporal scattering;
- (c) Research techniques.

Quality Evaluation

After following the quality criteria rule, some articles were selected. Focusing on the QA checklist, these studies were designated. The selection of studies through quality investigation is given in Table 2. The quality of a study equal to or more than 50% should be adopted according to a study presented in [23]. The selected QA checklist and the total score of selected studies were lower than 2, which did not respond to be discarded as it is declared the quality criteria should be 50% [23]. Despite the lower scores, the studies were not dismissed outright. It is essential to understand the specific reasons or considerations outlined in the study for not adhering strictly to the established quality threshold. The information provided suggests that articles focusing on challenges faced by developers from the client side in the GSD context were included in the final selection, resulting in 50 investigations. Moreover, articles that concentrated on bringing issues faced by developers from the client side in the GSD context were included. According to the quality regulation, a sum of 50 investigations were incorporated. The other studies were excluded as they did not adhere to the quality criteria stated in the present article.

Table 2. A quality assessment description of the collected articles.

Article	Q1	Q2	Q3	Q4	Total
[3]	0.5	0.5	0	0.5	2
[23]	0.5	1	0.5	1	2.5
[24]	1	1	1	1	4
[37]	0.5	0.5	0.5	0.5	2
[38]	1	0.5	0.5	1	2
[42]	1	1	0	0.5	2.5
[43]	1	1	1	1	4
[45]	1	0.5	1	1	3.5
[55]	0.5	1	0.5	1	3
[56]	0.5	1	0	0.5	2
[57]	1	0.5	0.5	0.5	2.5
[58]	0.5	1	0	0.5	2
[59]	1	1	0	0.5	2.5
[60]	0.5	1	0	0.5	2
[61]	0.5	1	0.5	0.5	2.5
[62]	0.5	1	0	1	2.5
[63]	0.5	1	0	0.5	2
[64]	0.5	1	0	0.5	2

Table 2. *Cont.*

Article	Q1	Q2	Q3	Q4	Total
[65]	0.5	1	0.5	0.5	2.5
[66]	1	1	0	0.5	2.5
[67]	0.5	1	0	0.5	2
[68]	0.5	0.5	0	1	2
[69]	0.5	1	0	1	2.5
[70]	0.5	1	0	0.5	2
[71]	0.5	1	0	0.5	2
[72]	0.5	1	0	0.5	2
[73]	0.5	1	0	0.5	2
[74]	0.5	1	0	0.5	2
[75]	0.5	1	0	0.5	2
[76]	0.5	1	0	0.5	2
[77]	0.5	1	0.5	0.5	2.5
[78]	0.5	1	0	0.5	2
[79]	0.5	1	0	1	2.5
[80]	1	1	0	1	3
[81]	0.5	1	0	0.5	2
[82]	0.5	1	0	1	2.5
[83]	0.5	1	0.5	0.5	2.5
[84]	0.5	1	0	0.5	2
[85]	0.5	1	0	0.5	2
[86]	0.5	1	0	0.5	2
[87]	0.5	1	0	0.5	2
[88]	0.5	1	0.5	0.5	2.5
[89]	1	1	0	0.5	2.5
[90]	0.5	1	0	0.5	2
[91]	1	1	0	0.5	2.5
[92]	0.5	1	0	0.5	2
[93]	1	1	0	0.5	2.5
[94]	1	1	0	1	3
[95]	0.5	1	1	0.5	3
[96]	1	1	1	1	4

Initial Studies of Temporal Distribution

The selected articles were published between 2015 and 2022, and 50 research studies were selected. Thirty-eight research studies were published from 2015–2020, and twelve were published from 2021–2022. Figure 1 shows the issuance of studies.

Research Methodology

The selected studies from the tollgate method comprise 47% of experimental studies, and 20% were systematic literature reviews. The remaining 15% were theoretical studies, 10% were framework preposition studies, and 8% were preliminary investigations or research studies. Figure 2 illustrates the issuance of the selected investigations.

3.2. Proposed Step-by-Step Methodology of Conceptual Framework

This segment comes up with the conceptual model, incorporating its hypothesis. The theoretical framework of this investigation encompasses eight external factors and one internal factor. The external factors include difficulties in communication (LC), disparities in the language (LD), differences in culture (CD), inadequate expertise and knowledge in the domain (EXP), lack of coordination and cooperation (CC), temporal disparities (TD), inadequate mutual comprehension (MU), and geographical remoteness (GD). Each of these factors significantly impacts CRM in the context of GSD and hence, it is deemed an endogenous element. In Figure 4, a conceptual framework of the suggested study is portrayed.

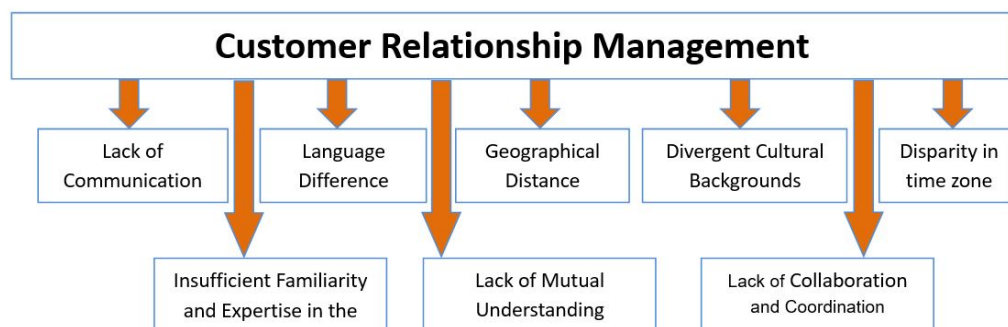


Figure 4. Overview of the suggested methodology for CRM.

3.2.1. Lack of Communication Selection

In this advanced period, software companies become needed for the GSD environment [97]. In the world of concoction, communication is a complicated element. Communication issues are considered a major challenge that negatively affects CRM. Various customer issues software organizations face negatively influence the CRM, which affects customer retention [44]. Lack of communication creates hurdles for organizations and businesses with globally distributed customers. Also, any hurdle in communicating negatively affects CRM. Less synchronization and telecommunication bandwidth are other facets of the communication issue. Less contemporize also influences CRM in GSD. Leveraging asynchronous communication methods, such as email and accounting for differences in time zones, etc., and some necessary substance is needed for expanding the communication. The quality of data exchanged between vendors and clients affects CRM in GSD for the reason of poor telecommunication bandwidth. Another factor that impacts communication between organizations and customers is the telecommunication bandwidth, which can result in undefined customer requirements that, in turn, affect the implementation of CRM [89].

3.2.2. Language Difference

Language differences give rise to problems in the GSD environment [89]. Language differences generate issues in the dispersed environment every time. The language factor is the main element for organizations to communicate with their customers concerning the project requirements. The considerable language used on international and national platforms is English. Language difference is a big issue faced by the vendors and creates a lot of issues. One of the biggest problems is understanding the specifications of clients, which results in client disappointments and impacts CRM implementation. The language difference delays working hours, i.e., consumes time in understanding the actual specifications of the customers, which affects CRM implementation in the GSD. In language differences, the main issue is the contextual difference; this same word has different meanings. The contextual difference misinterprets the customers' demands and affects the CRM directly [71]. The contextual difference decreases adequate communication, and developers face a lack of knowledge from the client side [81]. Vendors face many difficulties in assembling data

from the clients and increasing the time duration of a project due to contextual differences, which leads to customer dissatisfaction and affects CRM applications [78].

