Impact of various Challenges faced by Development Team and the Customer using Agile Software Development (ASD)

Syed Muhammad Ali Shah[1]*, Jamal Abdul Nasir[1], Ihsanullah[2], Muhammad Ijaz Khan[1],Mudasir Mahmood[1], Muhammad Farhan[1]

alishah@gu.edu.pk,jamalnasir@gu.edu.pk.,ihsanullah1974@gmail.com,ijazkhan@gu.edu.pk, mudasir@gu.edu.pk,farhan@gu.edu.pk

[1]Institute of Computing and Information Technology, Gomal University, Dera Ismail Khan,
[2]Department of Computer Science,Government Degree College No.1, Dera Ismail Khan.
Pakistan 29050
*Corresponding Author:(alishah@gu.edu.pk) (jamalnasir@gu.edu.pk)

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Abstract: ***The challenges of agile development have been extensively researched in the literature.The literature reports that there are different challenges like communication, change requirements, lack of information, and distribution of work within the team, timeframe, interpersonal challenges, insufficient agile experience,and Poor prioritizationinvolved within an agile software development process. A survey was conducted to collect related data from Agile Software Development (ASD) teams of 6 software development companies. A questionnaire was sent to 175 participants to highlight these challenges. To get deep understandings of these challenges we interviewed 14 professionals from different roles (i.e., developers, Team leaders, Scrum Masters and Project Manager). Data was also collected from 8 Customers to understand their experience about challenges.The focus of this research was to identify the impact of challenges on project success. The results obtained using data analysis in SPSS, which suggest that different variables i.e. useful communication, development team, and customer involvement throughout the development process and team support have favorable effects on software project success.***

Keywords: Agile Methodologies, Challenges in ASD, affective Communication, Requirements change, Team Engagement.

INTRODUCTION

Each project contains a system that follows to achieve project completion.Technology is growing rapidly and changing day by day. There are many methods for developing computer programs and the appropriate method for the development of software projects. There are two approaches for program development one is traditional and other is agile. There are some drawback in traditionalmethodologies like poor prioritization, difficult to make changes during the development, lack of communication. On the other hand new methodologies (agile approaches) focus on all of these factors. Agile approaches focus on effective and strong **communication** between customer and development team [1]

Connectivity with every system's shareholders results in the identification of needs. At this point, a thorough documentation of the procedure's requirements and processes is intended. To accomplish system goals, all team members have to work together and interact efficiently. [2].

During collection of information development team must be engaged and **communicate with clients** to identify **requirements of customers**[3]

Satisfying end customer's needs is necessary to ensure quality. For defined goals and dimension, breaking the tasks down into smaller phases, using project plans as live paperwork, and efficient collaboration were key elements impacting project success. One of the 12 agile principles is **efficient communication**. Agile allows for open communication and allows for everyone on the team to share their thoughts. The essential set of personal and interpersonal abilities for somebody to attain excellent results in a project, program, or portfolio, resulting in to its success, includes determination, an open-minded behavior, an understanding of responsibilities, and a willingness to gain knowledge in the context of projects. Additionally, interpersonal and communication abilities, fairness and the ability to collaborate with others are part of this set. [4]

Efficient **gathering of requirements** in Global Software Development (GSD) depends significantly on efficient and suitable client-vendor **communication**. Critical obstacles that both vendors and clients must overcome include linguistic and cultural boundaries as well as time zone disparities. Due to the aforementioned significant obstacles, it is hard to properly negotiate and address the demands, thus we needed sophisticated tools and systems that can support efficient communication. Due to both physical and geographical distance, cultural variation, as well as time zone differences which are the primary causes of misunderstandings effective and accurate communication is a significant issue. [5].Scrum and other agile methods operate ideally in compact cross-functional teams and promote broad professionals, making them stronger at methods that call for intense cooperation. [6]. Agile fosters a **strong work ethic both individually and collectively,** and it strongly relies on **communication between stakeholders**. Thus, it is unnecessary for us to elaborate on how stronger teams deliver more impactful project outcomes. A good example of the distinction between valuing people and procedures is communication. Communication is planned and needs specialized content in the case of processes. When it comes to people, communication is flexible and takes place as needed. Communication is one of the four agile values.[7]. Agile software engineering is, in fact, a communication-focused strategy that encourages successful and productive communication among all stakeholders. Agile is a communication-enabler methodology that relies on open dialogue. It was successfully determined that the danger of collaborating and communicating issues leading to less successful outcomes increases with the degree of geographic dispersal. The co-located agile development teams view communication as being essential to overcoming ambiguity and changing client needs. [8].

