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Analysis of Telecom Projects using Agile Framework

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Abstract**—** *The telecoms sector is the focus of this research project, which thoroughly explores the critical success factors associated with the implementation of Agile project management techniques. It has shown out to be beneficial in the industry of telecommunications, notably in digital services and managed services. Research is primarily focused on identifying the key success factors related to both individuals & organizational aspects, and how they impact the success of projects within the managed services and digital services functional departments of selected organizations. The study examines the influence of 5 major variables which includes Team Size, Team Communication, Team Performance, Customer Involvement, and Management Involvement. Survey was conducted using random sampling, and 110 participants from two telecom organizations, Pakistan Telecommunication Company Ltd (PTCL) and Special Communications Organization (SCO), replied. According to findings, team size and performance (in terms of experience & Agile expertise) was found as critical success element. Furthermore, active customer interaction on a daily basis, as governance (rather than micromanagement), was highlighted as essential factors to project success. These five variables appeared as essential in this study. The study found a positive correlation between these characteristics and project performance, specifically in terms of project value. However, it was not possible to make precise statistical predictions about the strength of this association. Study also identified additional areas for investigation, with a particular emphasis on team communication, customer interaction, contract formats, and internal corporate regulations. While the study provided new insights into contract formats and the use of Agile methodology in quality assurance, more research is needed to gain a better understanding of the impact of people and organizational factors, especially in the telecommunications industry, which includes data services and managed services functional domains.*

Keywords**— *AGILE, Agile Project Management, Digital Services, Telecommunications, Agile Telecommunication Projects, Managed Services.***

I. INTRODUCTION

In corporate environment, it is critical to react to fast-changing market needs in the sector of telecommunications and the services provided to subscribers. With fierce rivalry and a large number of operators, frequently three or more per country, company leaders must be continually on the lookout for new opportunities and responding to changes begun by their competitors. This circumstance forces service providers to consider agile methods in order to handle these changes efficiently and avoid losing market share to competitors.

The projects are integrated into business operations by organizations (Brosseau et al., 2019). There are two separate entities within the telecommunications business (Techie, 2017): (Investopedia, 2019). Telecommunication service vendors are businesses which supply services to service providers, which are then delivered to market customers or end-users. In essence, a telecommunication service provider is a licensed operator who is authorized to provide telecommunication services to people in a specific country. The telecommunications service vendor, on the other hand, is responsible for building the network infrastructure and supplying services to service providers, allowing them to lawfully offer services to the general public in the country.

Every project requires the implementation of a technique (Murugaiyan, 2012). Waterfall, V-model, and agile project management strategies are examples (Balaji. 2012). The suitable approach is chosen based on the specific qualities of the project that an organization wishes to undertake. The

agile methodology is recommended for projects that have frequent scope changes, can be broken down into smaller tasks, require competent workers, and must be completed within a specific deadline. Organizations choose project management methodologies depending on a number of criteria, including the type of project, unique requirements, contractual duties, and project objectives (Balaji and Murugaiyan, 2012).

Projects are critical in the telecommunications business because service delivery is primarily reliant on project execution. Because the nature, scope, and objectives of projects can vary substantially, project management offices within organizations must take a professional approach to ensure effective project outcomes (Hirner et al., 2019; Balashova and Gromova, 2017; Serti et al., 2007). Organizations can effectively deploy agile approaches that are aligned with their unique circumstances and requirements by carefully examining these criteria.

Agile project management is recognized as a novel strategy for successfully conducting information systems development programs in dynamic and changing environments (Diegmann et al., 2018). Telecommunications sector (Techie, 2017) includes many domains, one of which is telecommunications (Balashova and Gromova, 2017).

Digital services largely include product or project strategy, solutions, and delivery (Speta, 2011). There is a particular emphasis in this industry on using agile approaches to successfully respond to quick changes in market needs and competition. Digital services (DS) projects can range in size from modest to medium-sized, as well as complicated projects that might last for years, such as transformation initiatives. The existence of a solution unit in the DS domain is notable since it allows for close closeness to clients and promotes the translation of their needs into deliverable solutions.

The managed services domain is divided into two subdomains (Kumbakara, 2008). The first subdomain is devoted to pure operations, with a focus on network management and key performance indicators (KPIs). Simply said, this subdomain guarantees that the network runs smoothly and efficiently, in accordance with set metrics and performance criteria. Application Development and Modernization (ADM) is the second subdomain. There are two key concepts in ADM. The first notion, known as the Business Management (BM) process, is adding configurations to existing systems in order to define new business offers. The second concept, which falls under the purview of the ADM concept, entails creating code from scratch to generate whole new business solutions.

Background

Telecommunication vendors (Techie, 2017) are looking for the best approach to assure effective project delivery to telecommunication providers, often known as "customers" (Investopedia, 2019). The necessity for a technique that can effectively deal with quick changes in requirements has become critical and substantial, prompting the development of Agile project management as a solution to problem.

Agile project management manifesto (Beck et al. 2001) acts as road map for individuals who use Agile project management technique, guiding them in creating projects in accordance with the manifesto's principles. Goncalves (2020) defines "agile methodology" as a set of great practices utilized for software development in the modern world, basing his description on Beck et al.'s (2001) Agile manifesto. Goncalves explains Agile methodology and describes the Agile transformation path using Beck et al.'s twelve principles and four values. Since the creation of the manifesto, research on Agile methodology has evolved continuously introducing new ideas. In order to ensure project success, each organization must carefully identify the most appropriate methodologies to use.

- **Short History of Agile**

Agile development is a methodology that was first proposed in the early 1990s. It was created as an alternative to the traditional waterfall model of development. In agile, is developed in short cycles, or sprints, and each sprint focuses on a specific set of features. This allows for more flexibility and iteration than the waterfall model. Agile has become increasingly popular in recent years, and many organizations have adopted it as their primary method of development.

- **Agile Mindset**

As a result, Agile is a mindset founded on the ideas and principles of the Agile Manifesto. These beliefs and principles demonstrate how to generate and adapt to change, as well as deal with uncertainty. The opening statement of the Agile Manifesto encapsulates the entire concept: "By doing it and helping others do it, we are discovering new ways of building." When faced with uncertainties, try something you think could work, get feedback, and make changes as needed. Keep the ideals and principles in mind when you accomplish this. Allow the frameworks, methodologies, and approaches you use to engage with your team and give value to your customers to be informed by your context.

- **Agile Development Model**

According to the Agile model, each project should be handled differently, and current approaches should be updated to better match the project objectives. In Agile,

tasks are divided into time boxes (small time intervals) to provide specific features for a release. It is an iterative process, with each iteration yielding a functional build. Each build is incremental in terms of features; the final version has all of the features required by the customer.

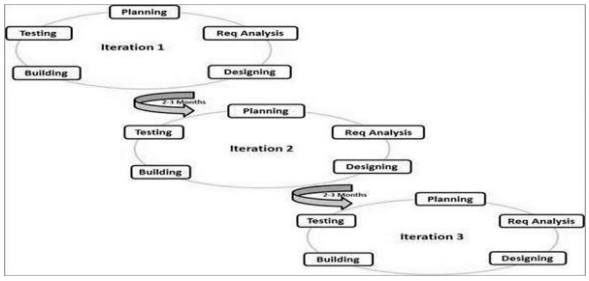


Fig 1.1: Agile Development Model

Agile thinking emerged early in development and gained in favor over time due to its flexibility and adaptability. Some of the most well-known agile techniques (1995) are Rational Unified Process (1994), Scrum (1995), Crystal Clear, Extreme Programming (1996), Adaptive Development, Feature Driven Development, and Dynamic Systems Development Method (DSDM). Following the 2001 publication of the Agile Manifesto, these are now known as Agile Methodologies.

- **Agile Development Process Use**

There are several common development methodologies, such as Scrum, Extreme Programming, and Feature-Driven Development (FDD). The processes involved in these methodologies are planning meetings, test-driven development, pair programming, stand up meetings and sprints. With Agile, people and the tasks their team does are the focus of development. An important aspect of the Agile development is the teams (self-organizing cross-functional) collaborating to finish a project. For example, those development teams would create their own plans to complete a task based on using best practices for their context while they keep in mind their potential failure and crisis management should they encounter an issue or problem. Those self-organizing teams should also work with other members who have different expertise as needs arise. Managers will still play a role in an agile environment; however, managers aid in implementing change within an agile project by creating a group that possesses or acquires skill sets to tackle projects successfully.