3.2.3. Insufficient Familiarity and Expertise in the Field

This topic pertains to clients who need more experience and domain knowledge regarding software development. The absence of such information and expertise causes disruptions that can result in project failure and unsuccessful CRM implementation [4]. The customer's disappointment affects the lack of awareness about project duration and the CRM process. The major part of developing any software project concerns customer specification and satisfaction. The issue in this stage is that customers need help explaining what requirements are exactly needed [91]. Developers rely on their experience to make decisions about what customers want. Still, if they don't meet the actual requirements of their customers, it can lead to project failure and a failure to implement CRM [74]. This challenge originates trust issues and creates misunderstandings, and customers show less interest in GSD projects, which badly affects the CRM process [44].

3.2.4. Lack of Collaboration and Coordination

In gathering data for project development from the customer's side, collaboration and coordination are crucial [93]. As mentioned in [24], global organizations have distributed customers, and their limited collaboration and coordination cause mutual understanding and communication [83]. CRM development is also affected due to a lack of coordination from the customer side and a tough task in understanding clients' requirements and issues. The absence of a two-way communication mode leads projects toward failure and the CRM process [62]. The absence of online coordination and collaboration can also adversely impact the CRM implementation process, which can lead to increased client service costs.

3.2.5. Divergent Cultural Backgrounds

Culture is characterized by its system, customs, convictions, principles, and morality. Whenever dissimilar cultures and individuals interconnect, it can give rise to communication issues [41]. Misunderstandings increase due to cultural differences, especially in organizational, ethnic, political, rules and regulations, and moral concepts badly influence CRM implementation [5]. Different working days and working environments because of cultural differences also affect CRM applications. Socio-economic diversity is defined as a class of people with other social and educational backgrounds, revenues, moral principles, etc. It is challenging to establish effective CRM when it comes to global assignments with dispersed customers having different backgrounds, especially authors talk about educational backgrounds [6] and most importantly, it is difficult to understand the customer aspect and requirements [78].

3.2.6. Disparity in Time Zone

The temporal discrepancy between corporations and their patrons can be denoted as a variation in time zones [45]. When organizations work globally with dispersed customers, both are located at different locations at different times, creating communication and coordination problems [45]. Delay in the responses and feedback from the customer's side is also an issue for the organizations dealing with them [43]. Working globally with customers due to the time difference of even an hour creates an issue for the developers in the delay of work, which impedes the exchange of views. All these issues are created by the time difference and negatively influence CRM implementation while working in the global environment. Furthermore, this increases the customer's efforts to establish contact with the vendors [78].

3.2.7. Lack of Mutual Understanding

In a global environment, customers from diverse backgrounds possess varied perspectives and ways of thinking, which can lead to misunderstandings when collaborating

with organizations and result in unsuccessful CRM implementation [43]. Tacit knowledge can also contribute to misunderstandings between customers and developers [98]. The absence of mutual understanding can create a noteworthy influence on CRM and affect the project's duration. So, for the successful implementation of CRM and projects, a good understanding is needed between the customers and developers [43].

3.2.8. Geographical Distance

Physical dispersion between clients and developers distributed globally is defined as geographical distance [41]. Because of geographical distance, there are no face-to-face meetings between clients and developers, which creates a misunderstanding of the customers' needs, some trust issues, and hinders communication that negatively affects CRM implementation. It is hard to collect data related to the project through online channels while working globally with dispersed clients; this leads to data loss during transferring because of small telecommunication bandwidth [98]. Another issue that arises from customers faced by the developers because of geographical distance is the trust issue, which is because no experience with the organization affects CRM implementation badly and makes it difficult for organizations to retain customers [43]. Also, this slows the communication process in the GSD environment and makes it difficult to gain customer loyalty and retention [44].

3.3. Observation and Experience of Theoretical Framework

This subsection presents an overview of the empirical analysis, including its outcomes. Additionally, to answer R-Q2, a survey was performed on Pakistan software companies based on GSD. Figure 5 illustrates a workflow of the proposed theoretical framework. First, an assessment and methodology of the proposed theoretical framework is proposed. In our research study, an online five-point Likert scale questionnaire was developed and utilized to collect data from respondents. The online five-point Likert scale questionnaire offers five responses, such as Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD). Next, respondents from various positions participated to gather data. The participants were invited through organizational collaboration and social media, such as Emails, LinkedIn, and Facebook. Once data were gathered, data analytical approaches were employed, such as descriptive analysis, reliability test, and PLS-SEM, to investigate the data for extracting hidden patterns and insights those affecting the implementation of the CRM in GSD.

3.3.1. Assessment and Methodology for Gathering Data

The quantitative research technique is used in this current study to investigate and describe the barriers affecting GSD CRM settings. An online questionnaire survey was conducted, keeping in mind the results of the SLR to assess the dominating factors that quickly fail the relationship between the customers' vendors while working globally and affect the CRM process. These questions were pointedly formulated concerning the challenges recognized during the SLR. The clear motivation at the back of the survey was to attain the recent data on the ongoing conditions and receive the details that are difficult to accumulate from the theory [58]. To collect data, a set of close-ended inquiries was crafted and dispensed to professionals working in software enterprises with expertise in CRM procedures within a GSD context. Responding to closed-ended questions in this manner is relatively easy for practitioners to answer [71]. In the initial stage, simple questions for the survey were developed. After performing several tests and a pilot study, the questionnaire is filtered further. A five-point Likert scale questionnaire was utilized, offering possible responses such as Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. In the Likert scale, there is no fault in adding the "Neutral" option mentioned by the authors in [72,73]. In addition, including the "Neutral" option results in impartiality; practitioners were free to give their point of view per their knowledge [74]. The pre-testing of the questionnaire is required before performing a questionnaire survey. It will help to check the imperfections

and limitations of the survey. Experts were consulted to conduct both face and content validity evaluations to assess the reliability of the questionnaire. The specialist validates elements stated in the questionnaire to know whether the applicants fetch the questions or not [74]. In content validity, trained specialists are needed who appraise the validity, coherence, and completeness of the questionnaire survey items and go along with the items that should remain in the final questionnaire [75]. The table displaying the selected questionnaire survey can be found in Appendix A.