CHALLENGES IN AGILE METHODOLOGIES

Although Agile's numerous benefits and the fact that it is still in vogue. There are three major challenges due to which Agile Methods fail in practice one is lack of understanding of agile techniques secondly Little understanding of the wider organizational change needed and third is Conflicting organizational philosophy or culture with agile principles[9]

The requirements are changing at a tumultuous pace since they are adaptable and arise quickly. It is challenging to forecast the software needs early on since client demands might change at any time. It is therefore challenging to determine which software specifications should be maintained and which should be altered. [10]

Project managers deal with difficulties tighter budgets, requirements for generating more value, and boosting efficiency. Project failures are mostly caused by keen timelines (59%), evolving requirements, and stakeholders' changing expectations (56%). [11]

Lack of Documentation is one of the issues in agile development, lack of knowledge about agile, When duties change due to technique modifies and personnel are not aware of their new tasks, loss of accountability results,Teams were found to operate independently in several places, working together and communicating more challenging.There have been several conflicts among the laws and the tenets of agile approaches. Delivery schedules, prices, information privacy, etc. [12]

Agile approaches' emphasis on minimal documentation, which causes them to give less attention to various elements of project management, notably risk management.Addressing the project risks is one of the key components of any project, therefore, risk management is particularly recognized as a significant project management task. Each strategy establishes its unique procedure, customs, functions, and artifacts. The implementation of technique, team efficiency and effectiveness, handling risks, and human-related difficulties are only a few of the problems and obstacles that must be overcome in the transition to agile methodologies.

Methods for building agile software face a number of difficulties because of geographical distance, time zone variations, cultural obstacles, and technological limitations. Based on a survey of the literature, nine themes—

communication, team cohesion, technical competence, sharing technological advances, consumer involvement, coordination and control, knowledge management, instruction, and mentoring—are used to categorize agile problems. [13]

An important and tough element is the scale of the software project. The initial steps of the task assessment involved estimating how many lines of code the project may require (Dekkers, 2005). This constitutes a few of the current constraints on agile. Agile appears to be functioning negatively for most large-scale projects involving over 50 software engineers.[14], [16]

The real difficulty facing a corporation is how to use agile concepts. Tracking, management, and continuous enhancement must follow the plan's execution. [15], [16], [18]

Delivering an effective piece of software to clients quickly and constantly with a short release cycle is the top objective of agile development. It presents a difficulty for the examination process since quick delivery intervals would impose set deadlines for testing operations, which prevents maximizing the duration of testing if more flaws are discovered than anticipated. [17]

Different locations of team members is a challenge. [19]

