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A Systematic Snapshot of Software Outsourcing Challenges

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Abstract: Outsourcing software development projects can be challenging, and there are several common challenges that organizations face. A study was conducted with a sample of 46 papers on outsourcing challenges, and the results show that there are several common challenges faced by organizations when outsourcing software development projects. Poor outsourcing relationship was identified as the most significant challenge, with 35% of the papers referencing it. Lack of quality was the second most significant challenge, with 33% of the papers referencing it. Language and cultural differences were the third most significant challenge, with 24% of the papers referencing it. Non-competitive price was another challenge faced by organizations, with 21% of the papers referencing it. Poor coordination and communication were also identified as a challenge, with 21% of the papers referencing it. Opportunistic behaviour, lack of contract negotiation, inadequate user involvement, and constraints due to time zone were also challenges faced by organizations. Other challenges faced by organizations included poor project management, lack of technical capabilities, vendor employee high turnover, poor requirement specification, IPR issues, poor management of budget, schedule, and delay, geopolitical and country instability, the difference in development methodologies, failure to manage end-user expectations, and poor monitoring and control. In conclusion, outsourcing software development projects can be challenging, but organizations can mitigate these challenges by selecting the right outsourcing partner, having a well-defined contract and clear communication, having a clear understanding of the requirements, and implementing effective project management practices.

Keywords: Software outsourcing, Vendor, Outsourcing challenges, Quality model, Continent, Country, Global outsourcing, IT Workforce Outsourcing.

Introduction

Outsourcing has been a topic of discussion for many decades, and Ross Perot is considered one of the pioneers of the concept. The idea behind outsourcing is to transfer non-core business activities to an external provider, in this case, a software development company, in order to reduce costs, access new skills and talent, and improve the quality of products. In today's highly competitive business environment, software outsourcing has become a popular strategy for IT companies to gain a competitive advantage. By outsourcing certain software development activities, companies can take advantage of the lower labor costs, expertise, and improved efficiency offered by outsourcing firms. This allows IT companies to focus on their core competencies and invest their resources into areas where they can differentiate themselves from their competitors.

However, as with any business strategy, there are also challenges associated with software outsourcing that need to be considered and managed effectively. The systematic literature review you conducted highlights the importance of managing outsourcing relationships in order to ensure the desired quality of software development work is met, and that the challenges encountered in SDO can vary based on specific circumstances.

Software Development Outsourcing (SDO) and Global Software Engineering (GSE) are techniques used to create and develop high-quality software products at a lower cost in low-wage countries. By outsourcing software development tasks, companies can take advantage of the expertise and lower labor costs offered by external software development organizations.

In recent years, there has been a trend towards using open-source software in industrial software development, which means that the industrial vendor needs to evaluate the quality of the open-source product before delivering it to the user. Ensuring the quality of both the internal and external aspects of the product is a key factor in the success of software outsourcing.

The IT outsourcing market is expected to grow significantly in the coming years, according to a recent research report by Statista. The "IT Outsourcing Market by Service, End-user, and Geography - Projected and Analysis 2020-2024" report projects that the IT outsourcing market will expand by USD 98 billion over the forecast period of 2020-2024. This highlights the growing demand for outsourcing services and the potential for growth in the industry.

Software outsourcing does have a poor reputation in some cases due to the difficulties in finding the right balance between cost and quality. There are several challenges associated with outsourcing software development, including:

- Communication barriers: Different time zones, language barriers, and cultural differences can make it difficult for outsourced software development teams to effectively communicate with each other.
- Misaligned goals and expectations: Outsourced software development teams may have different goals and expectations compared to the company that is outsourcing the work, which can lead to misunderstandings and project failures.
- Quality control: Ensuring the quality of software development work can be difficult when outsourcing, as the outsourced team may have different processes and standards compared to the company that is outsourcing the work.
- Dependency on external vendors: Companies that outsource software development work become dependent on their external vendors, which can create risks if the vendor is not reliable or if the relationship between the company and vendor breaks down.
- Intellectual property issues: There may be legal and intellectual property issues associated with outsourcing software development work, such as ownership of the software and protection of confidential information.

It's important for companies to carefully consider these challenges and take steps to mitigate them when outsourcing software development work. This may include implementing clear communication processes, setting clear goals and expectations, and carefully evaluating potential outsourcing partners to ensure they have the skills and experience needed to deliver high-quality software development work.