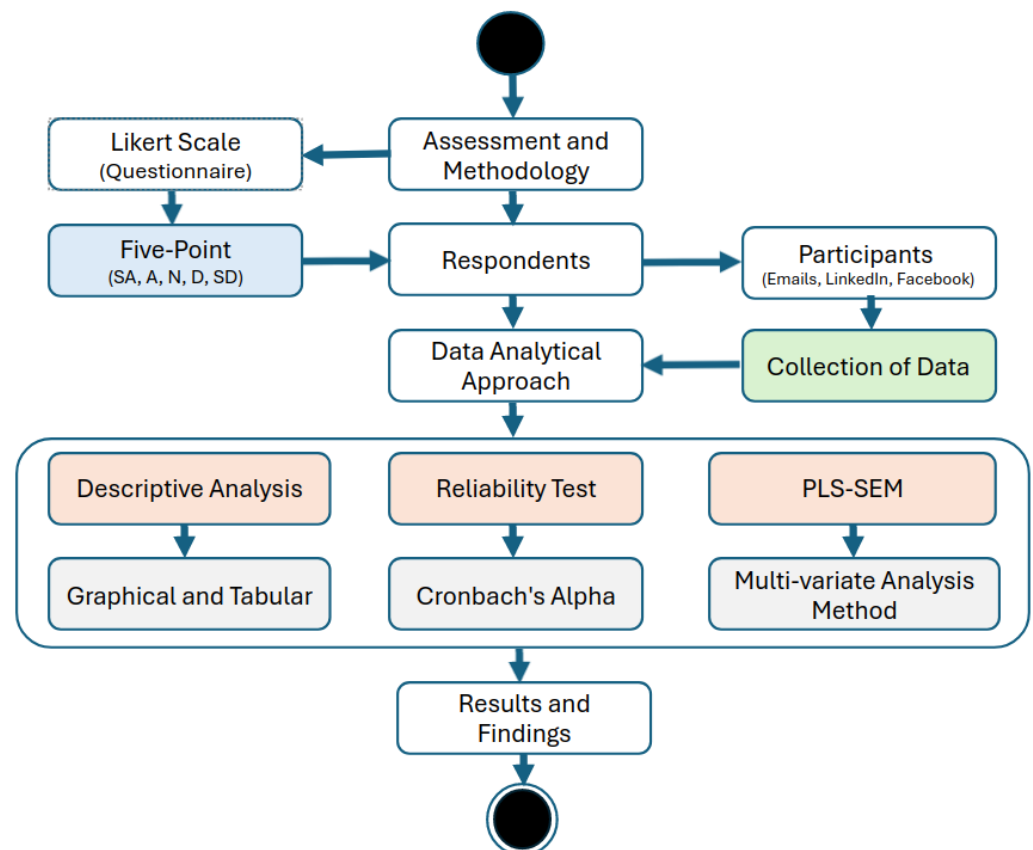


Figure 5. Workflow of the survey data analysis.

3.3.2. Respondents

The study focuses on searching for challenges to successful CRM settings in GSD. The aim is that the authors have chosen the applicants working in GSD organizations and IT companies in Pakistan. The individuals who participated in this examination comprised various positions, including a CRM manager, a project manager, a team manager, IT technicians, support engineers, developers, analysts, and other pertinent positions. The snowball technique was used to gather the applicants. The applicants were approached in different ways. Some were called via the applicant's fellow workers, and some through emails, LinkedIn, and Facebook. The data was collected from different companies working in GSD and on CRM implementation from 17 April 2022 to 23 June 2022. The complete operation of collecting the empirical data is durable for two months. A total of 340 questionnaires were spread among the applicants, out of which 180 were answered completely accurately. All the questionnaires were contemplated and eliminated lacking entries.

3.3.3. Data Analytical Approach

The present investigation employed Partial Least Squares-Structural Equation Modeling (PLS-SEM) as the statistical technique for analysis. The variables are formative and are recommended by [80]. Therefore, PLS-SEM was deemed appropriate for the present study

as it can handle complex models and small sample sizes. PLS-SEM comprises two interconnected models: the measurement model and the structural model. The measurement model characterizes the correlation between the unobserved variables and the observed indicators or survey data, whereas the structural model defines the associations between the latent variables. It is a multivariate analysis technique that examines complex relationships between variables [78]. The relation between endogenous and exogenous elements is appraised through SEM at once rather than performing it individually [58]. To achieve reliable outcomes in the structural equation modeling, the selected sample size of the survey of this study is larger than the proposed sample size, i.e., 100–150 respondents [64]. Examining the outcomes statistically of the data collected through the questionnaire is implemented by the tool WrapPLS version 7.0 by Kock [65].

4. Results and Findings

The complete exploration of detecting the customer issues that affect CRM implementation for developers in GSD of SLR is presented in this section. Afterward, an empirical investigation of the conceptual model will be discussed. The information obtained from the questionnaire survey and the theoretical framework is verified and analyzed.

4.1. Results from SLR

This segment presents the challenges that affect the implementation of CRM in GSD. The terms identified in the systematic review about developers. To address R-Q1, the hindrances encountered by developers from the customer's perspective, as well as the obstacles that impact the execution of CRM in GSD, are explained comprehensively. Eight factors are recognized from the SLR, including fifty primary studies, and all are presented in Table 3 with their frequencies and percentages. The table indicates that the variable of lack of communication holds a greater frequency than all other recorded variables. According to the stated summary, the other three factors, CD, LD, and GD, negatively influence the CRM settings in GSD. Time–zone differences also somewhat affect the implementation of CRM. Compared to above mention factors, the rest are affecting CRM moderately.

Table 3. Frequency and percentage analysis of the factor affecting the CRM.

Influence Factor	Frequency	Percentage
LC	52	78.7
LD	46	69.6
CD	47	71.2
EXP	27	40.9
CC	30	45.5
TD	39	59.09
MU	23	34.8
GD	46	69.6

- HY1: LC affects CRM in the context of GSD concerning the developer perspective.
- HY2: LD affects CRM in GSD according to the developer's perspective.
- HY3: CD affects CRM in GSD according to the developer's perspective.
- HY4: Inexperienced and unfamiliarity with the domain adversely impact CRM in the GSD.
- HY5: Deficiencies in synchronization and cooperation impact CRM in the GSD industry.
- HY6: From the developers' perspective, TD impacts CRM in the GSD setting.
- HY7: Lack of MU affects CRM in GSD according to the developer's perspective.
- HY8: From the viewpoint of developers, GD influences CRM in the context of GSD.

4.2. Findings of the Empirical Investigation

The empirical examination was conducted and the outcomes are expounded in this section with comprehensive particulars. To address R-Q2, a questionnaire survey was executed among software companies operating in the GSD industry in Pakistan. The outputs of every hypothesis were probed and inspected.

4.2.1. Profile of Respondents Based on Demographics

A comprehensive investigation of a questionnaire is necessary during the time of performing an experimental evaluation. The basic essential details of the respondents related to the organization effectively gain more accurate results [99]. This current research assembles demographic and organization-related data of the respondents. To procure more accurate and genuine survey observations. This part of the research sums up the experimental evaluation performed. Concerning QR2, the questionnaire survey was devotedly conducted. To procure accurate results from the survey the selection of sample size for PLS-SEM is over 150 [100]. In this research, 180 samples appeared.

4.2.2. Organization Related Information

Before executing the survey, it is very important to have knowledge about the software organizations, by what method employees were employed, and the types of projects in that organization. It is significant to look into the organizations based on GSD, what type of projects are organized there, and also how many employees are working in that software company. All details about the nature of the project and the number of employees are illustrated in Figures 6 and 7. This study aims to emphasize the software organizations that are working globally and operating CRM and what sort of projects are organized.