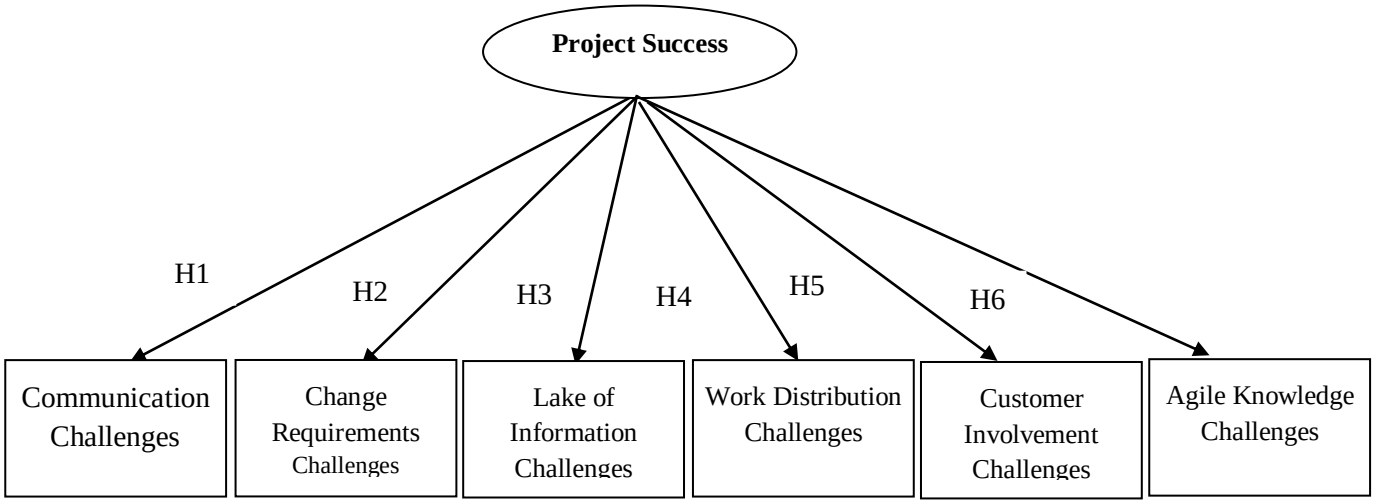
Distribution assets constitutes one of the coordination issues, which requires resource-allocation procedures to control how many players use limited assets. The management of producer-consumer interactions is the subsequent step, and it is crucial whenever an actor's output is utilized as an input for another actor's activity. The third entails managing various timelines, milestones, and process cycles that are relevant to various players. This is known as the coordination of simultaneity constraints. The coordination of tasks and subtasks is the fourth.[20]

The main obstacle to reaching consumers in an efficient method is customer interaction. For product executives, gathering data on client demands may be expensive. [21]

There are several difficulties, including problems with collaborating and communicating, cultural diversity, leadership, teamwork, technology, process problems, and time constraints. In a dispersed agile setting, team collaboration is seen as a key difficulty. [22]

Research Hypothesis

H1: Communication Challenges has an impact on Project Success
H2: Change Requirements have an impact on Project success
H3:Lake of Information has an impact on Project success
H4: Distribution of work among team member has an impact on Project success
H5: Customer Involvement has an impact on Project success
H6: Agile Experience / Knowledge has an impact on Project success



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RESEARCH METHODOLOGY

To address the study issues, it is critical to include the perspectives and experiences of participants who worked in a software development environment.It is necessary to investigate the experiences of those who work for software development companies.The complexities faced by the client and the software development team are examined.Data is gathered using a questionnaire that is designed for both the development team and the consumer individually in order to gain thorough and comprehensively answers to the research questions. Statistical analysis was used to gather information through surveys and questionnaires.The survey comprises of a questionnaire. Since they offer a quick, affordable, and accurate approach to acquire information, questionnaires were chosen. Data was collected through online questionnaire and telephonic interviews to get information in detail.The study's questionnaire provided information about each respondent's job, how long they worked for developing software, and the size of the organization. In order to learn more about the agile methodologies used in software development projects, a questionnaire was also added. A supplementary interview was performed to get a greater comprehension of an individual's experiences working in an agile team context.Telephonicinterviews were considered the appropriate method to gain an in-depth understanding of agile projects.Emails, telephonically, data combined from several sources, and web pages are examples of semi-structured interview formats that facilitate collaboration and promote in-depth topic exploration. The issues are explained in depth using a qualitative approach, and the information and data obtained stated numerically is explored using quantitative approaches. As the data are described numerically, statistical tests like Pearson correlation, Chi-Square to explain what the data show,based on the data, descriptive statistics are used to examine the association between several sets of data, such as Pearson's product-moment correlation coefficient. Qualitative data include details on participant experiences, requirements, routines, use cases, and different more exact facts about human behavior or personal attributes that quantitative research cannot. Using questionnaires, which are used as research tools, questions are asked in order to gather information from the responder. The qualitative data made it simpler to comprehend the numerous issues people faced when creating software.