Research Methodology

Our research methodology was designed with protocols to quickly address the relevant themes. In the initial phase, we selected popular search phrases related to Software Development Outsourcing (SDO), such as systematic literature reviews and mapping studies. We chose the Systematic Literature Review (SLR) as the data collection method as it is an unbiased method of collecting data. This approach helps in the systematic collection of information from the original studies included. The key steps of the methodology are depicted in Figure 1

Research Questions

The objective of this research is to shed light on an overlooked aspect of the scientific literature on outsourcing. The focus of this study is on the challenges faced in outsourcing. The research questions related to the topic of this study is “What are the challenges associated with software outsourcing?” The main questions are aimed at providing answers to the main topic of this research, which is the challenges of outsourcing and its impact on product quality. This study also aims to identify the major challenges of outsourcing and categorize them accordingly

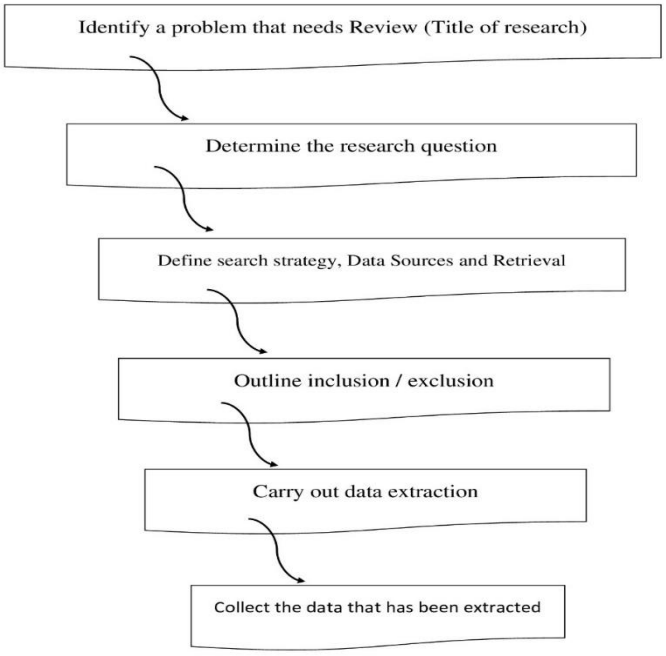

Figure 1. The SLR protocol

Search Strategy

Our research strategy was designed with procedures to efficiently address the relevant themes. The first step involved selecting popular search phrases related to Software Development Outsourcing (SDO), such as systematic literature reviews and mapping studies. The scope of the study was then established in the second step. The Scopus/IEEE database was instrumental in updating and maintaining the usefulness of the keywords. The key keywords are listed in Figure 2.

("software development outsourcing (SDO)" OR "Software outsourcing" OR" vendor "OR "Outsourcing challenges" OR "Quality" OR "ISO 9126 quality model" OR" Continent" OR" country" OR "global outsourcing "OR" IT Workforce Outsourcing")

Figure 2. List of keywords used as search

Data Sources and Retrieval

We chose numerous digital repositories for this study listed below:

- "IEEE Xplore (http://ieeexplore.ieee.org)"
- "ACM Digital Library (http://dl.acm.org)"
- "Springer Link (link.springer.com)"
- "Science Direct (http://www.sciencedirect.com)"
- "Google Scholar (scholar.google.com)"
- "IET-digital libraries (www.theiet.org)"

Furthermore, we limited the number of keywords to achieve the focus of our study and locate relevant sources in the field. The search was conducted between 2019 and 2022 and focused on peer-reviewed titles, abstracts, and

keywords in the literature. Based on the initial results, we conducted additional research. The results of the search were then promptly considered in the inclusion process.

Papers Selection Criteria

This section contains two sub-sections: Inclusion criteria and Exclusion criteria. To systematically evaluate related primary studies published in the software engineering domain, we established inclusion and exclusion criteria.

Inclusion criteria: (1) Articles published in a journal, as a conference paper, or as a book chapter, (2) English-language papers, (3) primary studies relevant to the research questions, (4) Papers with findings based on empirical research, (5) Publications that are not focused on the final selection of primary studies (review text), (6) Primary studies that examine outsourcing issues.

Exclusion criteria: (1) Articles not published in English, (2) Articles that do not meet the inclusion criteria, (3) Articles that do not analyze the success factors of software development outsourcing (SDO), (4) Articles written in a language other than English.

