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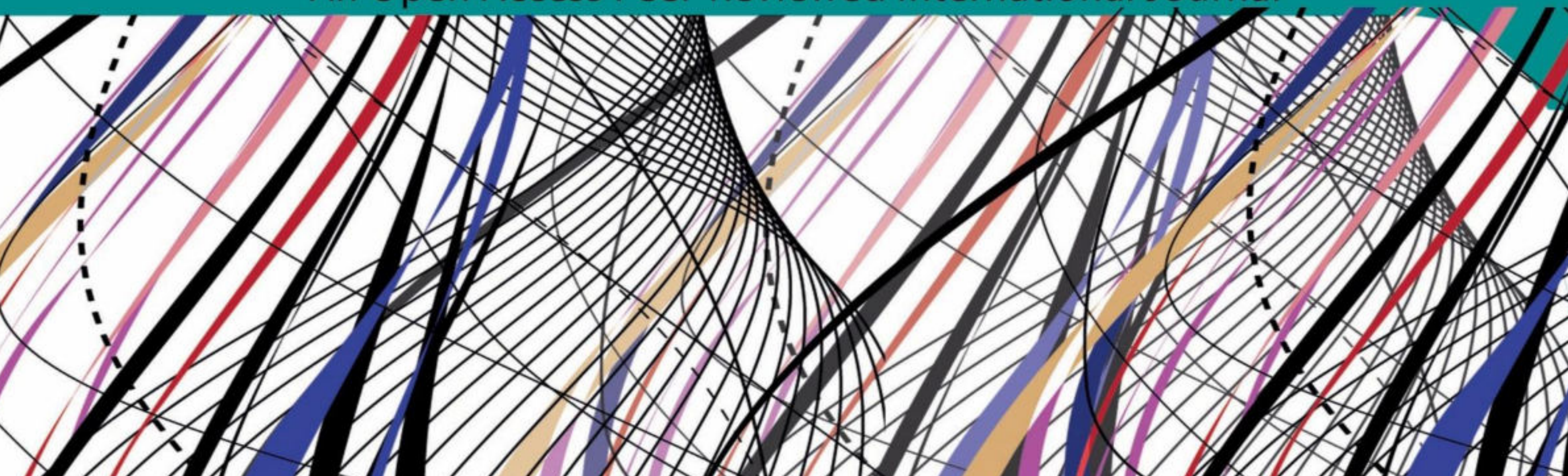

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Effectiveness of AI Education from Vitality- An Example of Banking Management in Taiwan

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Abstract— *This study analyzes the dimensions of the vitality of development for banking systems. Fuzzy synthetic decisions are used to construct and evaluate a vitality of training, assigning, and development index to offer banks new perspectives and methods of assessment. In this study, we analyze the vitality index for the human resources development of the banking system. Xie et al. (2021) think that with the rapid development and significant successfulness of various deep learning techniques in artificial intelligence (AI), AI has led to a significant evolution in both academic and industrial fields. For the uncertainty, the factor weight for the vitality index will be determined by using the fuzzy Delphi method (FDM). Through the process of fuzzy synthetic decision (FSD), the model calculated the relative importance for each dimension of the mean factor. In this empirical study of commercial banks, the priority ranks for the five dimensions are as follows: Efficiency, Leadership, Business Culture, Talents and Strategy.*

***Keywords*— Banking, AI, Vitality index, Fuzzy synthetic decision (FSD), Fuzzy Delphi method (FDM)**

I. INTRODUCTION

Traditional performance evaluation models for management focus on productivity and competitiveness. Most of them are financial indexes. But the financial index cannot fully express the sustainable development of an enterprise. A lot of physical examination forms for the human body, which are used to measure the function of every system and thus evaluate human health. Similarly, enterprises use indices to manage the performance of productivity and competitiveness. These explain the specification of enterprises to some extent, but not the complete source of an enterprise's sustainable development.

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This study aims to achieve the following objectives: 1. Establish the "vitality index" as measuring indexes of performance of the Taiwanese financial industry. 2. Find a method of operation for the survival of business.

II. THE STUDY OF LITERATURE

2.1 Living System Theory

Living System Theory (LST) was introduced by

Miller (1978), in which he integrated social, biographical, and scientific domains. From the "structure" and "process" of input, output, flow, stability, and feedback, it will help us to understand the characteristics of a living system and further to construct a general conception system that will correspond to the important variables of a concrete living system. Miller divided all living systems into seven levels, and each level was represented by 19 sub-systems.

The development of the vitality index is based on the LST (Tan, 1994), which is of extensive use in structural study, organization management, operating efficiency analysis, accounting, and information systems. In concept, managers can conceptualize the affairs that occurred in management and then provide a conceptual outline applicable to the organization.