RESEARCH DESIGN

A survey was conducted from the people who have worked on agile methodologies. A team work model that can be used to examine components that influence the affiliation between development team and customer. The collaboration model framework was used to guide the creation of questions for a questionnaire. Background data was provided, including the size of the organization, their function, and the length of time they had worked in software development. Information regarding the complications and elements that influenced the relationships was also gathered via the questionnaire.All the questionnaire were validated using experts opinions. A test's content validity measures how effectively it captures all pertinent elements of the theoretical notion, topic, or idea, including those that are typically not immediately measurable.

DATA COLLECTION.

The participants were chosen from companies whose primary activity was the development of software, or from companies that produced software for internal use. There were several software companies engaged in product or project development that create software for a particular business or user. Several of the programmers developed software for commercial usage. An online survey was used to gather quantitative data. Questionnaire was sentto people who are involved in development process and 175 people replied.Their response rate was58 percent.Data were gathered. Telephonic interviews were also taken from some participants to get deep and clear understandings. The online survey was sent using the google form. The web-based survey tool google form makes conducting surveys, assessments, and other data collecting tasks easier. This data was imported into SPSS.

To determine how much participant experience with problems on the team or with customers, the questionnaire contained demographic and experience questions.

DATA GATHERING FROM SOFTWARE DEVELOPMENT TEAMS

Inclusion Criteria: (a) At least CMMI based countries, Advanced Countries. (b) After determiningthe number of countries. Essential data were collected by online questionnaires from individuals currently working in software development in Pakistan and the United States. Questionnaire was also sent to the software houses in UK but they didn’t reply.

Data was collected by using from the Participants through following ways

- Via email,
- Asking for the persons to be sent a request.
- Email address obtained from people involved in agile development

Information was gathered from those who are actively working in the software development industry via an online survey.

CUSTOMER'S STUDY

The primary objective of this study was to understanding the interaction between the software development team and the customer. Once beginning the data collection, a research instrument with various inquiries centered on Research Questionswas created for the customer study. Eight questions were included for customers.

DATA COLLECTION FROM CUSTOMER

An online survey was conducted to collect data from individuals who are presently engaged in software development in Pakistan as customers or product owners. The individuals who responded to the online survey were contacted by phone for interviews. Participants were chosen from a variety of organizations in Pakistan who responded to an email. The online survey platform google-form was used to conduct the questionnaire. Respondents used a link in a recruiting email to access the questionnaire. The respondents usedagile for software projects were the target group. Finding the responders who were active in agile software development took the most time. Microsoft Excel and SPSS were used to download and import the survey's data in order to undertake statistical analysis, including Chi-Square test and Correlation calculations. The actual data was converted into numerical form for testing.

CHALLENGES IN SOFTWARE DEVELOPMENT

i. Challenges Faced by the Team

From a list supplied, respondents were asked to choose the number of times they have encountered issues within their development team during a normal sprint.**RQ3**: How to explore issues with development team? Regardless of the fact that agile software development encouraged cooperation amongst the team fellows, this showed that the team members had trouble exchanging ideas. Sixty-eight (68) (39%), of respondents said that throughout each normal sprint, they had one to three communication challenges.The majority of respondents stated that they had no trouble in communicating. This implied that not all initiatives face difficulties as they progress. Our data was crucial to this study since it allowed for the identification of the problems that agile software development projects encountered most frequently. This also revealed how many problems the projects' development had to deal with. Forty 40 (21.8%) respondents mentioned difficulties with changing requirements.27 respondents (15.42%) stated that they had trouble getting information and discussing ideas within the team. Table.1 present the summary of various challenges faced by development team.