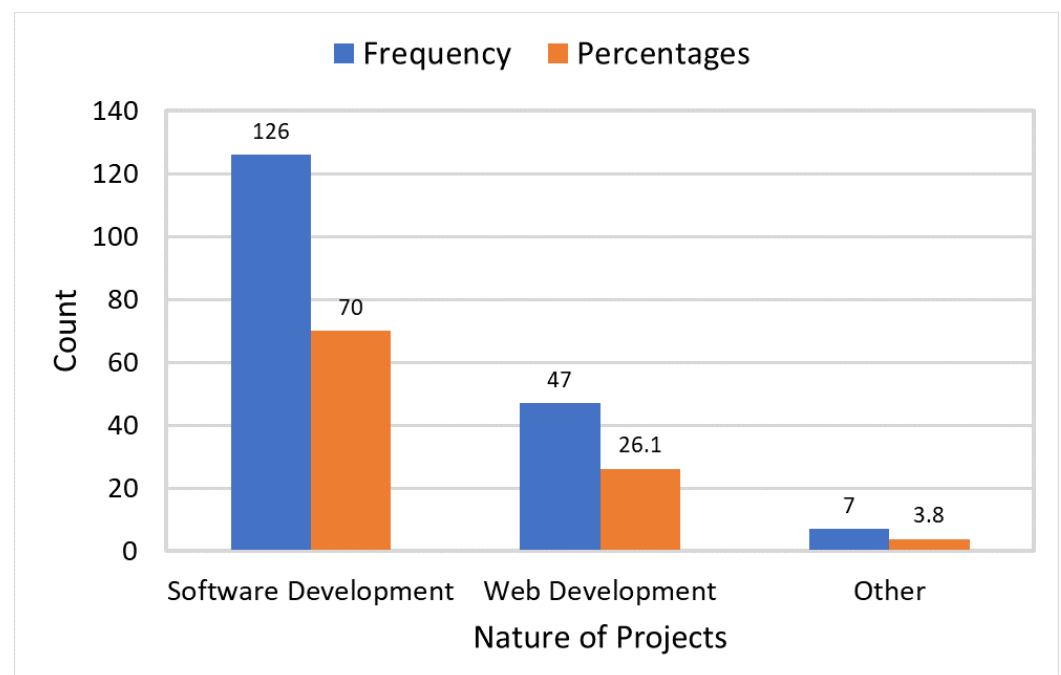


Figure 6. Information of the organization based on the nature of projects for the conducted questionnaire.

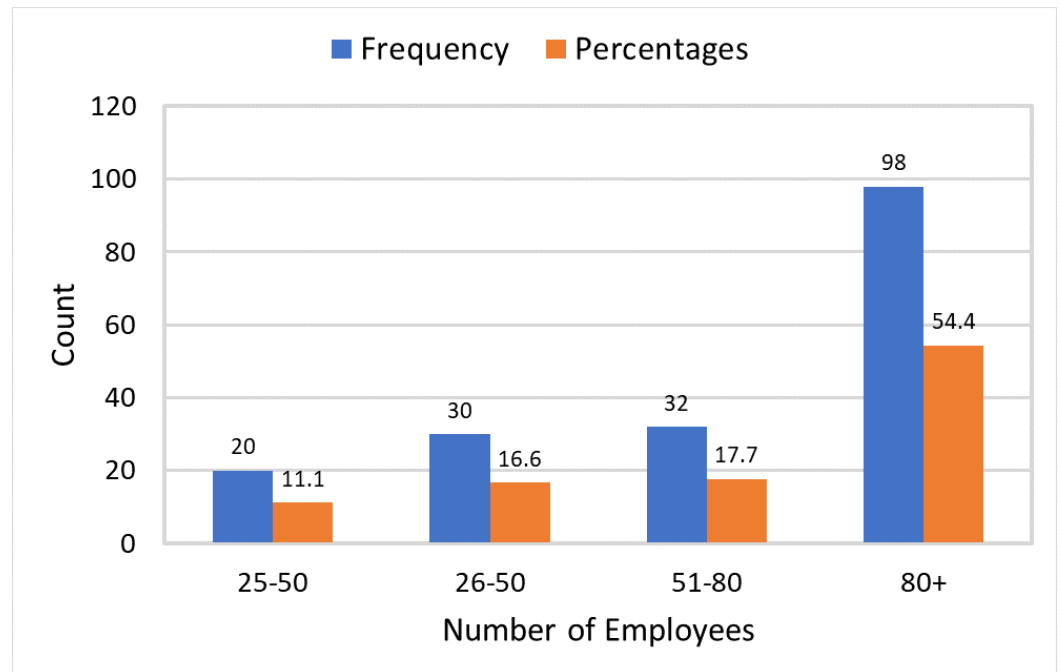


Figure 7. Information of the organization based on the number of employees for the conducted questionnaire.

4.2.3. Reliability Analysis of a Questionnaire Survey

To investigate the reliability and consistency of the survey questionnaire, Cronbach's Alpha test was practiced in this paper. Cronbach's Alpha is utilized for various scale elements to discover whether the elements involved are converged or not. In ideal conditions, the values of both procedures must be greater than 0.70, but a value of 0.60 is also acceptable according to the authors of [100]. If the value of Cronbach Alpha is 0.80, then it is contemplated good, and if the value is greater than 0.90, it is not contemplated significant because there is the possibility of unnecessary or replication [101]. A high Cronbach's Alpha indicates good reliability, but if the value is greater than 0.90, then it may suggest that some elements are not contributing toward unique information having a high correlation with each other. Therefore, these elements could potentially be omitted from the scale because these elements are measuring the same hidden/underlying patterns. Hence, Cronbach's Alpha above 0.9 causes a possibility of unnecessary replication in the scale being measured [102]. The use of every construct was inspected individually for accurate analysis. Cronbach's Alpha test works to assess the accuracy of the survey, which is analytically significant and also reveals that all variables of particular constructs are reliable for evaluation. Table 4 shows details of each factor's Cronbach Alpha values.

Table 4. Cronbach Alpha results

Barriers	No. of Items	Cronbach's Alpha
Lack of Communication	3	0.764
Language Difference	3	0.783
Culture differences	3	0.731
Experience and Domain Knowledge	3	0.742
Coordination and Collaboration	3	0.809
Temporal Difference	3	0.846
Mutual Understanding	3	0.788
Geographical Distance	3	0.831

4.2.4. Data Normality

For the performance of supplemental analytical calculations, the data used in this paper must be normalized. Consequently, to carry out statistical measurements, normal scattering of the variable used in the particular construct is required [103]. If the data normalization is not done, it may affect the estimation or outcomes of the evaluation [103]. The normality of the fact can be examined by applying graphical inspection and vision investigation that may embrace probability or scattered plots [104]. Moreover, the normality of the data is also inspected through multiple intimations, such as Kurtosis and Skewness. Kurtosis is described or calculated in which data are heavy or light-tailed compared to a common diffusion, and on the other hand, Skewness is described as a level of equilibrium or, specifically, the scarcity of the equilibrium. The data set contemplates equilibrium if it comes into view from the left side to the right side of the focal point. If the value of the data of Kurtosis is high, then it shows signs of high tails and irregularity, and if the value of data of Kurtosis is low, it shows signs of light tails and incline with no irregularity. A consistent scattering is observed as an exceptional type [105]. The value of the Skewness is equal to zero if it is normally distributed, and the value of Kurtosis is equal to 3. So the acceptable values for the Skewness are between -1.96 to $+1.96$, and for the Kurtosis is -3 to $+3$ [105]. Therefore, if the values of Skewness and Kurtosis lie in the specified scale, then it indicates that the data is normally distributed. Data normality is Kurtosis, and the Skewness of all the items of the constructs is presented in the next subsection.