Our search process was streamlined by limiting our scope through large databases and by following a peer-review process that began with titles, followed by abstracts, and finally keywords of the publications. Our goal was to expand our database with additional primary studies to meet the scope of our investigation. The final steps included removing duplicate studies and storing the remaining papers for full text review. Figure 3 summarizes the successive procedures and processes of our investigation and shows the final number of papers found in our search.

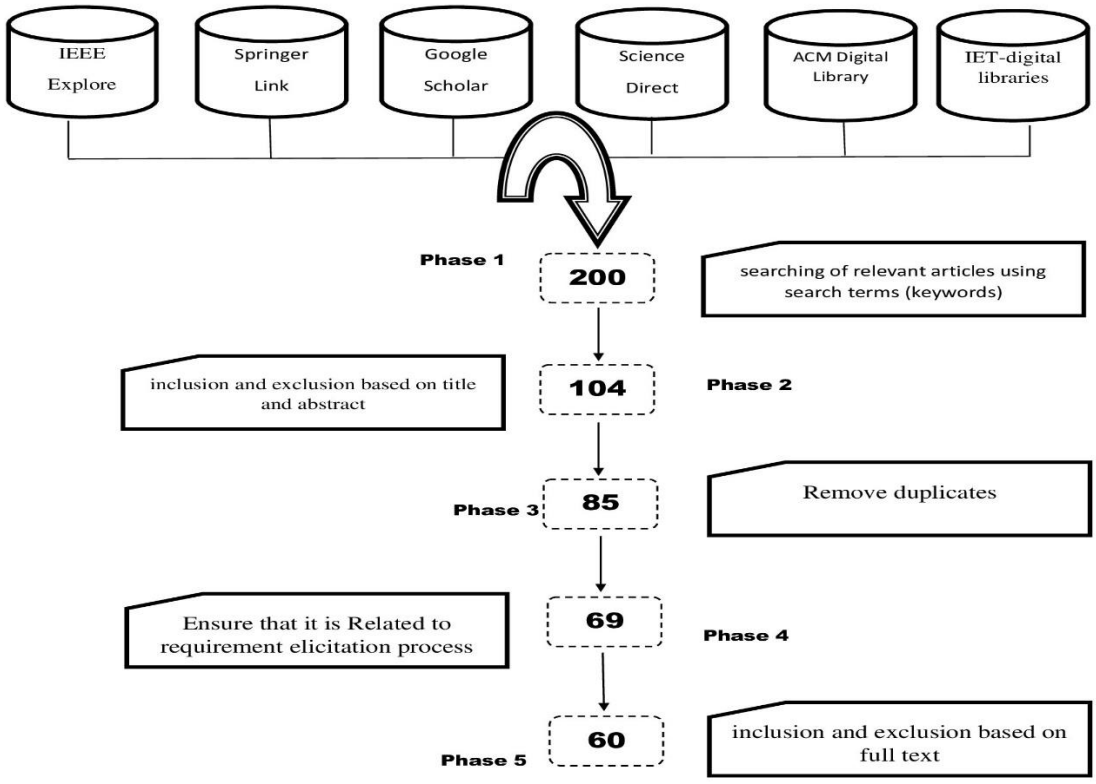

Figure 3. Process of Inclusion and exclusion

Results and Discussion

The section presents the categorization of previous studies and our new categorization scheme for the 200 papers. The statistical categorization is based on publication year, target countries, research method types,

publishers, and article types, while the main categorization focuses on the challenges of outsourcing. The factors and sub-factors in the main work are also included in the classification.

Reporting the Review

The results of the search process are presented in Table 1. Out of the 200 papers found using the major search string, only 46 met the criteria related to the requirement elicitation process. The duplicates were removed, leaving us with a final total of 46 papers. The table shows the distribution of primary study publication years between 2019 and 2022, indicating that research on software outsourcing is still on the rise and will continue to be a significant topic in the future.