- **SCRUM**

It's a technique used in agile development. Scrum is named after the rugby strategy and believes it's more beneficial to work in small teams than large ones. Within this method there are three categories, with their responsibilities as follows:

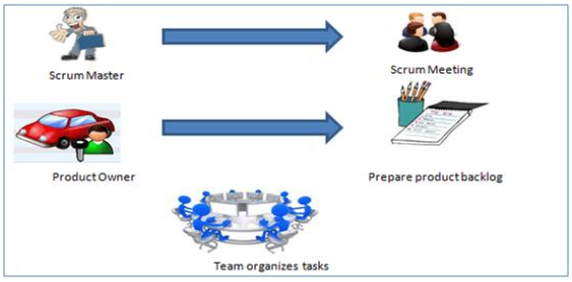


Fig 1.2: Scrum Method

a) The Scrum Master holds the responsibility for team organization, coordinating sprint meetings, and eliminating obstacles that hinder progress.

b) The Product Owner is responsible for delivering functionality during each iteration and constructing the product backlog.

c) Scrum Meeting: A scrum meeting is a short, daily meeting where team members discuss what they have accomplished since the last meeting and what they plan to do before the next one. This type of meeting helps ensure that everyone is on the same page and that tasks are being completed in a timely manner.

d) Product Backlog: It is an agile artefact that captures what needs to be delivered in order to achieve the desired outcome. The product backlog items are ordered by priority, with the most important items at the top. As new items are added, they are placed in priority order based on their impact on the business.

- **SCRUM Process Flow**

a) The team works on the set sprint backlog

b) The team checks for daily work

c) At the end of the sprint, the team provides product functionality

d) The product backlog is a list where all information is included to achieve the final-product

- **Benefits of Using the AGILE Methodology**

Agile methodology is a set of practices and methods that encourage collaboration and flexibility in the development process. It has become popular in recent years because it helps to improve communication, speed up project completion, and reduce risks. Following are some of the benefits of using agile methodology in your project.

On Time Delivery

Organizations that adopt agile methodology achieve a number of benefits, including on-time delivery. The traditional waterfall development process often results in projects taking longer than necessary to complete. This is

because the traditional process involves a long and detailed planning phase followed by a long and detailed development phase. During the planning phase, developers are required to compile a detailed list of features and specs, which can be difficult to change once the project has begun. This can also lead to delays in the development phase, as developers need time to incorporate all the proposed changes into the project.

Agile methodology, on the other hand, focuses on completing projects quickly and efficiently. This is done by breaking projects down into small, manageable pieces and building them until they are completed. This approach allows for more flexibility in project planning and development, which leads to quicker completion times. In addition, agile methods often result in improved quality because they allow for more rapid feedback and iteration between stakeholders.

Superior Quality Product

Agile methodology is more than just a development methodology. It's a way of life, one that stresses collaboration and communication, focus on customer needs and constant learning. The benefits of embracing agile are clear: superior quality products that are delivered on time and on budget. With an agile process in place, communication between team members is key. This allows for seamless integration of new features and updates into the product, resulting in a better user experience and less rework. An agile process allows for quicker development times, leading to a faster time to market. This can be essential in the ever-competitive world of technology.

By implementing an agile process, you can reduce costs associated with developing. The streamlined workflow will help keep your team organized and coordinated, allowing for more accurate estimates and fewer missteps. An agile process leads to higher quality products by encouraging teams to work quickly and efficiently without compromising on quality. By minimizing errors from the start, you can ensure that your final product is of the highest caliber.

Customer Satisfaction

The agile methodology is a process that helps organizations to be more responsive to customers and improve their overall customer satisfaction. By using the agile methodology, organizations can increase their ability to respond quickly to changes in the marketplace and provide better service to their customers.

Organizations that use the agile methodology often find that they are able to improve their customer satisfaction ratings. This is because agile methods help organizations to become more responsive to customer needs, and this responsiveness can lead to improved satisfaction levels. In addition, agile methods help Organizations reduce the amount of time needed to deliver products or services, which can also lead to increased customer satisfaction.

Overall, the agile methodology is a useful way for organizations to improve their customer satisfaction ratings.

Better Control

Agile methods allow for better control over project deadlines and product quality. By working incrementally and continuously testing, agile techniques help developers to find and fix errors early, saving time and money. Furthermore, agile methods promote collaboration among team members, which leads to a better understanding of the project and an increased ability to meet deadlines. With everyone working together in an open environment, the project can move more quickly and efficiently. Overall, agile techniques offer many advantages for both the developers and the organization as a whole - making it a popular choice for projects of all types.

Improved Project Predictability

The agile methodology has been shown to be an effective tool for improving project predictability. This allows for better planning and communication, which in turn leads to a more efficient and successful project. One of the key benefits of using the agile methodology is that it helps to overcome the "waterfall model" mentality. The waterfall model is a process where a project is planned and executed in a sequential manner, with each step requiring prior completion of the previous step. However, this model can be inefficient because it can lead to delays in project milestones.

By using the agile methodology, projects are able to move faster and more efficiently through the stages of development. This allows for a more accurate prediction of when certain tasks will be completed and ultimately leads to a more accurate end product.

Reduced Risks

Agile methodologies help to reduce the risks associated with project delivery. This is because they emphasize communication and collaboration between team members, which helps to eliminate misunderstandings and potential conflict. Another benefit of agile methodology is that it allows teams to adapt quickly to changes in the environment. This means that they are able to respond more effectively to unforeseen challenges and problems. Overall, agile methods provide a number of advantages that can help organizations achieve their goals faster and with fewer risks.

Increased Flexibility

Agile methodology has been shown to lead to increased flexibility. This is because agile encourages the use of short, iterative cycles that allow for changes to be made quickly and easily. As a result, projects are able to move faster and achieve their objectives more quickly. Furthermore, because agile is incremental, it is less risky and allows for corrections along the way. This methodology also leads to a better understanding of the problem and results in better solutions.

Continuous Improvement

Agile methodologies are designed to help organizations achieve continuous improvement. According to the National Institute of Standards and Technology, "Each iteration of the agile methodology focuses on delivering working frequently, with a focus on customer satisfaction." This approach encourages teams to continuously assess their work and make necessary changes in order to improve the quality and efficiency of their work.

Agile development, according to Dipendra Ghimire, has an impact on team communication, project requirements, and project priorities, with more practices being followed correlating with better project outcomes. Rashina Hoda discusses the Rise and progress of Agile Development in a research paper, providing a historical review of agile's primary focus areas as well as a holistic synthesis of its tendencies, their progress over the past two decades, and agile's current position and anticipated future. Elvan Kula conducted a study called Factors Affecting On-Time Delivery in Large-Scale Agile Development, which discovered that factors like requirements refinement, task dependencies, organizational alignment, and organizational politics are perceived to have the greatest impact on time delivery, whereas proxy measures like project size, number of dependencies, historical delivery performance, and team familiarity can help explain a large degree of schedule deviations.

Problem Statement

Telecomm services providers in Telecommunication sector, particularly in DS or MS, confront the issue of frequently changing requirements and the necessity to deliver project value fast while adjusting to these changes in order to achieve time-to-market (TTM) targets. Agile project management methods may be modified in order to meet the needs of organizations while maintaining the essential ideals and concepts of agile techniques. Nguyen (2016) emphasizes the value of relevant agile engineering methodologies, appropriate technology and development tools, and customer involvement for agile production teams, which is consistent with earlier research on CSFs. Researchers identify team size as the most important success element, emphasizing the importance of organizations assessing their contextual factors, corporate culture, business practices, and systems before applying agile project management methodologies.

Rationale of the Research

Based on the literature analysis, this study has reduced its focus to two components: people and organizational factors. These characteristics were chosen because of their importance to the organization and the time limits of the study project, which hindered the examination of all variables.

Research Questions

- Does utilization of APM methodologies is advantageous for success of DS and MS functional domains?
- Which are the key factors associated with implementation of APM techniques which have the most significant impact on project success?
- Is there a correlation between effective APM and factors like team communication, team size, and team performance?

Objectives

- Performing extensive literature review for identifying gaps in current research & knowledge.
- Analyzing key critical factors linked to successful implementation of agile project management & attaining project value.
- Investigating correlation b/w APM and team communication, size, and performance.
- Confirming outcomes obtained through a quantitative research methodology.

Research Significance

Based on a restricted literature survey, the researcher's present study topic targets a relatively unexplored region within the telecommunications industry, focusing primarily on DS and MS departments. The researcher aims to contribute valuable insights to the field of project management, particularly within the telecommunications industry. Following are five independent variables:

- Team Size
- Team Capability
- Team Communication
- Customer involvement
- Management Involvement

The dependent variables are:

- Project Value measured in terms of time to market

(TTM)

It seeks to validate the effectiveness of Agile methodology in Digital Services & Managed Services departments.

II. BACKGROUND

According to World atlas in 2019, telecommunications plays a big part in contributing to the global GDP. In the United States, for example, telecommunications are the tenth largest contributor to GDP, accounting for 4% of the total (World atlas, 2019). To reduce the focus, this study will look exclusively at the IT component of telecommunication, also known as "IT telecom." Two specific departments within IT telecom will be investigated i.e. Digital Services Department and the Managed Services department.

DS department is an essential component of information technology that incorporates all IT services, from project management to rollout and delivery. It is crucial to highlight that many telecommunications organizations have moved their focus from a product-oriented to a service-oriented strategy, giving rise to the dominance of the digital services department in the telecom sector (Williams et al., 2008). Apple, Amazon, and eBay are currently key market participants in the digital service provider arena, with a large presence and impact in the industry.