4.2.5. Descriptive Statistics

Descriptive statistics of each item of the construct used in the questionnaire of this study are presented in Table 5. That includes the mean, standard deviation, skewness, and kurtosis of each item of the particular construct. Furthermore, Figure 8 shows a visual analysis of the aggregated mean, standard deviation, and skewness scores of each identified critical challenge affecting sustainable CRM implementation in enterprise GSD.

Table 5. Data normality analysis of the highlighted critical challenges influencing CRM in enterprise GSD.

Item	Mean	Std. Dev	Skewness	Kurtosis
LC1	1.99	1.049	0.778	0.017
LC2	2.20	0.911	0.712	−0.013
LC3	2.12	0.795	0.862	1.308
LD1	2.11	0.761	0.318	−0.302
LD2	2.38	1.031	0.212	−0.633
LD3	2.14	0.865	0.215	−0.702
CD1	2.15	1.029	0.762	−0.014
CD2	2.21	0.917	0.619	0.017
CD3	1.95	0.798	0.872	1.380
EXP1	2.33	0.766	0.338	−0.303
EXP2	2.52	1.651	0.222	−0.713
EXP3	2.21	0.935	0.225	−0.982
CC1	2.23	0.852	0.318	−0.302
CC2	2.28	1.031	0.232	−0.713
CC3	2.21	0.925	0.216	−0.906
TD1	2.23	0.866	0.328	−0.307
TD2	2.58	1.051	0.232	−0.733
TD3	2.41	0.965	0.215	−0.902
MU1	2.13	0.846	0.318	−0.304
MU2	2.48	1.071	0.212	−0.731
MU3	2.41	0.935	0.211	−0.908

Table 5. Cont.

Item	Mean	Std. Dev	Skewness	Kurtosis
GD1	2.11	0.816	0.318	−0.317
GD2	2.18	1.031	0.212	−0.713
GD3	2.21	0.915	0.235	−0.912
CRM1	2.23	0.866	0.328	−0.307
CRM2	2.28	1.051	0.232	−0.733
CRM3	2.21	0.915	0.217	−0.901
CRM4	2.33	0.827	0.321	−0.303
CRM5	2.68	1.021	0.212	−0.731
CRM6	2.51	0.915	0.211	−0.904
CRM7	2.43	0.896	0.321	−0.304
CRM8	2.51	1.051	0.235	−0.734

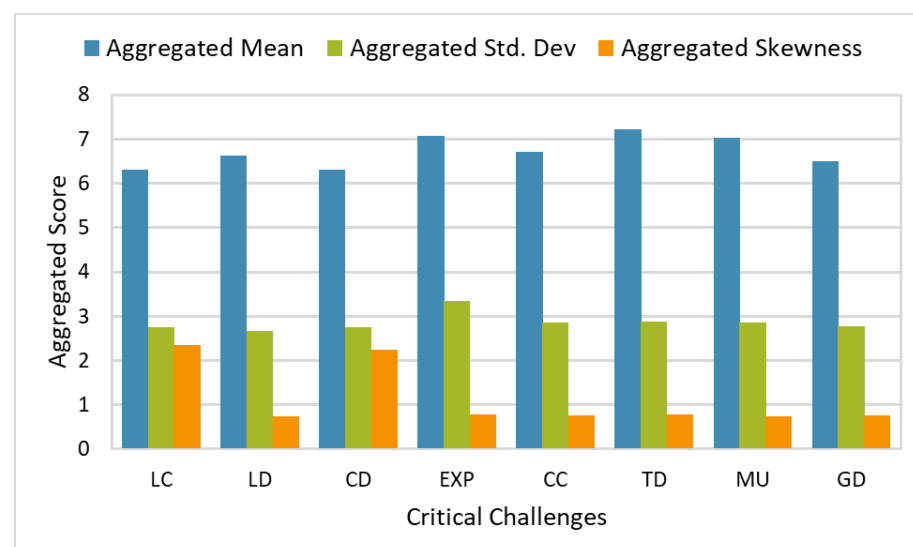


Figure 8. Descriptive analysis of aggregated mean, standard deviation, skewness of identified critical challenges affecting sustainable CRM in enterprise GSD.

4.2.6. Quantitative Analysis

The current investigation utilized the PLS-SEM approach, which involves two stages: the measurement and structural models. First, check the authenticity and accuracy of all the constructs for evaluating the measurement model. Next, we used a structural model in which the relationship between constructs takes place and was tested. To know the actual and genuine outcomes for path coefficients linked to direct effects, the model analysis supplemental proffer. In this research, a stable sampling technique is implemented [74].

Measurement Model

This research presents a conceptual model which is formative. The conceptual model contains eight exogenous constructs (Lack of communication, Language difference, Experience and domain knowledge, coordination and collaboration, time-zone difference, cultural difference, and one endogenous variable (challenges in CRM within the GSD context). The authors recommend the PLS Model B for the analysis of the formative measurement [106]. Consequently, PLS Model B is employed to assess the measurement model while evaluating the formative construct, which is verified by obtaining a Variance Inflation Factor (VIF). For the assessment of VIF, the following are the rules:

- If the value is smaller than five, then VIF is accepted and ideal if smaller than three [107].
- If the Value of Tolerance is equivalent to or smaller than 0.989, then it is accepted [100].

- To appraise the soundness of the formative conception, the weights, and loading of the indicators, as well as their quality for analysis and review, were assessed [108].
- It is recommended that an item be considered acceptable if it has a factor loading greater than >0.50 [100].

Furthermore, the assessment of the proposed formative approach based on several indicators, such as VIF, loading (L), tolerance (T), and weights (W), shown in Table 6.

Table 6. Assessment analysis of proposed formative measurement approach.