In approach, LST supplies a model construction ability, the application of which extends to fields such as accounting, manufacturing, resource management, human resources, TQM, software design, etc. Therefore, LST can be used to describe a management system and framework.

2.2 The Performance of Management in AI

Szentes (2005) proposed a method for measuring competitiveness, including products and services. An asset life cycle management (ALCM) model is subsequently presented for assets in the process industry, integrating the concepts of generic project management frameworks and systems engineering and operational reliability to deal with these inefficiencies (Schuman et al. 2005). José Eugenio (2020) presented in detail a simplified method for the application of the analytic hierarchy method (AHP) that aims to calculate the priorities of a set of criteria. This increases the attractiveness of the AHP method for business applications.

Liang et al. (2003) adopt the efficiency concept to assess and analyze the business performance of organizations, for example, integration evaluation of banks or financial holding companies and performance evaluation of research and development programs.

Overall, business performance is the effectiveness and effect of different kinds of business operations. In profit orientation, it includes quantitative financial indexes and the business strategies and activities of earning at least reasonable profit. In competitive advantage, it includes two dimensions, including business strategies and activities that aim to achieve goals and shape leading advantage in horizontal competition and further develop hypotheses. Business efficiency has a significant impact on business performance, while business performance has a significant impact on the sustainable operation of businesses. The precondition of the sustainable operation hypothesis of an enterprise is to regard it as a living system and to enable it to survive in sustainability.

2.3 Fuzzy Delphi Method

Liang et al. (2003) proposed a process capability index for measuring the operation performance of banks' industries. There is a new insight for the service quality of banks' operations. Chang et al. (2000) developed a new fuzzy Delphi method (FDM) to be used in managerial talent assessment for a company located in Taiwan. This new method employed the fuzzy statistics and technique of a conjugate gradient search to fit membership functions, which may be derived for fuzzy forecasts. Liang and Hsieh (2005) also developed an ability index by using FDM for training in banks' industry.

Xie et al. (2021) think that with the rapid development and significant successfulness of various deep learning techniques in artificial intelligence (AI), AI has led to a significant evolution in both academic and industrial fields.

III. METHODOLOGY

3.1 Structure of Sustainable Vitality

This study determined 'the vitality of the sustainable development index' used by banks' training, assigning, and development departments using the FDM and Analytic Hierarchy Process (AHP) method. Chang and Lee (1995) adopted the original defuzzification method (OM) to determine the weight distribution of these factors, establishing a fuzzy decision system to choose the best candidates.

3.2 Fuzzy Synthetic Decision Process

The fuzzy theory uses the membership function to solve the problem of the general difficulty of determining. The fuzzy synthetic decision (FSD) method is used to compare the relative importance of each dimension of the mean factor.

IV. RESEARCH RESULTS

After a fairly comprehensive survey and discussions with experts, the vitality of the sustainable development index for banks was established by factor analysis. A total of 899 experts, professionals from banking industries and universities, were invited to answer the factor analysis questionnaire, which was sent through the mail. The weights of various factors in each dimension, given by the weight set W used in the fuzzy synthetic decision, can be determined by the OM method of calculation

In order to test the vitality indexes of the financial industry established in the research, we will conduct in-depth interviews with each manager of department with an aim to understand the importance of leadership, management strategy, management efficiency, assigning managers to foreign branches, responsiveness, and business culture on the vitality index and the weight of vitality of W1, W2, W3, W4, and W5. The final vitality index, that is, shown as table 1.

Table 1 The Statistics of Vitality Indexes of Case Company

Scores / Contents of Sub-Systems	Weight of Vitality (OM value)	weights percentage %	Vitality Index
Leadership	34.5730	0.225	2
Management Strategy	22.3235	0.137	5
Management Efficiency	49.6635	0.306	1
Assigning Managers to Foreign Branches	25.5595	0.151	4
Business Culture	29.6203	0.182	3
total	162.8398	100%	

Defuzzification provides a single score for each appraisal grade. Then, the membership degree of each appraisal grade is multiplied by its score, and the fuzzy decision-making set is defuzzified to yield a certain score. Excellent, good, normal, bad, and very bad scores are assigned values of 10, 7.5, 5, 2.5, and 0, respectively. The vitality of sustainable development index score is 9.2.

V. CONCLUSION

In this study, a fuzzy Delphi method and the fuzzy synthetic method were applied to an empirical study. The following conclusions are drawn.

The empirical vitality of sustainable development index has five dimensions: 1) leadership; 2) management strategy; 3) management efficiency; 4) managers assigned to foreign branches and development of talented personnel; and 5) business culture. This study used the fuzzy Delphi method to determine the weights of factors. A higher OM value indicates that more attention is paid to that factor.