The operational characteristics and performance of the services offered by communications service providers, on the other hand, must be monitored by a managed services department. 20% yearly growth has been recorded in the market for managed IT services (Speta, 2011; Kumbakara, 2008). The market has been thoroughly examined by Speta (2011) and Kumbakara (2008), who have shown that it is extremely competitive, with a wide spectrum of service providers, from tiny businesses to huge corporations, competing for a competitive advantage.

It is clear how important project management is to many organizational endeavors. The emphasis has switched from product-centric to service-oriented approaches among telecom vendor providers. As a result, organizations are giving their project managers and program directors top priority because they understand the critical role they play in managing these companies successfully. The suggested research project will look into the DS and MS divisions of the IT telecommunications industry.

When compared to conventional project management frameworks, agile project management approaches include a number of techniques that have proven to be more effective (Onag, 2017). Because they allow staff to adjust to constantly changing customer requirements, these strategies are highly advised for IT-related work and developing organizations (Doyle et al., 2005).

The timely completion of the project scope within the allotted budget is often seen as the definition of success for projects under the traditional idea of project management Even if a project is finished on schedule and within budget, it is still important to emphasize its worth. This is such that if a project is not supplied with upfront value, market dynamics may change and perhaps make it obsolete (McGaughy et al., 2018). Let's use the development of a website as an example to highlight the importance of project value. However, the project would not be deemed successful if end users had difficulty finding the necessary information quickly. Another illustration involves putting an application atop a new technology, like 5G in the telecom sector. Failure to provide the application sooner would reduce its expected value if the project is intended to be finished within a year but, after six months, there is a pressing need for it since it has the potential to generate large money. Therefore, the ability to achieve the required outputs and benefits in line with strategic goals, regardless of adherence to budget and deadline constraints, is the primary definition of project success.

In the IT and digital industries, agile project management has grown significantly in popularity (Kaur et al., 2015). This is mainly because of the current digital transformation period and the ever-changing requirements that organizations must meet in order to complete projects. A thorough assessment of the literature was undertaken to pinpoint the research gap and lay the groundwork for the study. This review focused on the material that was pertinent to the subject at hand and identified the most suitable principles to direct the investigation.

In agreement with these authors, Goncalves (2020) acknowledged the presence of various agile approaches, many of which have similar practices, traits, and philosophies. Nevertheless, each agile methodology has its own special techniques, jargon, and tactics when it comes to implementation. All of these approaches were compared by Goncalves (2020), who highlighted the benefits, drawbacks, and best practices of each method.

Scrum is a management and control system that handles iterations and increments across a range of project types. It is an adaptable framework that may be used with various agile approaches. Because Scrum may increase productivity while providing simplicity and flexibility, it has become increasingly popular within the agile technique. According to Al-Zewairi et al. (2017) and Margini et al. (2017), the Scrum framework offers rules for using product backlogs, working with cross-functional production teams, involving key roles like the product owner and scrum master, and holding sprint retrospective meetings. Agile teams may

produce products with fewer problems and challenges by successfully performing sprints, which are crucial to both Scrum and agile approaches as a whole.

Lean software was created by Mary and Tom Poppendieck as an iterative process in 2003. They see it as a continuation of the lean business movement, which Toyota first applied to lean manufacturing. Lean software adheres to the following seven guiding principles in order to deliver complex software systems: According to Al-Zewairi et al. (2017) and Margini et al. (2017), these seven goals include generating knowledge, ensuring quality, delivering quickly, honoring commitments, promoting a culture of respect for people, optimizing the system, and removing waste. The lean technique relies on open lines of communication between consumers and programmers and places a significant emphasis on speed and efficiency. Lean places a strong emphasis on the flexibility and efficiency of individual or small team decision-making rather than the use of hierarchical decision-making procedures. The goal is to move the software development process along by making decisions more quickly and intelligently.

The Scrum method is used to make project conception easier while emphasizing continuous execution and preventing the construction team from being overworked. Scrum processes are intended to increase team productivity, much like scrum. The team may further boost performance by using a Scrum board to visualize the workflow, spot problems, and efficiently manage the flow by matching the workload with phase restrictions. The foundation of the Scrum Method is a set of guidelines/procedures for streamlining & improving workflow. It is an evolutionary strategy that promotes gradual modifications to an organization's operations without creating havoc. Organizations can use Scrum to improve flow, shorten cycle times, and boost overall efficiency in their business processes by putting these concepts and practices into practice.

XP is regarded as one of the most commonly used and thought-provoking agile approaches, according to Kent Beck's (2004) description. It offers a methodical strategy for effectively and reliably creating high-quality apps. In order to develop functional applications and reduce time to market (TTM), XP places a strong emphasis on active user involvement in ongoing planning, monitoring, and rapid feedback. Technical practices such as the use of story cards, iterative development, refactoring, and automated testing have all been significantly impacted by this methodology. Planning is the first step in the XP process, and at this stage, several important factors are taken into account. The project's goals are established during this phase, and the expected cost is established as well. Designing a new system while staying inside the allotted budget and achieving user expectations is essential. Gathering end-user requirements is a key step in the analysis phase, and users are essential in defining all the features and expectations for the new system. The decision-making phase of the development process is followed by the design phase, during which the new system's blueprint is developed. In this stage, data flow diagrams, charts, and other visual representations of the project's flow are created. Additionally, sample prototypes may be created to obtain client feedback that the programmer will utilize to develop the product. Following development, the software must then be implemented before being evaluated and having user input gathered. If the product doesn't satisfy customer needs, it goes through a maintenance phase to fix the problems.

The Crystal process is recognized as one of the easiest and most effective methods for developing applications. It includes a variety of agile systems, including Crystal Yellow, Transparent, and others. The importance of the system, the size of the team, and the project's objectives are just a few of the variables that have an impact on these systems. The Crystal family of techniques places a strong emphasis on the knowledge that every project has particular characteristics that call for adjustments to be made to the processes.

A dynamic system design methodology (DSDM) arose as a platform for business project management in 1994 to solve the problems brought on by the rapid advancement of technology. The method used to manage this expansion during the 1990s was frequently disorganized and lacking in structure. But since its origin, DSDM has grown and matured, offering a well-structured framework for organizing, carrying out, delivering, and reproducing agile systems and iterative initiatives (Margini et al., 2017).

Rajashima, Lim Bak Wee, Paul Szego, Jon Kern, and Stephen Palmer created the Feature-Driven Development (FDD) technique. It is a method that, by first determining the structure of the agile model, emphasizes concept-driven, iterative work. Every two weeks, the "plan by feature, build by feature" process is used in various iterations. Due to their functionality and portability, these features are intended to improve the consumer experience.

To define success determinants from the perspectives of multiple stakeholders, Davis (2014) undertook a thorough integrative literature review. But he found that among the stakeholders he looked at, there were no consistent perceptions of these issues. For instance, project managers used a traditional methodology in which a project's success was determined by its ability to adhere to time, financial, and scope restrictions. This meant that the project had to be

completed on schedule and within the allotted budget. On the other hand, according to project team members, communication and ongoing learning are signs of a successful project (Cooke-Davies, 2002). As their measure of success, senior management concentrated on generating benefits for the company. Despite the disparate perspectives and opinions of different stakeholders, Davis' research found that communication was the sole shared success component, which is consistent with the Project Management Institute's (2013) position.

Agile professionals participated in a survey study to determine the key success factors (CSFs). Unlike Davis, they were able to collect first-hand information to identify key success elements and divide them into three major categories: (1) delivery strategies; (2) agile software engineering approaches; and (3) delivery team competencies. When applying agile approaches, the authors did not discover evidence to support several prerequisites. Stankovic et al. (2013) proposed two new success criteria relating to deadlines and cost after discovering that not all of these success factors could be used in the study they conducted in Yugoslavia. To further classify the observed success elements, Chow and Cao proposed five dimensions: organization, people, process, technical, and project.

Lindsjrn et al. (2016) found no appreciable differences between agile project management and traditional surveys when analyzing the impact of workgroup quality as a success element. They did note, however, that when using an agile methodology, the impact of teamwork quality on total teamwork performance was more apparent, highlighting the efficacy of the agile methodology.

Rehman and Nawaz (2020), on the other hand, discovered answers and suggested tools for testing software created using agile processes, allowing for the use of agile approaches to testing phases. Joslin and Müller (2015) discovered inconsistent evidence, despite Kaur et al.'s study highlighting the advantages. They found that using the project management approach for services results in more successful projects than using it for products. They also found that the likelihood of a project's success increased with the amount of project management expertise used in adopting the technique. Although the results are intriguing, it is yet unclear how they were arrived at.

Lalsing (2012) especially addressed team size with regard to attaining successful agile project management, emphasizing the significance of choosing the right team size at the outset. In agreement with Lalsing, Mohammad (2013) emphasized that the people, especially the client and agile team members, are the essence of the agile process.

Wang (2010) discovered that education, planning, and active engagement in the agile community are crucial for successful deployment. They also emphasized the importance of addressing technological implementation and architectural issues. Drury-Grogan (2014) examined CSFs from a different angle, emphasizing the team, crucial decision-making, and agile team iteration objectives. This supports the findings of Lalsing, Mohammad, Wan, and Wang, emphasizing the significance of the people aspect in the success of agile projects.