Table 1. Summary of Data about Challenges Faced by the Team

Difficulties	Respondents	Percentage
Difficulties in communicating and sharing of ideas	68	38.85%
Difficulties in change requirements	40	22.85%
Difficulties in lack of information and sharing ideas	27	15.42
Issues with the way the team divides up the job	4	2.28%
Difficulties in Poor prioritization	9	5.14%

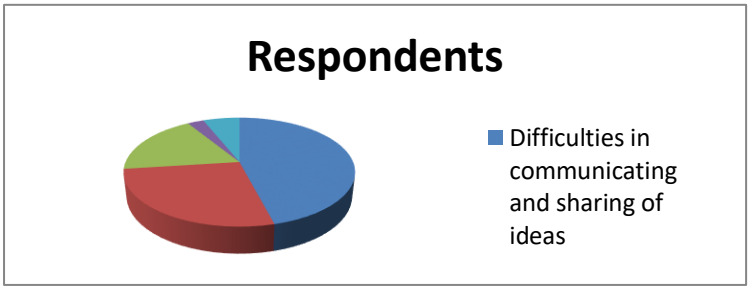

Fig. 5. Graphical Representation of Summary of Data about Challenges Faced by the Team

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i. Issues with Development Team and the Customer.

Data on the relationship between the team and the product owner was gathered. Eight (8) respondents stated that they had problems with the customer concerning the project two to three times. Five (5) respondents mentioned having trouble in communication with the customer.The data on customer problems showed that there were issues arising between team and the customer. Over half of those surveyed claimed that the project's priorities, requirements, timeline, human contacts, and communication presented challenges.Clarifying the requirements, getting feedback, and business productivity all suffered as a result of these difficulties. This information aided in establishing the connection between these difficulties and project outcomes, such as timely and cost-effective project completion. For this study, RQ4: What are relationship issues between development team and the customer? There were challenges between the software development team and the product owner, according to quantitative data from the software development team study. In this study, approximately more than 50% of the respondents stated that there were problems with the project's priorities, specifications, timeline, interpersonal difficulties, and communication.

Table 4. Association of relationship bw Dev: Team and customer w.r.t various factors Cross tabulation

		Customer Engagement	Communication	Customer knowledge about agile	Impact of Language
relationship b/w D.Team and customer	Pearson Chi-Square Asymp. Sig. (2-sided)	.030	.019	.000	.962
Total		175	175	175	175

Challenges Faced by Customer.

The data on customer problems showed that there were issues arising between team and the customer. Over half of those surveyed claimed that the project's priorities, requirements, timeline, human contacts, and communication presented difficulties. Clarifying the requirements, getting feedback, and business productivity all suffered as a result of these challenges. This information helped in establishing the connection between these challenges and project outcomes, such as timely and cost-effective project completion.RQ2: How to explore issues with customer?

Table 2. Issues Faced by the Customer.

Difficulties	**Respondents**	**Percentage**
issues with the customer on project priorities	5	62.50%
Difficulties with customer about project requirements	1	12.50%
issues with the customer on timeframe of the project	1	12.50%
Interpersonal challenges between the team members and the customer	5	62.50%
Communication issues with the customer	5	62.50%

Project completion times were shown to be significantly impacted by communication problems within the team, disagreements between the customer and the team on priorities, requirements, the schedule of the projects, and interpersonal challenges.The Pearson's Product Moment Correlation Coefficient was used to identify the correlations between variables, such as communication barriers, idea sharing, workload allocation, project time, and project budget. Table-3.The estimated Pearson correlation shows correlation between different factors.The results obtained by analyzing data in SPSS.