#	L	W	Significance	Full Col-Linearity	T	VIF
LC-1	0.853	0.384	<0.001	2.757	0.559	1.796
LC-2	0.906	0.505	<0.001		0.531	1.890
LC-3	0.780	0.285	<0.001		0.618	1.623
LD-1	0.748	0.221	<0.001	1.842	0.524	1.916
LD-2	0.735	0.306	<0.001		0.563	1.783
LD-3	0.782	0.295	<0.001		0.507	1.980
CD-1	0.742	0.312	<0.001	1.420	0.711	1.415
CD-2	0.879	0.508	<0.001		0.615	1.636
CD-3	0.732	0.323	<0.001		0.737	2.010
EXP-1	0.860	0.332	<0.001	1.621	0.441	2.248
EXP-2	0.904	0.384	<0.001		0.378	2.624
EXP-3	0.868	0.441	<0.001		0.533	1.861
CC-1	0.770	0.408	<0.001	1.624	0.530	1.891
CC-2	0.811	0.379	<0.001		0.454	2.221
CC-3	0.89	0.452	<0.001		0.406	2.487
TD-1	0.832	0.457	<0.001	1.101	0.527	1.891
TD-2	0.851	0.363	<0.001		0.473	2.109
T-D3	0.780	0.204	<0.001		0.508	1.961
MU-1	0.864	0.375	<0.001	1.844	0.363	2.734
MU-2	0.905	0.377	<0.001		0.318	3.119
MU-3	0.866	0.377	<0.001		0.438	2.272
GD-1	0.923	0.549	<0.001	2.064	0.466	2.139
GD-2	0.838	0.118	<0.001		0.329	3.024
GD-3	0.781	0.249	<0.001		0.521	1.912
CRM-1	0.515	0.167	<0.001	3.926	0.783	1.277
CRM-2	0.585	0.196	<0.001		0.903	1.112
CRM-3	0.440	0.121	<0.001		0.858	1.173
CRM-4	0.569	0.165	<0.001		0.664	1.496
CRM-5	0.562	0.178	<0.001		0.682	1.472
CRM-6	0.72	0.185	<0.001		0.709	1.408
CRM-7	0.466	0.143	<0.001		0.684	1.455
CRM-8	0.582	0.193	<0.001		0.982	1.017

Hence, the formative constructs are considered valid, as evidenced by the evaluation. The assessment of the measurement framework shows statistically noteworthy outcomes.

Model Structural

The path coefficients, effect size, and R2 coefficient value of the endogenous variable (i.e., CRM issues), as well as T-values, were calculated using Wrap PLS 7.0 to test the hypothesis and assess the structural model. To calculate the T-value, the path coefficient must be divided by the standard error, and the T-value threshold should exceed either 1.64 or 1.96 [88]. A p -value threshold of < 0.05 is also recommended [78]. As the Wrap 3 algorithm is deemed to be the most suitable algorithm for calculating path coefficients for formative models, it was utilized to assess the structural model. Different statistical

measures are taken into account to highlight the importance of hypothesis testing, T-value, path coefficients, and effect size.

4.3. Comparative Analysis

This subsection presents a comparative analysis to evaluate the convergent and discriminant significance of the CRM factors between SLR and empirical studies using correlation. Correlation analysis is used to investigate the degree of association between CRM factors scores obtained from SLR and empirical studies that are theoretically related. On the other hand, it can also be used to investigate discriminant validity by analyzing correlation scores obtained from different scales. In this study, a SPSS software (SPSS 26) is used to employ Spearman's rank-order correlation for analyzing monotonic relationship. Furthermore, Figure 9 shows a relative investigation of an SLR and experimental study situated on the extricate variables. For instance, it is obtained from the empirical study that a lack of coordination and collaboration possesses a high frequency of 83.1%, and in SLR lack of communication possesses a high frequency of 78.7% from other variables.

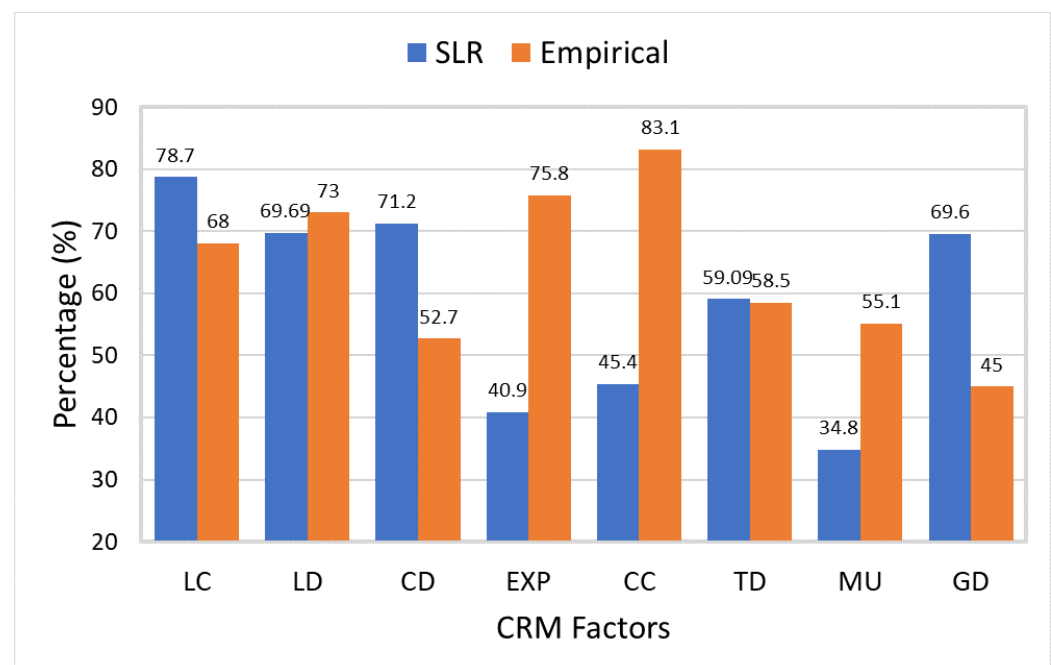


Figure 9. Percentage analysis of SLR and empirical studies for influential factors.

This research differentiates SLR from empirical studies in examining the variables that badly influence CRM in GSD. The previously mentioned variable's likelihood changes from industry to industry as well as divergent as a consequence of topographic separation covering several borders. To discover the censorious factors in SLR and in empirical analysis, if the recurrence of the variable is 50%, then the variable is accepted as censorious. The present research results show that three variables are tremendously censorious experience, domain knowledge coordination and collaboration, and language difference. These results assist the developers and software companies outsourcing. Moreover, these findings assist in determining which variables affect CRM the most and what factors do not tremendously affect it in GSD.

5. Discussion

This research shows that CRM is pivotal in the GSD context [24]. The paramount aim of the study was to indicate every single challenge that customers face in GSD and raise CRM implantation in GSD. A systematic study was executed to explore the eight variables. To explore the consequences of the pick-out variables affecting CRM in GSD, a conceptual framework has been developed to determine and explain the variables. Various