Conforto et al. (2016) adopted a distinctive stance by characterizing agility as culture as opposed to framework. Their findings suggest that agility should be considered as a team's performance rather than a fixed process or approach that must be rigidly adhered to. The stakeholders involved are essential to the agile methodology's success. Along with Tam et al. (2020), the authors also found that rapid project planning and customer interaction can be used to evaluate the performance of agile development. These results make it more difficult to determine whether the agile methodology actually aids in project management.

Project success was defined by de Carvalho et al. (2015) taking into account variables including schedule, cost, and margin. Regardless of the methods utilized, they discovered that project complexity positively influenced project success using a three-year quantitative longitudinal field survey. Their study demonstrated how project management enablers and initiatives have a favorable impact on project performance. In conclusion, both articles emphasized how important PM is.

Kalenda et al. (2018) emphasized the difficulties in putting agile project management into practice, such as resistance to change, quick adoption, problems with consistency, and inclusion without agile business alignment. The writers came to the conclusion that, even while adopting a particular plan is not necessary inside an organization, the process or approach should be modified to satisfy client demands while preserving the fundamentals of agile methodologies.

Itai and Shtub (2019) investigated the methods used by organizations to evaluate the outcomes of their agile project management. They discovered that many projects fell short of the objectives of the organizations and the standards by which they were judged successful. According to the survey, organizations still use outdated success metrics like planned vs. real timeframes and product quality since they don't have the right tools to evaluate success using agile framework.

Understanding client loyalty and demands is a key component of the agile approach, which prioritizes providing the consumer with the entire market value. According to the principles of lean software development, any tasks that do not benefit the customer should be

eliminated. Using a prioritized set of criteria to direct the production process and segregating criteria depending on their market worth are two ways to do this. According to Jarzbowicz and Sitko (2020), this pattern fits with particular design methodologies like Scrum or Extreme Programming.

In order to characterize the success criteria connected with the adoption of agile project management on a bigger scale than other papers, Misra et al. (2009) conducted a thorough study utilizing a strictly quantitative technique. The authors advocated team member empowerment, which is consistent with the results of prior studies on the topic. O'Sheedy and Sankaran's (2013) work concentrated on creating an agile project management framework and identifying the crucial factors for every stage of conventional project management. They agreed that more action research and practical applications needed to be investigated.

A study was undertaken by Sheffield and Lemétayer (2013b) to pinpoint crucial elements that affect project success when utilizing an agile methodology. They discovered that it's critical for the project environment and the selected agile approach to be in sync. In order to complete projects successfully, organizations should also decide on the right amount of software development agility.

Critical success factors (CSFs) were the subject of Hummel and Epp's (2015) research, and they discovered that self-governance is a crucial characteristic of agile project teams. Additionally, they emphasized how crucial management participation, agile values, customer participation, and good communication are at the organizational level. These results are consistent with earlier work on consumer interaction and organizational culture by Tam et al. (2020b). Researchers have all agreed that organizational culture, customer involvement, and team dynamics are crucial components of agile methodology.

Nasir and Sahibuddin (2011) outlined twenty-six CSFs, highlighting the need of top management backing, competent project managers, customer input, accurate estimating, clear requirements, and good communication. 29 success variables were discovered by Dikert et al. (2016). They emphasized the significance of these elements while also recognizing the need for additional research in the area.

Papadopoulos (2015) emphasized how traditional project management has trouble responding to shifting client needs, necessitating the search for an alternate strategy. Agile project management may increase client satisfaction and eventually deliver the intended project value because to its flexibility in establishing needs and assuring project success.

Papadopoulos (2015) recommended the adoption of a tailored agile methodology for larger organizations, while more research was required to ascertain its efficacy. According to Pundak (2014), it is important to choose a project management technique depending on the kind, size, and relevance of each project because each one is unique. However, selecting a certain methodology for every project may be difficult and waste time and resources.

Abdalhamid (2019) observed that agile is preferable to traditional techniques because it can handle fluctuating needs and achieve faster time to market.

Agile may not always be the best option, according to Sharma et al. (2012), who compared it to other software development life cycles. This finding suggests that some organizations continue to work within a traditional framework. However, the authors discovered that in terms of productivity, performance, time to market, and risk analysis, agile initiatives typically exceed others. The researchers' objective to use agile methodology in the context of testing and quality assurance is aligned with the fact that agile procedures are frequently used in web-based and testing tools.

Robbins et al. (2016) identified a number of critical factors for success and failure in agile project delivery to ease the transition from traditional to agile project management. These include organizational culture, team member skill level and attitude, project type and planning, team structure, stakeholder involvement, and customer participation.

In order to illustrate how successfully implementing agile project management approaches can be, Paasivaara et al. (2018) used the research and design division of a sizable company like Ericsson as their case study.

Misra et al. (2010) claim that in order to successfully embrace agile project management approaches, organizations must take into consideration a number of elements. Changes in organizational culture, managerial style, knowledge management strategy, and development procedures are some of these influences. This is consistent with what Robbins et al. (2016) found.

It is crucial to remember that conventional models work well for simple projects with constant scope and specifications. Agile techniques, as emphasized by Reddy and Kumar (2020), are the suggested course of action for projects with unclear, ambiguous, and frequently changing requirements or scope. Additionally, Nurdiani et al. (2019) advise implementing agile practices in a particular sequence to get around any difficulties that may arise when switching from traditional to agile techniques.

Only 2.5% of businesses worldwide have a 100% completion rate for their projects, according to Rasnacis and Berzisa's (2015) analysis of project completion rates. The majority of projects were either over budget, overdue, or

unfinished.

Lebdeh et al. (2020) assert that improving collaboration between various technical and management employees should be the solution to the integration problem when using agile approaches in large-scale organizations. It's critical to have efficient communication plans during the planning phase of a significant construction project. In order to optimize tasks and plans based on particular job specifications, it is therefore crucial to customize an agile structure before deployment for each project.

III. RESEARCH METHODOLOGY

The literature review indicates that software development is where Agile technique is most frequently used. The study on its use in data science (DS) and management science (MS) in general, however, is scarce. Only a few of the literature review's articles address its applicability to the telecoms sector. This dearth of research in the telecom sector points to a knowledge vacuum. As a result, both MS and DS will gain from the study project's findings that will add significant knowledge to the use of Agile methodology in the telecoms industry.

- **Methodology**

Quantitative approach uses data and statistics to describe, explain & even make predictions. It makes it possible to get first-hand information from a sizable sample size and can be used both cross-sectional and longitudinally across time. This methodology deals with issues including amounts, frequencies, amounts, causes, and processes. Even if surveys aren't the only tool used by quantitative researchers, they are by far the most popular ones.

The research process is guided by the methodology, which outlines the processes to accomplish the study objectives. It guarantees that the research questions are effectively answered. Quantitative data are gathered and analyzed in this particular investigation. In order to collect data, the survey approach is used, which entails asking participants survey questions. The survey is carried out through a variety of methods, including emails, phone calls, and in-person interactions. The researcher decided to use these channels to deliver questionnaires. By putting a focus on project value, this research seeks to assist the organization under examination in achieving its project goals. The quantitative method, which begins with quantitative data collecting and is followed by quantitative data analysis, is then applied after the aforementioned technique has been adopted. After that, qualitative data is gathered, and qualitative data is analyzed. The analytical outcomes from the quantitative step are used by the researcher to validate and explain the findings. In other words, the quantitative analysis of the main data acquired by the researcher comes after the analysis phase. An online survey is used as the data gathering mechanism for the quantitative method. The suggested technique guarantees the gathering of pertinent data, while identifying the research gap and guaranteeing that the research project's findings add to our understanding of the world.

- **Conceptual Framework**

According to Blomquist et al. (2016), the conceptual framework acts as a visual representation illuminating the relationship between independent and dependent variables. It will be used in this study to investigate the relationships between variables. Literature review revealed that many definitions of project success have been used by researchers, with project success being treated as the dependent variable. The literature also showed that various combinations of independent variables were used by researchers. Some only paid attention to the people element, while others took into account all factors, including the project, process, organization, and people. The people component and the organization element are the only independent factors in this research endeavor, though.

The benchmark research paper selected for this research was published by Wafa, Rubab, Muhammad Qasim Khan, Fazal Malik, Akmalbek Bobomirzaevich Abdusalomov, Young Im Cho, and Roman Odarchenko. (2022). "The Impact of Agile Methodology on Project Success, with a Moderating Role of Person's Job Fit in the IT Industry of Pakistan" Applied Sciences 12, no. 21: 10698. https://doi.org/10.3390/app122110698

Conceptualized model is shown below.