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Table-3 Pearson correlation among different variables

Variables		Project Time	Project Budget	Project Agreement
Communication issues	Pearson Correlation	**.035**	**.039**	**.140**
	Sig. (2-tailed)	.644	.612	.65
Team Support issues	Pearson Correlation	**.039**	**.001**	**-.022**
	Sig. (2-tailed)	.612	.189	.771
Interpersonal Issues	Pearson Correlation	**.035**	**.036**	**.140**
	Sig. (2-tailed)	.644	.073	.65
Project Priorities Issues with customer	Pearson Correlation	**-.022**	**-.119**	**-.053**
	Sig. (2-tailed)	.077	.065	.522
Conflicts with customer on Project requirements	Pearson Correlation	**-.022**	**-.019**	**-.053**
	Sig. (2-tailed)	.771	.065	.522
Product Owner Availability	Pearson Correlation	**.027**	**.035**	**.033**
	Sig. (2-tailed)	.723	.000	.662
	N	175	175	175

It has been discovered that communication and project time, communication and project budget have significant correlation (p-value<.05), which shows that timeline of the project and budget are effected by communication. Similarly team support issues have significant correlation with time, budget and contract, inter-personal issues have significant correlation with time and budget.If (p-value <.05) in each project priorities issues, project requirements and availability of product owner with project time, budget and contract then there is significant correlation between these variable and they have impact on time, budget and contract. The outcome, however, indicated that the project's timeframe might not be impacted by the product's availability.

Table 3.21. Impact of Relationship with various factors of Project Success

Impact of Relationship on project outcome	1. Customer Engagement/ Availability 2. Communication 3. Customer Knowledge about Agile 4. Impact of Language

Chi-Square test is applied to understand the impact of different factors on the project success
Our null hypothesis is that there is no impact of these factors on the project success, and our alternate hypothesis is that there is significant impact of these factors on project success. Here impact of relationship on project outcome is dependent variable and in the right column of the table are independent variables

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Table 3.22. Association of relationship bw DT and customer and various factors Cross tabulation

		Customer Engagement	Communication	Customer knowledge about agile	Impact of Language
relationship b/w D.Team and customer	Pearson Chi-Square Asymp. Sig. (2-sided)	.030	.019	.000	.962
Total		175	175	175	175

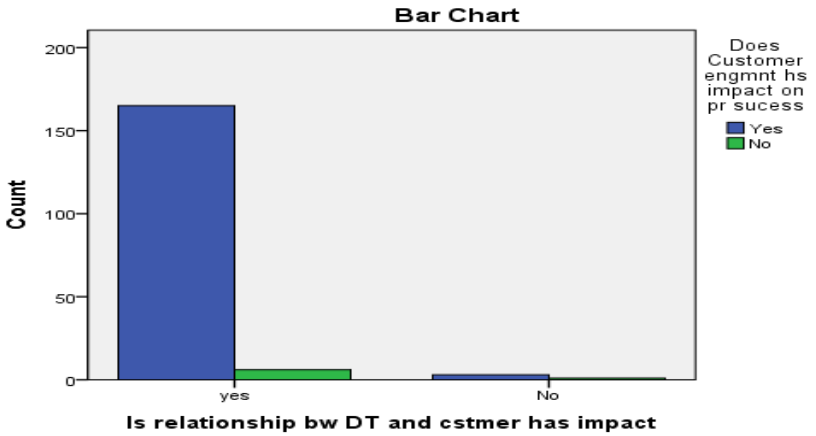

Fig. 6. Graphical Representation of impact of Customer Engagement on Relationship

SPSS results Pearson Chi-Square p-value=.030 < 0.05 which is significant therefore our null hypothesis is rejected so the relationship between development team and customer has strong association with customer engagement. This relationship depends on customer engagement / involvement. Here in SPSS results Pearson Chi-Square p-value=.019 < 0.05 which is significant therefore our null hypothesis is rejected so the relationship between development team and customer has strong association with communication.