Table 1. Summary of selected papers

Source	IEEE	IEEE (Open with money)	ACM Digital Library	Springer Link	Science Direct	IET-digital libraries
Total results retrieved	90	12	20	40	20	18
Exclusion based on title and abstract	50	10	14	19	6	5
Ensure that it is Related to the requirement elicitation process	28	9	12	10	5	5
Exclusion based on full text (Total exclusion)	29	7	7	9	4	4
Overall selection			200			
Final selection			46			

Software Outsource challenges classification

We have categorized the research from previous stages into 46 papers, as previously mentioned, and based on the challenges outlined by (Usman, Khan et al. 2020). In his research, they highlight the challenges that arise during outsourcing into 19 categories. The distribution of these challenges is as follows:

- Weak coordination and communication.
- Bad Outsourcing Relationship
- opportunistic behavior
- Linguistic and cultural differences
- Not negotiating the contract
- Bad project management
- Poor monitoring and control
- Intellectual property rights issues
- lack of technical capabilities
- geopolitical and country instability
- Inferior requirements specification
- The difference in development methodologies
- Fail to manage end-user expectations
- High sales employee turnover
- Restrictions due to time zone
- Poor Mgt. Budget, schedule and delay
- poor quality
- Insufficient user participation
- non-competitive price

Quality is a crucial aspect in software engineering and is often defined as meeting the customer's expectations and standards. The definition provided by the IEEE describes quality as the degree to which a system, component, or process satisfies the stated standards. However, achieving high quality in software development outsourcing, particularly in global software development, is a challenging task due to many factors. The most important factor being poor requirements collection from customers, which is extremely difficult in comparison to internal software development. Research by (Usman, Khan et al. 2020) also emphasized the importance of meeting high quality standards as a crucial turning point in the success of the project. Our literature review showed that the relationship between bad outsourcing and poor quality is a common challenge.

The table 2 presents the challenges faced in outsourcing, based on 46 total papers. The most prevalent challenge is poor outsourcing relationship, affecting 35% of the papers and cited in references 1-16. The second most significant challenge is the lack of quality, affecting 33% of the papers and cited in references 1, 7, 8, 10, 17-27. Language and cultural differences also present a significant challenge, affecting 24% of the papers and cited in references 3, 4, 8, 11, 13, 16, 17, 22, 28-30. Non-competitive price is another significant challenge, affecting 21% of the papers and cited in references 8, 11, 17, 20, 21, 23, 28, 31-33.

Poor coordination and communication is also a significant challenge, affecting 21% of the papers and cited in references 2, 3, 8, 28, 34-39. Opportunistic behavior is cited as a challenge in 15% of the papers, referenced in references 8, 16, 29, 31, 35, 40, 41.

Lack of contract negotiation, inadequate user involvement, constraints due to time zone, poor project management, lack of technical capabilities, vendor employee high turnover, and poor requirement specification are also noted as challenges, each affecting around 10-15% of the papers. IPR issues, poor management of budget, schedule, and delay, geopolitical and country instability, the difference in development methodologies, failure to manage end-user expectations, and poor monitoring and control are also noted as challenges but affecting a smaller proportion of the papers.

Table 2. Challenges classification.

Challenge	Total papers = 46		
	#Challenges	%	Reference
Poor outsourcing relationship	16	35%	(Karimi-Alaghehband and Rivard 2019, Khader and Zein 2019, Wang and Wang 2019, Ali, Huang et al. 2020, Hanafizadeh and Zareravasan 2020, Usman, Khan et al. 2020, Deng, Wang et al. 2021, Drzewiecki 2021, Hussein and Zein 2021, Jain 2021, Jebali, Sassi et al. 2021, Juvekar 2021, Kaveh Pishghadam and Esmaeeli 2021, Khan, Niazi et al. 2021, Elnakeep, Helal et al. 2022, Kocot and Kocot 2022)
Lack of quality	15	33%	(Saqib , Malik and Velan 2019, Ali, Huang et al. 2020, Sharma, Burtsev et al. 2020, Usman, Khan et al. 2020, Jain 2021, Juvekar 2021, Qureshi, Khan et al. 2021, Rahman, Raza et al. 2021, Sahoo and Goute 2021, Sloniec 2021, Suresh and Ravichandran 2021, Veloso, Sousa et al. 2021, Wong 2021, Ren, Yuan et al. 2022)
Language and cultural differences	11	24%	(Saqib , Karimi-Alaghehband and Rivard 2019, Khader and Zein 2019, Malik and Velan 2019, Ali, Huang et al. 2020, Cheng, Fu et al. 2021, Drzewiecki 2021, Kocev 2021, Mehmood and Zulfqar 2021, Elnakeep, Helal et al. 2022, Kocot and Kocot 2022)
Non-competitive price	10	21%	(Karimi-Alaghehband and Rivard 2019, Malik and Velan 2019, Ali, Huang et al. 2020, Sharma, Burtsev et al. 2020, Cheng, Fu et al. 2021, Orlu 2021, Paudel and Kumar 2021, Sahoo and Goute 2021, Lee, Kang et al. 2022, Ren, Yuan et al. 2022)
Poor coordination and communication	10	21%	(Usman and Khan 2018, Ali, Huang et al. 2020,