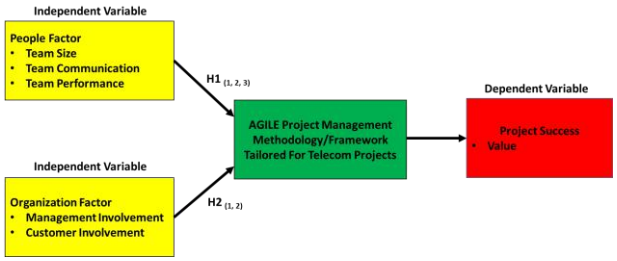


Fig 3.1: Conceptualized Model

Independent Variables

- People Factor (Team Size, Communication and Performance)
- Organization Factor (Management and Customer Involvement)

Dependent Variable

- Project Success (Value)

- **Hypothesis**

Following hypotheses are formulated for this research study:

Hypothesis 1

$H1_1$: A correlation exists between the size of the team and project success (measured in value) when utilizing an AGILE Project Management Methodology/Framework specifically designed for telecom projects.

$H1_2$: An association can be observed between team communication & project value when implementing AGILE Project Management Methodology/Framework specifically tailored for telecom projects.

$H1_3$: A connection can be identified between team capability and project value when employing AGILE Project Management Methodology/Framework specifically customized for telecom projects.

Hypothesis 2

$H2_1$: A correlation exists between management involvement and project value when implementing an AGILE Project Management Methodology/Framework specifically tailored for telecom projects.

$H2_2$: A connection can be observed between customer involvement and project value when utilizing AGILE Project Management Methodology/Framework specifically customized for telecom projects.

- **Data Collection**

The process of gathering data used tools that were suited for the topic of research, such as surveys for both quantitative and qualitative methodologies. Quantitative approach was used to start the investigation. Random sampling approach was used to calculate sample size or assuring fairness and reduce bias. A survey (Jisc, 2020) was given to the chosen sample in order to thoroughly evaluate the links between the independent and dependent variables. The analysis tool used was SPSS, which was used to analyze the data gathered and look into causal effects. The survey data for this research endeavor underwent both descriptive and inferential analyses. It's vital to remember that the survey had a cross-sectional design.

- **Sample Size**

Sample size is established using recognized formulas. Having confidence level of 99% and a confidence interval of 5%, 110 survey participants were determined to be the ideal sample size, taking into account a population size of 130 (65 questionnaires from each company, i.e., PTCL and SCO).

- **SPSS Tool**

A popular piece of software for social science research and data processing is called SPSS (Statistical Package for the Social Sciences). It offers a full range of tools for organizing, managing, and analyzing data as well as producing reports and visualizations. Researchers can enter, modify, and change data using SPSS to get it ready for analysis. This involves activities including importing data from different sources, cleaning and recoding variables, and developing new variables based on old ones.

After the data has been generated, a variety of statistical techniques and processes are available in SPSS for analysis. These comprise inferential statistics like t-tests, analysis of variance (ANOVA), regression analysis, and chi-square tests as well as descriptive statistics like mean, median, and standard deviation. These techniques assist researchers in finding patterns, connections, and linkages in the data and in drawing statistical conclusions about the population under study.

Researchers with different degrees of statistical knowledge can use SPSS because of its user-friendly graphical interface. Users can create Tabs, charts, and graphs to present and visualize their findings. Overall, SPSS is an effective tool for managing data and performing statistical analysis, allowing researchers to rigorously and methodically analyze their data and draw conclusions from it.

- **Ethical Considerations**

Throughout the course of the project, the researcher made precautions to uphold ethical standards. The right to withdraw from the survey was given to participants, and they were not required to give a reason. Additionally, the acquired data was safely preserved and not made public in its unprocessed form. Prior to taking part in the study, participants had to give their permission. It's critical to remember that every participant was older than 18.

IV. DATA ANALYSIS AND DISCUSSION

- **Data Collection**

With great consideration given to its design, the survey was used as the primary approach for gathering data in order to properly answer the study questions. The survey questions were developed to provide responses and insights related to the research objectives by drawing on the knowledge obtained from the literature review. Questionnaire was divided into four main sections: Demographic questions were in Section 1, and the details of the Agile project were in Section 2. Agile success elements were covered in Section 3 before success perception was examined in Section 4.

In order to collect data for the study's analysis and conclusion, a set of demographic questions were added to the survey. The five particular questions in the demographic

section were designed to gather information about the participants' positions, ages, departments, and other pertinent criteria. Because demographic questions were included, statistical analysis was made easier and survey respondents' responses could be thoroughly examined in light of numerous demographic factors.

Gender	Age	Department
Position	Location	

Tab 4.1: Demographic Questions

The researcher gathered feedback on important issues such project management approach, project definition, and scope within the area devoted to Agile project information. In addition, the poll asked about the three crucial success factors as shown in the table below. This section's data collection yielded important insights into certain particular facets of Agile project management.

Project Management Methodology	Project Definition	Team Capability
Customer Involvement	Management Involvement	

Tab 4.2: Project Information

The researcher received replies from the section on Agile success criteria that offered insights into a number of independent variables. To obtain information on aspects including team size, communication within the team, and performance, questions were developed. These replies were gathered in order to perform a thorough analysis of these factors and how they affected the study's findings.

Team Size	Team Communication	Team Performance
Proper Training	Active Management	Implement Complete Methodology
Team Access external Resources	Corporate Size	Team Collocation

Tab 4.3: Success Factors

Participants were asked a series of questions about how they saw success in the survey's final segment. With the use of these questions, the survey's participants were asked to provide their opinions on the efficiency of the Agile PM approach in both the DS and MS departments. This component is crucial because it gives the researcher important information about how participants perceive and use Agile project management approach. This information will be used to inform the study's overall analysis and conclusions.

Agile in Digital Services Functional Domain	Agile in Managed Services Functional Domain

Tab 4.4: Perception of Success

Likert Scale was used.

Strongly Disagree	Disagree	Neither agree nor disagree
Agree	Strongly Agree	

Tab 4.5: 5-Point Likert Scale

- **Descriptive Statistics**

There were 110 respondents in the survey sample, meaning that everyone who participated answered every question. There were no missing data points. This sample size, which is greater than 100, can be regarded as a normal sample and allow for direct analysis. The demographic data from Section One analysis showed that there were no missing data and that all survey respondents submitted legitimate responses. For instance, the variable Age had a mean of 3.69 because all 110 respondents supplied a response. This shows that most survey respondents are over 40 years old. A kurtosis score of -0.439 shows that the tail of the distribution is slightly skewed to the left of the mean, while a skewness value of 0.154 suggests that the data distribution is relatively symmetrical. In terms of gender distribution, 95 out of 110 survey participants—or 86.4% of the sample—were male, while 15 out of 110—or 13.6%—were female. The fact that over 40 percent of survey respondents are clearly senior personnel is demonstrated by the poll results. Further confirming the idea that most workers in this field are older, the majority of respondents who fell within the medium age group were between 36 and 40 years old.

In terms of departmental representation, 31.8% of respondents were from the managed services department, compared to 68.2% from the department of digital services. The digital services department within the chosen organizations may be greater in size than the managed services department, notwithstanding the fact that the sample was randomly chosen. The frequency and percentage of survey respondents by department were examined, and it was discovered that 48.2% of respondents held positions such as project/program managers, while 22.7% of respondents represented program directors, a major position in the department of digital services. 1.8% of the employees in the managed services division were chiefs, and 2.7% were directors. The statistics are shown in the Tabs below:

Respondents Gender		Age	Department	Org Level
N	Valid	110	110	110	110
	Missing	-	-	-	-
Mean		1.12	3.78	1.23	2.10
Skewness		2.125	.143	.783	1.052
Std. Error of Skewness		.241	.241	.241	.241
Scrum		2.652	-.429	-1.388	.148
Std. Error of Scrum		.461	.461	.461	.461

Tab 4.6: Statistics

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Male	95	86.4	86.4	86.4
Female		15	13.6	13.6	100
Total		110	100	100	

Tab 4.7: Gender

		Frequency	%	Valid %	Cumulative %
Valid	< or = to 30	2	1.79	1.79	1.79
	31 to 35 Years	15	13.4	13.4	15.4
	36 to 40 Years	33	29.9	29.9	45.4
	41 to 45 Years	34	30.8	30.8	76.5
	46 to 50 Years	17	15.4	15.4	91.7
	Above 50 Years	9	8.3	8.3	100.0
	Total	110	100.0	100.0	

Tab 4.8: Age

		Frequency	%	Valid %	Cumulative %
Valid	Digital Services	75	67.18	67.18	67.18
	Managed Services	35	32.01	32.01	100.0
	Total	110	100.0	100.0	

Tab 4.9: Department

		Frequency	%	Valid %	Cumulative %
Valid	Project/Program Manager	53	47.32	47.32	47.32
	Program Director	25	21.67	21.67	71.89
	Head/Manager	10	8.21	9.21	79.99
	DS Head / MS Head	17	14.46	14.46	94.88
	DS Director	3	2.69	2.69	97.42
	MS Director	2	1.79	1.79	100
	Total	110	100	100	

Tab 4.10: Position

		Digital Services	Managed Services	Total
Gender	Male	65	30	95
	Female	10	5	15
Total		75	35	110

Tab 4.11: Gender by Departments

		Age						
		Less than or equal to 30	31 - 35	36 – 40	41 – 45	46 - 50	Above 50	Total
Gender	Male	0	13	27	30	16	9	95
	Female	2	2	6	4	1	0	15
Total		2	15	33	34	17	9	110

Tab 4.12: Gender &Age

- **Reliability**

Based on the presented Tab, it was determined that the data was dependable after evaluating the dependability of both the dependent and independent variables.