Fuzzy synthetic decisions are used to evaluate a set of vitality of sustainable development indices, offering banks new perspectives and methods of assessing their performance. The index can be used to help solve problems that arise in relation to a bank's development, and especially training and assigning performance.

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Analysis of the Promotional Strategies of Private Schools in Zaragoza, Nueva Ecija

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Abstract— *This study intended to analyze the promotional mix of private schools in Zaragoza, Nueva Ecija, regarding marketing communication and the utilization of promotional tools to increase the number of enrollees. It also aims to create a strategic plan based on the results of this study. The study found that all of the participating schools believe that marketing is crucial to drawing in new students and improving their standing as an institution. Due to its cost-effectiveness and reach, social media has become the most popular instrument for audience interaction. However, the amount of money that schools have available for other promotional items, such printed ads, can restrict the extent of their advertising. In order to provide a varied and effective promotional strategy, future plans should concentrate on a balanced budget that supports both digital and traditional media. Growth and competitive positioning still depend on these strategies' ongoing innovation.*

Keywords*— *Marketing Communication, Marketing Strategy, Private School, Promotional Mix, Promotional Tools.

I. INTRODUCTION

One of the difficulties private schools face every school year is the number of students enrolling in private schools. Despite promotional discounts from private schools and financial support from the local government, students still prefer to enroll in public schools. This research paper aims to explore and analyze the different promotional mix of private schools in Zaragoza, Nueva Ecija in terms of their respective organizations' strategies in promoting their schools and create a comparative analysis among them. It will focus on marketing communication and promotional tools. Additionally, the study will analyze the factors that shape school organizations' perception of promotion, such as organizational communication and leadership support for sustainable operations (Balaria, et al., 2017).

In order to establish their reputation, draw in potential students, and keep a close relationship with the community, schools advertise their institutions using a range of marketing platforms and instruments. One popular strategy is digital marketing, which includes social media sites where schools interact with parents and students, highlight events, and highlight their accomplishments. Families may immediately learn about the school's options because to this presence, which fosters a sense of accessibility and transparency. In order to make it easy for prospective students to learn more about what each school has to offer, schools frequently use their websites to offer comprehensive information about academic programs, extracurricular activities, and enrollment procedures. The community can also be updated about important developments, enrollment deadlines, and any financial help or scholarships that may be offered through targeted advertisements and email newsletters (Tay, et al., 2023).

Developing connections within the community is another key element that influence important marketing tactic (Fonda, 2023). Schools regularly hold informational seminars, campus tours, and open houses to give parents and potential students a firsthand look at the atmosphere and culture of the school. Participation in educational fairs, sponsorship of neighborhood events, and alliances with nearby companies can raise awareness and position the school as an engaged member of the community. Furthermore, happy families frequently share positive experiences and serve as advocates for the school, demonstrating the continued value of word-of-mouth in educational marketing. Schools can successfully communicate their principles, accomplishments, and distinctive services to draw and keep students by fusing contemporary digital initiatives with more conventional techniques (Subia, 2018) like print advertising and community involvement.

Furthermore, the paper will investigate the impact of promotion on the number of enrollees, considering factors such as retention, satisfaction rate, and organizational behavior.

II. RESEARCH METHODOLOGY

The researcher used the descriptive method of the research. According to Kumar (2014) as cited by Zabala, Gutierrez and Subia (2018),"descriptive survey can systematically describe a situation, problem, phenomenon, service or programs, or provide information or describe the attitude towards an issue". The respondents will choose their choice from (4, 3, 2, 1) in a particular statement, 4 being the highest (Strongly Agree) and 1 being the lowest (Strongly Disagree).

The information gathered from computing the percentage can be summarized in a formula:

To get the percentage: $P = f/N \times 100$

Where:

P= percentage

f= frequency (number of responses)

N= total respondents

III. RESULTS AND DISCUSSIONS

This section presents the findings of the survey conducted to assess the different strategies used by private schools in Zaragoza, Nueva Ecija. The study involved employees and administrators from the participating schools. The data collected provides valuable insights into the perceptions, methods, and strategies used by private schools in Zaragoza. Out of the six operating schools, only three agreed to participate in the survey. A follow-up interview was conducted to validate the survey results and to gather additional information.

Demographic Profile of Participants

Table 1. School Information (Years of Operation)

Years of Operation	Frequency	Percentage
1–5	0	0%
6–10	2	67%
10 and above	1	33%
Total	**3**	**100%**

As presented in Table 1, the number of years the participating schools have been in operation varies. Two out of the three schools (67%) have been operating for 6 to 10 years, while one school (33%) has been operating for more than 10 years. None of the schools in the sample have been in operation for less than 5 years.