			Balcet and Ietto-Gillies 2020, ALAGAH 2021, Androsova and Simonenko 2021, Cheng, Fu et al. 2021, DA, ÓRGÃO et al. 2021, Deng, Wang et al. 2021, Drzewiecki 2021, Santos and Silva 2021)
Opportunistic behaviour	7	15%	(Ali, Huang et al. 2020, Androsova and Simonenko 2021, Kocev 2021, Legesse 2021, Looi and Szepan 2021, Kocot and Kocot 2022, Lee, Kang et al. 2022)
Lack of contract negotiation	7	15%	(Karimi-Alaghehband and Rivard 2019, Khader and Zein 2019, Ali, Huang et al. 2020, Androsova and Simonenko 2021, Kaveh Pishghadam and Esmaeeli 2021, Orlu 2021, Suresh and Ravichandran 2021)
Inadequate user involvement	6	13%	(Usman and Khan 2018, Ali, Huang et al. 2020, Androsova and Simonenko 2021, Orlu 2021, Santos and Silva 2021, Ren, Yuan et al. 2022)
Constraints due to time zone	6	13%	(Kazmi, Hafeez et al. 2018, Malik and Velan 2019, Ali, Huang et al. 2020, ALAGAH 2021, Drzewiecki 2021, Mehmood and Zulfqar 2021)
Poor project management	5	10%	(Ali, Huang et al. 2020, Juvekar 2021, Orlu 2021, Paudel and Kumar 2021, Lee, Kang et al. 2022)
Lack of technical capabilities	5	10%	(Ali, Huang et al. 2020, Androsova and Simonenko 2021, Wong 2021, Elnakeep, Helal et al. 2022, Lee, Kang et al. 2022)
Vendor employee high turnover	5	10%	(Ali, Huang et al. 2020, Jain 2021, Ravi and Donawa 2021, Sahoo and Goute 2021, Elnakeep, Helal et al. 2022)
Poor requirement specification	4	8%	(Ali, Huang et al. 2020, Kaveh Pishghadam and Esmaeeli 2021, Rahman, Raza et al. 2021, Rana and Mondal 2021)
IPR Issues	4	8%	(Usman and Khan 2018, Karimi-Alaghehband and Rivard 2019, Ali, Huang et al. 2020, Androsova and Simonenko 2021)
Poor Mgt. of budget, schedule & delay	4	8%	(Ali, Huang et al. 2020, Orlu 2021, Rehman and Khan 2022, Thanh, Gam et al. 2022)
Geopolitical and country instability	3	5%	(Karimi-Alaghehband and Rivard 2019, Paudel and Kumar 2021, Elnakeep, Helal et al. 2022)
The difference in development methodologies	3	5%	(Ali, Huang et al. 2020, Orlu 2021, Rahman, Raza et al. 2021)
Failure to manage end-user expectations	3	5%	(Karimi-Alaghehband and Rivard 2019, Ali, Huang et al. 2020, Jain 2021)
Poor monitoring and control	3	5%	(Ali, Huang et al. 2020, Orlu 2021, Lee, Kang et al. 2022)

Classifications based on Years of Publication

Table 3 displays the distribution of these papers based on their publication year, which ranges from 2019 to 2022. The majority of the papers were published in 2021, with 31 articles, followed by 6 articles in 2020, 5 articles in 2019, and only 4 articles in 2022. The low number of articles in 2022 may be due to the limited research conducted in the first 6 months of the year. This trend of increasing publication in the field of IT outsourcing research indicates a growing interest in the subject, which has evolved over time since the 1990s.

Table 3. Based on publication year

Year	Number of Papers
2019	5
2020	6
2021	31
2022	4
Total	46

Classifications Based on Research Methods

Our findings indicate that survey method were the most commonly used, accounting for 23 papers out of the total. Additionally, case studies were used in 9 papers, while empirical research was the method of choice for 6 papers. Only a small proportion of the papers utilized other methods, such as qualitative studies.