Variable	Reliability Test (Cronbach's Alpha)
Team Size	0.799
Team Communication	0.563
Team Capability	0.723
Management Involvement	0.744
Customer involvement	0.754
Project Value	0.748

Tab 4.13: Testing Reliability

- **Correlation**

By formulating hypotheses, you can assess and examine the potential relationship b/w dependent variable & independent factors. p-value is 0.007 in the Tab below,

which is less than 0.01, suggesting statistical significance. This shows a 0.255-positive association between the size of the crew and the importance of the project. The p-value in Tab is 0.000, which also denotes statistical significance. Consequently, there is a positive correlation of 0.392 between team communication and project value. Similar to Tab shows a positive correlation of 0.538 between team performance and project value with a p-value of 0.000, showing statistical significance. The p-value is 0.000, indicating statistical significance. This suggests a link between management engagement and project value of 0.482, which is favorable. The final result is shown, where a p-value of 0.001 (less than 0.01) denotes statistical significance. This results in a correlation coefficient of 0.312 b/w customer involvement & project value that is showing positive link.

		TEAM SIZE	PROJECT VALUE
TEAM SIZE	Pearson Correlation (PC)	1	.266**
	Sig. (2-tailed)		.007
	N	110	110
Project Value	PC	.266**	1
	Sig. (2-tailed)	.007	
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

Tab 4.14: Team Size & Project Value

		Project Value	TEAM COMM
Project Value	PC	1	.383**
	Sig. (2-tailed)		.000
	N	110	110
TEAM COMM	PC	.383**	1
	Sig. (2-tailed)	.000	
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

Tab 4.15: Team Communication/Project Value

		Project Value	TEAM PER
Project Value	PC	1	.547**
	Sig. (2-tailed)		.000
	N	110	110
TEAM PER	PC	.547**	1
	Sig. (2-tailed)	.000	
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

Tab 4.16: Team Performance/Project Value

		Project Value	Management Involvement
Project Value	PC	1	.473**
	Sig. (2-tailed)		.000
	N	110	110
Management Involvement	PC	.473**	1
	Sig. (2-tailed)	.000	
	N	110	110

Tab 4.17: Management Involvement/Project Value

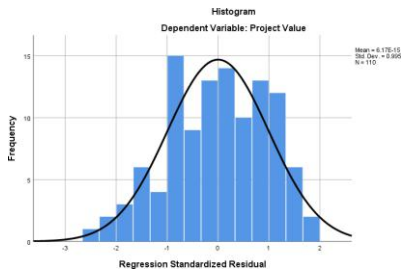
		Project Value	Customer Involvement
Project Value	PC	1	.323**
	Sig. (2-tailed)		.001
	N	110	110
Customer Involvement	PC	.323**	1
	Sig. (2-tailed)	.001	
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

Tab 4.18: Customer Involvement & Project Value

Variable	Pearson Correlation
Team Size	0.263
Team Communication	0.375
Team Capability	0.543
Management Involvement	0.490
Customer involvement	0.325

Tab 4.19: Correlation Analysis Summary



- **Regression**

The researcher performed a regression test as an additional investigation to check the accuracy of the five hypotheses.

According to the Tab below, the association between team size and project value has an R-squared value of 0.065, or a prediction percentage of almost 6.5%. This proportion is regarded as being extremely low. The association between team communication and project value has an R-squared value of 0.154, which translates to a prediction rate of about 15.4%. This percentage is likewise thought to be quite low. The R-squared value for the association between Team performance and project value is 0.29, which corresponds to a low prediction percentage of about 29%. Additionally, the link between management engagement and project value has an R-squared value of 0.233, translating to a prediction percentage of roughly 23.3% that is likewise considered low.

	Mean	Std. Deviation	N
Project Value	4.0643	.51305	110
TEAM SIZE	4.0898	.57989	110

Tab 4.20: Team Size

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.253[a]	.058	.049	.47733	.058	7.498	1

Tab 4.21: Team Size & Project Value

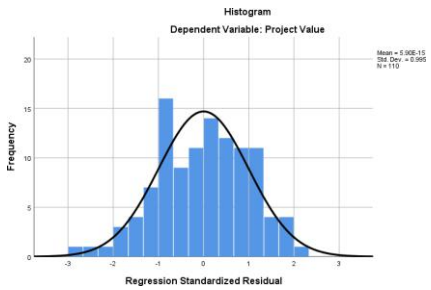


Fig 4.1: Histogram Team Size

	Mean	Std. Deviation	N
Project Value	4.0677	.51045	110
TEAM COMM	4.3967	.43487	110

Tab 4.22: Team Communication

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.383[a]	.139	.143	.45896	.148	19.564	1

Tab 4.23: Team Communication & Project Value

	Mean	Std. Deviation	N
Project Value	4.0693	.51367	110
TEAM PER	4.3782	.3782	110

Tab 4.24: Team Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.529[a]	.288	.278	.43444	.288	44.045	1

Tab 4.25: Team Performance & Project Value

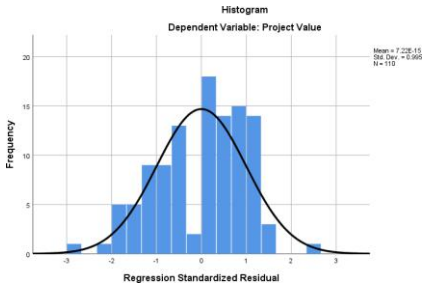


Fig 4.3: Histogram Team Performance

	Mean	Std. Deviation	N
Project Value	4.0810	.50347	110
Management involvement	4.2434	.45386	110

Tab 4.26: Management Involvement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.473[a]	.244	.234	.43899	.245	32.689	1

Tab 4.27: Management Involvement and Project Value

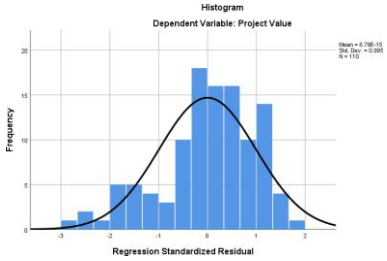


Fig 4.4: Histogram Management Involvement

	Mean	Std. Deviation	N
Project Value	4.0699	.50310	110
Customer involvement	4.2428	.50483	110

Tab 4.28: Customer Involvement - Descriptive Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.323[a]	.089	.091	.47045	.097	11.701	1

Tab 4.29: Customer Involvement & Project Value

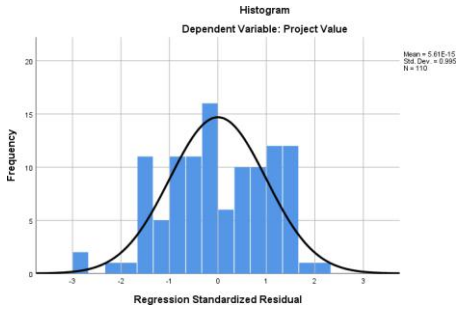


Fig 4.5: Histogram Customer Involvement

Variable	R square
Team Size	0.059
Team Communication	0.143
Team Capability	0.289
Management Involvement	0.244
Customer involvement	0.084

Tab 4.30: Regression Analysis Summary

V. DISCUSSION AND CONCLUSION

- **General Discussion**

The study used a quantitative approach to its technique. 110 participants completed the survey, yielding 100% valid data with no questions skipped or left out, according to the primary data gathering process. A reliability test was performed to ensure the consistency of the independent and dependent variables, and the results supported the statistical consistency of the study and its applicability for making decisions. Except for team communication, which had a reliability coefficient just above 0.5, suggesting lesser reliability, the Cronbach's alpha test findings showed that all variables were trustworthy because they all exceeded a threshold of 0.7 (Field et al., 2013). It is important to keep in mind that while the demographic data from the survey may be important for the organization's, it is not a crucial component of the research study.

In terms of demographic data, just 13.6% of survey respondents identified as female, while 86.4% identified as male. Participants between the ages of 36 and 40 made up roughly 30% of the total, while those between the ages of 41 and 45 made up roughly 30.9%. As a result, more than 60% of respondents were between the ages of 36 and 45,

with 8.2% of respondents being above 50, indicating higher organizational experience.

- **Analysis of Research Questions**

1st Research Question (RQ)

Does utilization of APM methodologies is advantageous for success of DS and MS functional domains?

By analyzing how survey participants and interviews approached this topic, the primary data analysis will shed light on the first research question. Questions in the survey directly addressed this topic. According to the poll findings, 39.1% of participants agreed with the assertion that applying APM in DS would be more successful than using the conventional method, while 37.3% strongly agreed. However, only 2.7% of respondents disagreed, and 20.9% remained undecided. We get a total of 76.4% of respondents endorsing the idea when we include the percentages of those who agreed and strongly agreed, demonstrating a high level of agreement across the dataset.

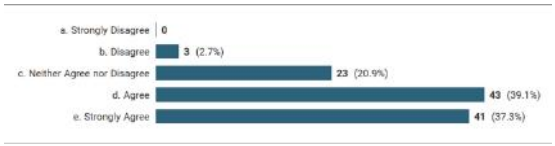


Fig 5.1: APM - Agile Project Management will be Successful in DS Compared to the Traditional Approach?