software industries in Pakistan operating CRM in the GSD context were elected to procure data covering the variables influencing CRM application in GSD and badly changing the working conditions. Table 7 provides an in-depth discussion of the importance of hypothesis testing, T-value, path coefficients, and effect size. By considering the results in Table 7, these outcomes are summarized: Insufficient communication secured a great impression on CRM, having a value of path coefficient of 0.123, with a T-value of 2.068 apropos $p = 0.02$, which is scientifically considerable. The LD is substantial according to the defined criteria, having a great impression on CRM, having a value of path coefficient of 0.249, with a T-value of 3.067 apropos $p < 0.01$. The CD is substantial, with a great impression on the endogenous variable with a path coefficient value of 0.164 and a T-value of 2.241 apropos $p < 0.05$. In addition, experience and domain knowledge secured a great impression on CRM, having a value path coefficient of 0.122, with a T-value of 2.363 apropos $p = 0.03$, which is scientifically considerable. Likewise, coordination and collaboration, time-zone difference, and mutual understating are scientifically considerable and have a great impression on CRM, simultaneously substantially assure the criteria, i.e., CC having a value of path coefficient of 0.198, TD 0.121, and MU 0.119. IT-value for CC is 3.056 at $p \leq 0.01$, TD is 2.071 at P0.04, and MU is 1.780 at $p = 0.02$. In contrast, geographical distance is not substantial and not having a good impression on CRM with low values i.e., path coefficient is 0.088 and T-value is 1.475 apropos $p = 0.07$. So, it is clear from the results that H1, H2, H3, H4, H5, H6, and H7 have a great impression on CRM and are scientifically considerable, except H8 has no good impression on CRM and is not substantial. The value of R2 is 0.75, which is an endogenous construct CRM. If the value of R2 is ≤ 0.05 , it is scientifically considerable [73]. So, the effect size R2 of CRM is acceptable scientifically. Six global fitness designate standard calculations for the entire model analysis using WrapPLS 7.0. The model is scientifically significant if it follows the below-mentioned criteria: If values of P for APC, ARS, and AARS are ≤ 0.05 are sustainable [63]. Generally, the AARS means adapted R-squared has a tendency to be lower than the adapted R-squared mean (AARS) described in [100]. According to [106], it is recommended that the average block AVIF and average full collinearity AFVIF be considered significant if their values are ≤ 5 , and exemplary if ≤ 3.3 .

This study achieves the specified calculations [109] and possesses a p -value of APC, ARC, and AARS ≤ 0.05 . The P-value of AARS was 0.744, and ARS was 0.756; both procure the specified criteria [110]. In addition, the values of AVIF and AFVIF were also measured. Appropriately, both establish the modern dimensions that improve the evaluation of the catch-all descriptive condition of the framework [111]. Depending on the recommended calculations, the results of this research substantiate specified standards that the AVIF and AFVIF values were ≤ 3.3 . This illustrates that the mentioned values are preferably contented. The analysis of the structural framework was scientifically considerable.

Table 7. Assessment analysis of the proposed formative structural approach.

Hypothesis Testing	Path Coefficient	SE	T-Value	p -Value	ES	Outcomes
HY1:LC $\Rightarrow$ CRM	0.123	0.064	2.068	0.02	0.332	Supported
HY2:LD $\Rightarrow$ CRM	0.249	0.065	3.067	<0.01	0.145	Supported
HY3:CD $\Rightarrow$ CRM	0.164	0.066	2.241	0.04	0.250	Supported
HY4:EXP $\Rightarrow$ CRM	0.122	0.066	2.363	0.03	0.065	Supported
HY5:CC $\Rightarrow$ CRM	0.198	0.065	3.056	<0.01	0.138	Supported
HY6:TD $\Rightarrow$ CRM	0.121	0.064	2.071	0.04	0.253	Supported
HY7:MU $\Rightarrow$ CRM	0.119	0.066	1.780	0.02	0.064	Supported
HY8:GD $\Rightarrow$ CRM	0.088	0.065	1.475	0.07	0.018	Not Supported

Furthermore, Figure 10 illustrates an assessment analysis focusing on the supported elements. This analysis encompasses key metrics, namely Beta coefficient value, p -value, and ES (Effect Size). The beta coefficient indicates the strong relationship between the supported elements. Similarly, the p -value, on the other hand, is a statistical measure that

helps determine the significance of these relationships. It can be seen that the p -value of the supported elements is lower, which indicates a more significant relationship between these supported elements. Furthermore, a larger ES suggests a more substantial impact or difference. It can be seen that the ES value of the supported variables is large compared to the GD; resulting supported elements have a significant impact on CRM in GSD.

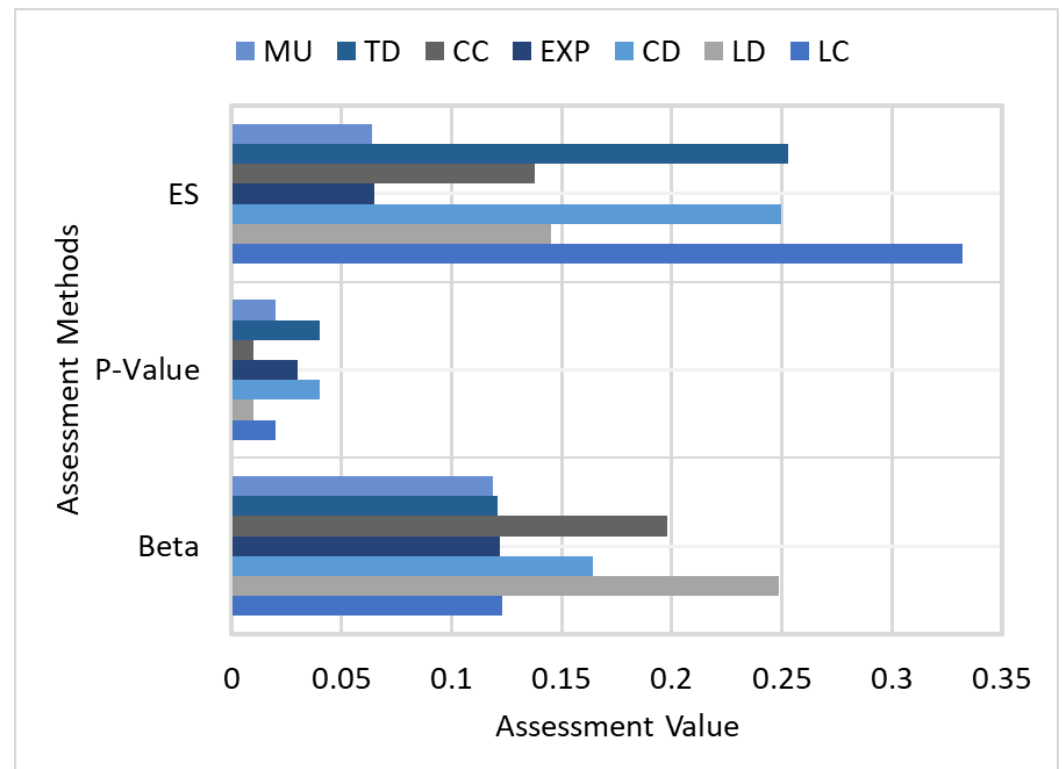


Figure 10. Assessment analysis focusing on the supported elements.

Several challenges faced by the developers during CRM implementation are probed from the literature but not assessed simultaneously, and also not looked over to their effects [112]. The present research calls attention to the consequences of the recognized challenges and studies the impact of these challenges on the implementation of CRM in organizations working globally. The systematic study analysis was conducted to explore the variables that badly affect CRM execution in GSD to direct R-Q1. Similarly, eight variables have been recognized from the chosen studies. These eight variables encompass LC, LD, MU, CD, CC, TD, EXP, and GD. A conceptual framework has been proffered to investigate the impact of the recognized challenges of CRM while outsourcing. Operating statistical analysis empirically investigated the conceptual framework and speculation to answer R-Q2.