Table 4. Based on research method

Research Method	Number of Papers
Survey method	23
Case Study	9
empirical research	6
Qualitative Studies	6
Other Methods	2

Classifications depending on the Nations of Interest

Figure 4 displays the distribution of 46 papers across 26 countries. The United States was among the countries with the highest number of research papers on outsourcing, with an average of 8 papers out of 46. Meanwhile, Pakistan came in second place with an average of 6 research papers. The world map as shows in Figure 4 was color-coded to indicate the countries that had a significant interest in researching outsourcing challenges, with yellow being the most prominent color, as indicated by the arrow. This visual representation highlights the countries that were most concerned about outsourcing challenges and the need for solutions to overcome these challenges.

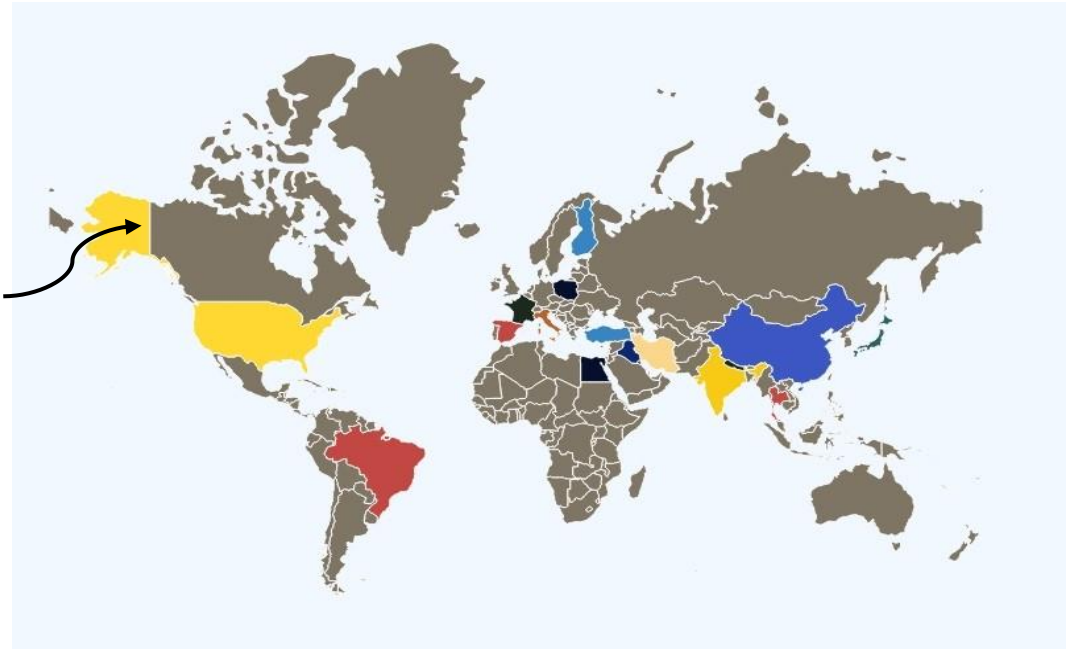

Figure 4. Nations of interest classification

Conclusion

The research analyzed 46 papers related to outsourcing in the field of information technology. The papers were collected from 200 articles in databases and digital libraries, with a focus on the years 2019 to 2022. The research found that the number of papers in 2021 was the highest, with 31 articles, while the number in 2022 was the lowest with only 4 papers. The United States was found to be one of the countries with the most research on outsourcing, followed by Pakistan with an average of 8 research papers.

The 46 papers were categorized based on the challenges identified by (Usman, Khan et al. 2020). The most challenging issue found in the research was poor outsourcing relationship, affecting 35% of the papers and cited

in references. The second most significant challenge is the lack of quality, which had a recurrence rate of 33%. The 19 challenges identified were divided into two categories, those related to human resources and logistical. Out of the 19 challenges, 5 were considered critical as they had a frequency a higher and significantly impacted the product's quality when delivered.

Quality is a difficult problem in software development outsourcing, with many factors influencing it, such as poor requirements collection. Quality in software engineering is defined as meeting customer needs and is a crucial factor in the success of a project. Software quality will never be perfect, but prioritizing it is important as the biggest cause of software failure is poor development quality.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

Acknowledgements or Notes

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