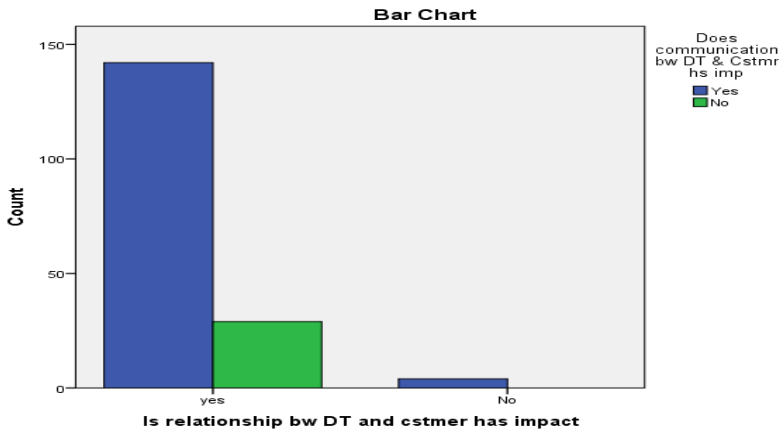

Fig. 7. Graphical Representation of impact of Communication on Relationship

SPSS results Pearson Chi-Square p-value=.000 < 0.05 which is significant therefore our null hypothesis is rejected so the Customer knowledge has strong association with relationship between development team and customer.

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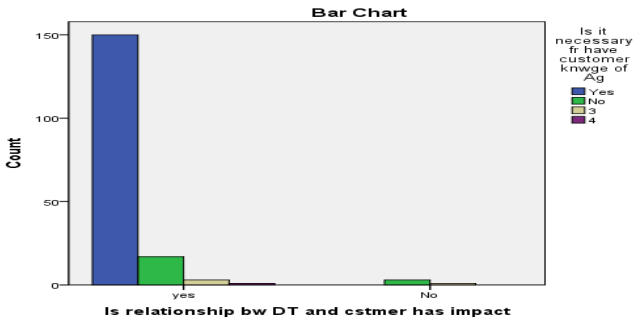

Fig.8. Graphical Representation of impact of Customer knowledge on Relationship

Chi-Square p-value .962> 0.05 which is non-significant therefore our null hypothesis is accepted so there is no as such impact of language on relationship between development team and customer.

IMPORTANCE OF DEVELOPMENT TEAM ABOUT COMMUNICATION

The percentages were used to express the respondents' responses. According to 68.57% (120) of the respondents, collaboration and communication between the development team and the client are crucial to achieving the project's objectives.19.42% (34) of the respondents expressed their opinions on the significance of trust between members of the development team and their clients. A factor that was important to 8.57% (15) of the participants was team and customer transparency.Collaboration was cited as the most critical component of project success as a result. According to the respondents, there were some challenges both within the team as well as between the team and the client. It was discovered that some of the difficulties, including communication issues and project needs, had an effect on project completion. This implied that such difficulties might affect the bond between the team and the customer. These difficulties might also affect how well a team collaborates and coordinates, which might affect how well a team works in agile software development projects.
Relationships in all respects were cited as being the most vitalfactor of a project's success. by 98.85% of the respondents.

INTERVIEWS

Twelve respondents in the survey were contacted by phone for in-depth discussions of the data. Nearly every interviewer shared the same viewpoint. Each respondent had the same comment on importance of communication therefore, no more interviews were required.The interviews result reveal that communication between stakeholders is an important factor. Other than communication factor team support, team engagement and customer engagement has vital role in project success.
The researchprojectused a questionnaire and interviews with a selected software development teamtogaininsightintotheir experiences and perceptions.Anadditionalresearchendeavorinvolvedobtaininginsights and understandingsfrom product owners bymeans of a concisesurvey.

CONCLUSION AND RESULTS

Both the team and the customers' study revealed that. It became evident that positive effective communication between team and customer has an influence on the results of software development initiative. This study also provided evidence that there were problems such as communication, interpersonal problems, changing requirements Technical skills, availability of customer, Controversy about agreement with the customer.

RESEARCH CONTRIBUTION

it was discovered that participants noted a correlation between the success of a project and these factors. Numerous investigative studies have examined the effectiveness of communication models such as teamwork model, and various communication models in Agile software development teams.Various Challenges faced by Development Team and Customer using Agile Software Development are traced out.

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