In addition to confirming the value and effectiveness of using the agile methodology in the DS department, as previously proposed by Sjödin et al. (2020), the study's findings also help close the research gap in the field of DS. Additionally, the findings provide insight into the application of APM in the MS department, an area that received little focus in earlier studies by Speta (2011) and Kumbakara (2008).

Participants in the poll were questioned about the possibility of agile project management success in the MS department. 29.1% of the respondents said they strongly agreed with the statement, while 37.3% said they agreed. In comparison, 4.5% of respondents disagreed, 28.2% did not respond, and 0.9% strongly disagreed. We note that 66.4% of respondents were in agreement when we add the percentages of those who agreed and strongly agreed. In comparison to the proportion of respondents who disagreed with the proposal, this proportion is statistically significant.

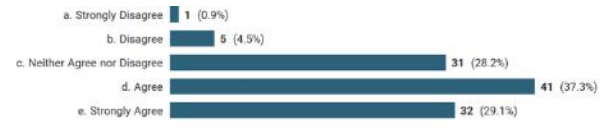


Fig 5.2: APM will be Successful in Managed Services if Applied?

This connection suggests that the company has already started applying APM methodology across its international R&D operations. The application of this practice should, however, be done in stages, it is crucial to emphasize. In conclusion, the answer to research question 1 is yes, albeit under specific circumstances. These circumstances are consistent with the body of literature and advise the organizations to start with pilot projects.

2nd RQ

Which are the key factors associated with implementation of APM techniques which have the most significant impact on project success?

It sought to ascertain whether the organization's practices were consistent with the body of literature or if new insights could be acquired that would be useful for further study. The statistical overview is shown below:

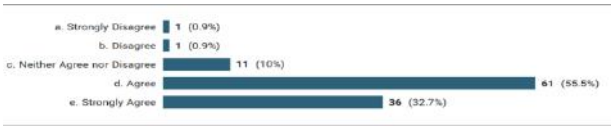


Fig 5.3: Using APM Methodology - Can It Achieve Project Value?

Sizable majority of respondents to the survey of 55.5% agreed that using an APM technique can result in the achievement of project value. Less than 1% objected, 10% stayed indifferent, and 32.7% strongly agreed with this assertion. A total of 88.2% of respondents agreed or strongly agreed with the concept when the percentages of those who agreed and strongly agreed are added together. According to Diegmann et al. (2018), these results show an increasing belief in the efficiency of APM technique and its favorable impact on project success, which is consistent with both the interview responses and the body of current literature.

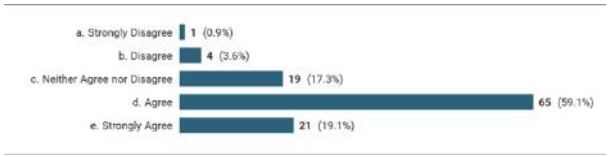


Fig 5.4: Do you Agree that Project Achieves Project Value when Moderated by APM Method rather than Traditional Method?

Approximately 78.2% of survey participants concurred that the project definition and framework have the potential to result in project success. Within this group, 59.1% said they agreed, and 19.1% said they strongly agreed. These results are consistent with the Tab that emphasizes the significance

of the agile framework. According to the survey respondents, training is one of the most important critical success factors (CSFs), as shown in the Tab below, which is consistent with the aforementioned training information.

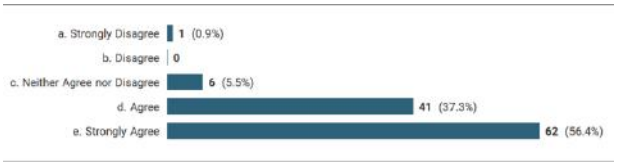


Fig 5.5: Proper Training on use of Agile will have Significant impact on implementing that methodology by team and Achieve Project Value?

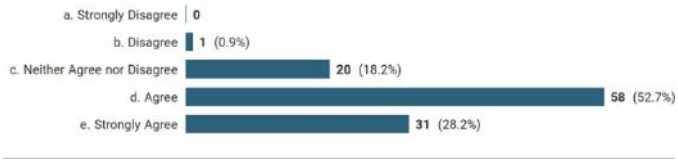


Fig 5.6: Providing Training to Team

When the survey results were statistically analyzed, it was found that 93.7% of the respondents agreed that training, specifically appropriate training in agile project management, is key success factor in achieving project value when using APM methodology.

Respondents' answers to direct question also agree with the preceding Tab and critical success factors (CSFs) designated as the framework, as well as the following examples of current literature:

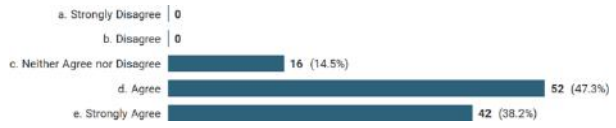


Fig 5.7: Complete Methodology Implementation Strategy Will Significantly Impact Implementing that APM Methodology & Achieving the Project Value.

The vast majority of survey participants nearly 85.5% agreed that following an agile framework is one of the key critical success factors (CSFs) when putting into practice an agile project management technique. These conclusions are consistent with the body of literature.

3rd RQ

Is there a correlation between effective APM and factors like team communication, team size, and team performance?

In order to assess the relationship between the independent factors and the dependent variable, correlation analyses were conducted. The results unequivocally demonstrate a positive association between the project value (dependent variable) and the five independent variables. Notably, team capability and management participation exhibited the strongest relationships, followed by team communication, customer involvement, and team size.

There exists correlation b/w each variable and dependent variable, as shown by the significance level of p 0.01 for all statistical tests conducted on the variables. The above-mentioned Tab's correlation coefficient, which is greater than 0.5, shows a strong relationship between team effectiveness and project value. The people element, which is acknowledged as one of the crucial factors alongside organization, process, and technical aspects in the literature, is related to variables including team size, communication, and performance.

With exception of people performance, Chow and Cao's (2008) study found little evidence to support all people characteristics as key success factors (CSFs). Their work is extensively cited and warrants more research, particularly with regard to the people component. The results of the current study concur with their findings, demonstrating that team performance shows the greatest association.

Wan and Wang (2010) also highlight the significance of team competency, which is consistent with the findings of Dikert et al. (2016). It is essential for organization's to carefully evaluate the selection of the right individuals and team size in order to successfully apply APM methodology and achieve project success. Team competence was recognized by Aldahmash et al. (2017) as one of the crucial success elements associated with the people factor, but they stressed the need for additional research to ascertain the relative weight of each crucial aspect. Although Tsoy and Staples (2020) concur that team size and communication are important, their study lacked quantitative testing. Er Meenakshi (2020) emphasized the value of effective teamwork and communication, which points the way for future studies on other crucial elements.

Quantitative technique was used to cross-reference, clarify, and validate the findings due to the paucity of literature in the telecommunications industry, specifically in the context of DS and MS. Team capability emerges as the most important component, closely followed by team communication and team size.

Study's findings demonstrate that the participants think these three human component traits have some bearing on a project's ability to succeed when employing the agile project management methodology. Given that there is a link but there is no straight one-to-one mapping, the statistical results for these variables do not indicate a high correlation. Team performance is considered as being essential to success in the agile process, and team communication

emerges as a key CSF.

The respondents emphasized the drawbacks of looking at each variable separately when asked to explain the reduced correlation between project value as the dependent variable and team size as well as the moderate correlation with team communication. They gave the example of a team that was appropriately sized but had poor communication and average performance, which might not be successful. The researcher then combined all variables related to the people component into one variable. Unfortunately, as shown, the result showed a moderate association. However, more study and research are needed to determine the cause of this link.

In conclusion, the research results show that there is a relationship b/w team size, team effectiveness, and team communication. These three factors have a range of association coefficients, from high to medium to low, as shown by survey respondents' responses and corroborated by the body of existing knowledge.

It is important to stress that there is a severe lack of research particularly evaluating the combined effect of these three variables in the literature. As a result, this study endeavor significantly advances knowledge in the field of communications. The study clarifies the reasons why there isn't a significant correlation coefficient when all variables are taken into account, pointing to the necessity for more investigation into and comprehension of this phenomenon.

In this research, the researcher concentrated on two organizational element variables: management and consumer involvement. There was some diversity in how management engagement was seen during the interviews, with some interviewees viewing it as micromanagement and others as governance. However, given the medium correlation value and the correlation coefficient, it suggests that most survey participants viewed management engagement as governance.

Customer involvement and management involvement have correlation coefficients that are more than 0.3, showing a moderate relationship between the two variables. Both relationships were discovered to be favorable as well. Although Misra et al. (2009) and Chow and Cao (2008) both acknowledged the importance of management engagement as a main critical success factor, they did not uncover a correlation. Wan and Wang (2010), on the other hand, were able to designate both the flexible leadership management and the customer involvement as CSFs.