The present model consists of eight variables that negatively influence CRM in GSD. The questionnaire was performed in software organizations in Pakistan working globally to assess the effect of the variables on CRM. This study appraises and probes the impact of all eight variables that are raised in the literature study. This study undertakes an experimental calculation and estimation of the impact associated with all identified elements outlined in the literature. The empirical findings from the review affirm that both inexperience and a deficiency in domain knowledge affect CRM within the GSD industry. Moreover, these factors significantly contribute to the breakdown of successful CRM applications [113]. Likewise, the other six variables also affect CRM except for geographical distance. These seven challenges affect CRM applications and show the failure of the project. This research also validates the seven factors' hypothesis and illustrates that the relationship between these variables and CRM is directly proportional. Contrarily, focusing on the present study's

outcomes, geographical distance does not validate the hypothesis [114]. So, geographical distance has no impact on CRM implementation while outsourcing. Therefore, the current study's findings diverge from the explanation provided in the literature, indicating that geographical distance does not negatively impact the implementation of CRM in GSD. This discrepancy could be attributed to the increasing array of electronic communication options over time, diminishing the perceived negative influence of geographical distance on CRM applications by stakeholders.

In this modern era, software companies' outsourcing progresses and accelerates, decreasing the topographic separation issue. Hence, it has been determined that these challenges significantly impact CRM applications. Accordingly, outsourcing entities and industries should prioritize addressing these challenges to ensure project success and enhance client satisfaction. Spearman's correlation experiment was conducted in response to R-Q3 to differentiate the recognized challenges of SLR and experimental analysis. The correlation investigation scrutinizes the connection between the rankings of CRM variables recognized in the experimental examination and SLR. Spearman's approach inspects the likeness and discrepancies between the SLR and experimental study. The outcomes of this method display a notable correlation between the two ranking groups. The acceptable guideline for the coefficient correlation range is from +1 to −1 [90], and the obtained value is 0.501, which is substantial. On the other hand, $p = 0.005$ satisfies the criteria, i.e., it should be lower than 0.01. So, the outcome is evident that there is a substantial correlation. This study presents the experimental assessment of eight variables that affect CRM applications while outsourcing. The conceptual framework and the hypothesis developed narrate that these factors affect CRM while outsourcing. Developers and organizations should concentrate on these acceptable challenges to avoid project failure.

6. Conclusions and Future Work

In conclusion, this research has highlighted critical challenges in CRM implementation within global software development (GSD) organizations. The findings underscore the importance of client satisfaction for the software industry, recognizing that clients are pivotal stakeholders. The challenges customers face are not only substantial but are also expected to increase with the advancement of GSD practices. Effective communication and coordination between clients and developers throughout the project's life-cycle are essential. However, our research has identified several challenges that hinder the successful implementation of CRM applications during outsourcing.

The primary contributions and main conclusions of this study can be summarized as follows:

1. Management commitment, staff involvement, allocated resources, and pilot projects are identified as critical success factors for CRM implementation in GSD.
2. Lack of resources, inexperienced staff, organizational politics, and time pressure are identified as critical barriers that hinder the successful adoption of CRM in GSD.
3. The research outcomes serve as a valuable resource for software industry researchers and practitioners, aiding them in recognizing and addressing the significant challenges present in the GSD industry.

For future studies, it is recommended to delve deeper into the specific challenges identified in this research. Further investigation should consider customer and developer perspectives in a single study to gain a holistic understanding of the primary issues from both viewpoints. Additionally, research should focus on identifying and implementing mitigation strategies for CRM application challenges. Future work can extend beyond quantitative analysis to encompass qualitative research approaches. Furthermore, adopting a case study approach would provide a more in-depth understanding of challenges negatively impacting CRM in the GSD industries.

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Appendix A

The following acronyms are used: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), and Strongly Agree (SA).

Table A1. Section D-CRM in GSD (construct related in formation).

Sustainable CRM Items	SD	D	N	A	SA
Lack of communication directly affects CRM in GSD.	1	2	3	4	5
Language Difference directly influence CRM in GSD.	1	2	3	4	5
Cultural Differences negatively influence CRM in GSD.	1	2	3	4	5
Lack of experience and domain knowledge directly affects CRM in GSD context.	1	2	3	4	5
Collaboration and coordination issues negatively affect CRM in GSD.	1	2	3	4	5
Temporal difference influences CRM in GSD.	1	2	3	4	5
Lack of mutual understanding is a potential barrier to CRM implementation in GSD.	1	2	3	4	5
Geographical distance negatively influences CRM in GSD.	1	2	3	4	5

Table A2. Section C-Issues affecting CRM (customer relationship management in GSD (global software development)).

Lack of communication Items	SD	D	N	A	SA
1: Fewer chances for simultaneity influence CRM in enterprise GSD.	1	2	3	4	5
2: In-efficacious information with consideration to requirements wants influence CRM.	1	2	3	4	5
3: Disturbance take place via telecommunication due to small capacity.	1	2	3	4	5
Language Difference Items	SD	D	N	A	SA
1: linguistic subject influence CRM in enterprise GSD.	1	2	3	4	5
2: Dialect incompetence consequence slows down work.	1	2	3	4	5
3: Language influences the conception of customer descriptions.	1	2	3	4	5
Experience and Domain Knowledge Items	SD	D	N	A	SA
1: Usually, clients fail to provide all of the functional requirements because of a lack of domain knowledge.	1	2	3	4	5
2: Due to the absence of experience and domain knowledge, clients have no idea of project prolongation.	1	2	3	4	5
3: Absence of experience and domain knowledge initiate dubiousness.	1	2	3	4	5

Table A2. Cont.

Lack of Coordination and Collaboration Items	SD	D	N	A	SA
1: Customer inadequacy influences collaboration and coordination, which upshot CRM.	1	2	3	4	5
2: Customer misconceptions influence collaboration and coordination.	1	2	3	4	5
3: Customer's lack of interaction with the project influences collaboration and coordination that directly influence CRM in enterprise GSD.	1	2	3	4	5
Cultural Differences Items	SD	D	N	A	SA
1: Conflicting with workdays (holidays) influences CRM in GSD.	1	2	3	4	5
2: Semantic variance directly impacts CRM in enterprise GSD.	1	2	3	4	5
3: Socio-demographic inequality influences CRM in enterprise GSD.	1	2	3	4	5
Time-Zone Differences Items	SD	D	N	A	SA
1: Customer involvement gets limited due to time-zone differences.	1	2	3	4	5
2: The absence of continual responses influences CRM in enterprise GSD.	1	2	3	4	5
3: A couple of hours overlying influence CRM in enterprise GSD.	1	2	3	4	5
Lack of Mutual understandings Items	SD	D	N	A	SA
1: Customer inability to transfer knowledge of the project influences CRM in enterprise GSD.	1	2	3	4	5
2: Less Interaction affects mutual understanding.	1	2	3	4	5
3: Misinterpretation boosts project prolongation, influencing CRM in enterprise GSD.	1	2	3	4	5
Geographical Distance Items	SD	D	N	A	SA
1: There were no one-to-one interviews because of the topographical gap.	1	2	3	4	5
2: The absence of continual feedback influences CRM.	1	2	3	4	5
3: Information send due to geographical distance result in data loss.	1	2	3	4	5

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