Customer involvement was found to be the most important organization factor in Tsoy and Staples' (2020) research. Their study took into account micromanagement, as well as consumer involvement in governance and support, which is compatible with the knowledge gleaned from the interviews conducted for this research project. Project success was regarded dependent on both management and consumer involvement. The importance of these two variables was underlined inside the organization factor, expanding on the findings of Chow and Cao (2008), even though they were not given specific focus in the literature.

The following conclusions were reached based on survey questions about customer involvement:

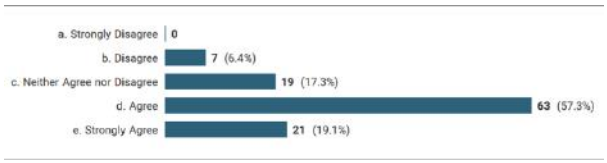


Fig 5.8: Management Involvement Using APM Method Achieves Project Value rather than Traditional one?

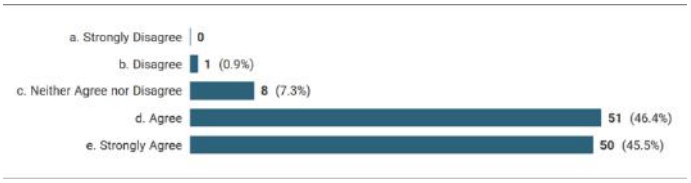


Fig 5.9: Active Management Involvement & Support

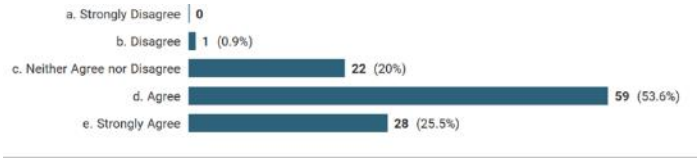


Fig 5.10: Management Involvement has Significant Impact on the Application of APM Methodology

According to the aforementioned graphs, a sizable majority of survey participants—between 80% and 90%—agree that customer interaction is a critical success factor (CSF). The stronger correlation coefficient found for consumer involvement compared to other categories reflects this high level of agreement.

The following findings can be drawn from an analysis of the customer involvement survey questions:

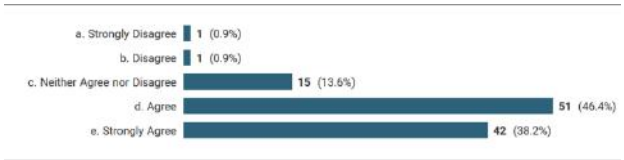


Fig 5.11: Customer Involvement has Significant Impact on Application of Agile Methodology

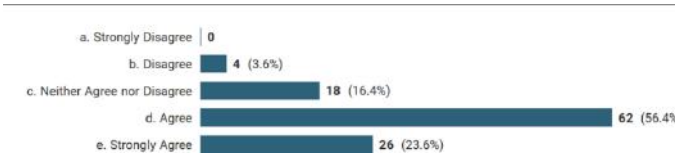


Fig 5.12: Customer Involvement Achieves Project Value When Moderated by APM Methodology

Based on the survey data, around 90% of the participants acknowledged the significance of consumer participation as a CSF, with moderately strong association. This outcome highlights the necessity for more comprehensive investigations into customer involvement that delve beyond team communication to explore the reasons behind the absence of a significantly positive association.

Gathering primary data was important in order to answer the three research questions and reach the project's goals. The relationship between the independent variables and the dependent variable, as described in the conceptual framework, was validated by the quantitative data collected from the survey respondents. It is noteworthy that the approach used supported the criteria and adhered to the body of prior research.

To see if dependent variable could be predicted based on the independent factors, the researcher ran extra study to look at the variables' regression. R-squared values, which quantify how well dependent variable can be predicted from the independent variable, were obtained from the regression analysis for each variable. The regression analysis's findings show that team size only explains 6.5% of the variation in the dependent variable, leaving it unable to account for 93.5% of the variability. A similar 15.2% of the variance is explained by team communication, leaving an additional 84.8% unaccounted for. 29% of the variability is explained by team capability, whereas 71% is still unclear. 23.3% of the variance is explained by management engagement, leaving 76.7% unaccounted for. Finally, 9.8% of the variance is explained by consumer interaction, leaving 90.2% unaccounted for.

These findings imply that although there is a correlation between the variables, none of the independent variables can reliably predict the dependent variable, project success under the agile project management technique. In other words, none of the independent variables by themselves can be relied upon to predict the outcome of a project. This result emphasizes the need for additional study in this field.

Survey respondents expressed agreement over the applicability of agile approach to testing and quality assurance. This disparity emphasizes the necessity of further investigation to comprehend these issues in greater depth.

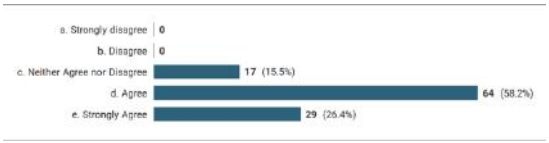


Fig 5.13: Success if used in Testing Phases

Akerele et al. (2014) found that approximately 93% of respondents felt that agile approach can be used effectively in quality assurance, notably in areas like unit testing, acceptance testing methods, and user acceptability testing.

- **Present Research Recommendations**

There are a number of topics that demand additional study and research. Although only five variables were chosen for examination in the current research project, it is advised that future studies go even further into the people and organization components. It is critical to investigate why, although being acknowledged as being essential to project success, team communication does not show the highest correlation coefficient. It is also crucial to look more closely at how management engagement and customer involvement affect bigger initiatives.

If given additional time, the researcher might also think about carrying out a longitudinal survey to collect data over a lengthy period, which would improve the dependability of the results. The study also recommends that the company launch trial projects utilizing several agile approaches, particularly Scrum, to evaluate their efficacy.

The researcher draws the conclusion that Scrum is an appropriate agile project management approach for the telecommunications domains such as DS and MS based on the outcomes of this study project. The study emphasizes the value of regular standup meetings, small team numbers, and team competence as factors that influence project success. Additionally, the study highlights the need of daily customer interaction and suggests that management involvement be centered on governance rather than micro-managing. The independent and dependent variables were not shown to have a causal link in this study; hence, additional research is required to investigate the causality and association of these variables.

- **Professional Contribution**

The adoption of APM technique in the telecommunications industry, specifically in the DS and MS departments, is the specific emphasis of this research project. The findings of this study show how successful and useful the Agile methodology has been in these departments. The research project also broadens the use of Agile methodology in testing and quality assurance, which has not been

thoroughly investigated in the telecommunications industry. The originality enriches the study and adds to the corpus of knowledge already in existence.

The five Critical Success Factors (CSFs) are being applied and validated for the first time in this research study of its sort. High correlation and regression results indicate the value of customer interaction and team capacity or performance for the organization. The importance of team communication as a CSF was again emphasized by the survey respondents. The organization is advised to give priority to these CSFs, guarantee the right team size for each project, actively involve clients during all project phases, hold daily standup meetings for efficient team communication, and ensure the team's proficiency with Agile project management techniques. It is crucial that management participation be kept to governance and not micromanagement. The company should also analyze current contracts to make sure they follow agile principles and think about implementing agile approaches in new contracts.

The five CSFs for effectively implementing Agile methodology in the DS and MS departments of Pakistan Telecommunication Company Ltd (PTCL) and Special Communications Organization (SCO) are clarified by this research project, which serves as a summary. These CSFs should be carefully considered by project managers, program managers, project directors, telecom directors, and chief operating officers of managed services. This study, which focuses primarily on DS and MS departments, is the first of its kind in the world of telecommunications and adds significantly to the body of knowledge in this area.

5.1. Future Research

It is of upmost to emphasize that the company has made significant investments in artificial intelligence (AI) and machine learning (ML) and is actively involved in these fields. It is crucial to do research in these areas given the organization's focus on AI and ML in order to secure future breakthroughs. Applying the Agile project management technique becomes more important, especially given that the company has an advantage over its rivals in this industry.

The contract type and employee culture are two further characteristics that the researcher advises investigating. These elements may have a big impact on whether or not you choose using APM methodology. The organization's upcoming projects would benefit greatly from further research into these issues. The research also advises adopting pilot projects to test out various Agile techniques, particularly Scrum, in order to validate the benefits of Time to Market (TTM). This advice is based on two pilot initiatives that the researcher has already carried out within the organization. By participating in such pilot projects, the organization will be able to obtain real-world experience and identify the Agile methodology that best suits their unique requirements.

- **Research Limitation**

This research project's purview has been widened to include the telecommunications industry, with a focus on two divisions in particular: MS & DS services functional departments. The project, however, had difficulties in extrapolating dependent variable from five independent variables, highlighting the need for further focused investigation. Instead of conducting a longitudinal survey, which might have produced more thorough and trustworthy data over time, time restrictions forced the conduct of a cross-sectional survey. Additionally, the project did not take into account several independent variables, such as the type of contract, which according to respondent comments emerged as a crucial success factor for project success under the Agile project management approach. If given more time, performing extensive research on a bigger project within the Digital Services industry could assist the organization conducting the research in numerous ways. The research project has nevertheless successfully emphasized the significance of Agile project management for the administration of organization’s in this area.

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