Table 2. Current Promotional Activities

Current Promotional Activities	Weighted mean	Description
Social Media Marketing	4.0	Strongly Agree
Local Community Events	2.3	Disagree
Print Advertising	2.0	Disagree
School Campaign	4.0	Strongly Agree
Average WM	**3.1**	**Agree**

As shown in Table 2, Social Media Marketing and School Campaigns are the most strongly supported promotional activities, both receiving a weighted mean of 4.0. In contrast, Local Community Events and Print Advertising are less favored, with weighted means of 2.3 and 2.0, respectively, indicating disagreement. Overall, the average weighted mean of 3.1 suggests general agreement with the promotional strategies used.

Table 3. Target Audience for Promotional Activities

Target Audience	Weighted Mean	Description
Parents	4.0	Strongly Agree
Students	3.3	Agree
Community members	2.0	Disagree
Average WM	**3.1**	**Agree**

Table 3 indicates that Parents are strongly agreed upon as the primary target audience for promotional activities, with a weighted mean of 4.0. Students are also seen as an important target, with a mean of 3.3, suggesting agreement. However, Community Members are not considered a key target, with a mean of 2.0, indicating disagreement.

Table 4. Unique Selling Proposition (USP)

Unique Selling Proposition	Weighted mean	Description
High Academic Standards	4.0	Strongly Agree
Small Class Sizes	3.7	Agree
Specialized Programs	3.0	Agree
Average WM	**3.6**	**Agree**

In Table 4, High Academic Standards are strongly agreed upon as the most important unique selling proposition, with a weighted mean of 4.0. Small Class Sizes are also seen as a strength, with a mean of 3.7, while Specialized Programs are agreed upon with a mean of 3.0. The overall weighted mean of 3.6 suggests that these features contribute to the schools' appeal.

Table 5. Marketing Channels

Marketing Channels	Weighted mean	Description
Social Media	4.0	Strongly Agree
School Website	4.0	Strongly Agree
Local Community Events	2.0	Disagree
Average WM	**3.3**	**Agree**

Based on the weighted mean scores, Social Media and the School Website are strongly agreed upon as effective marketing channels, both with a weighted mean of 4.0. Local Community Events, however, are less favored, with a mean of 2.0. The average weighted mean of 3.3 reflects overall agreement on the use of these marketing channels. Integrated marketing communication (IMC) emerged during the late twentieth century and its importance has been growing ever since (Chaniago & Ariyani, 2023).

Table 6. Budget for Promotional Activities

Budget Items	Weighted mean	Description
Digital Marketing	4.0	Strongly Agree
Printed Ads	1.0	Strongly Disagree
Paid Advertisement	1.0	Strongly Disagree
Average WM	**2.0**	**Disagree**

Table 6 shows that Digital Marketing is strongly supported in the budget allocation, with a weighted mean of 4.0. However, Printed Ads and Paid Advertisements receive very low support, with weighted means of 1.0 each, indicating strong disagreement. The overall average weighted mean of 2.0 reflects a general disagreement with the current budget allocations for these activities.

Table 7. Goals and Objectives for Promotional Strategy

Goals and Objectives	Weighted mean	Description
Increase Enrollment	4.0	Strongly Agree
Improve Brand Awareness	4.0	Strongly Agree
Enhance Community Engagement	4.0	Strongly Agree
Average WM	**4.0**	Strongly Agree

Table 7 shows that all the goals and objectives, which include Increasing Enrollment, Improving Brand Awareness, and Enhancing Community Engagement, received a weighted mean of 4.0, indicating strong agreement. The unanimous agreement highlights the shared focus of the schools on these critical promotional objectives. Goal setting, in all organizations, is a vital function through which individual goals are transformed into organizational policies and actions (Han, Campbell & McKenna, 2023).

Table 8. Future Plans

Future Plans	Weighted mean	Description
Digital Marketing	4.0	Strongly Agree
School Expansion	4.0	Strongly Agree
Average WM	**4.0**	**Strongly Agree**

In Table 8, the Future Plans of Digital Marketing and School Expansion are strongly supported, with both receiving a weighted mean of 4.0. This suggests a strong consensus on the direction these schools intend to take moving forward.

IV. CONCLUSION

The survey results showed valuable results in analyzing the promotional strategies of private schools in Zaragoza, Nueva Ecija. It shows significant results that all schools recognize the importance of promotional activities in attracting new students and enhancing their reputation (AlKhouri, Halteh, Halteh, & Tiwari, 2024).

All participating educational institutions agreed on the power of effectiveness of social media to gain an audience.

Strategic promotion requires overcoming obstacles like funding shortages for additional promotional materials like printed advertisements.

Future planning should center on these strategies. Setting aside a sufficient amount of money even though it was more expensive than social media (Simanjorang & Nawawi, 2022).

While the private schools in this survey are making good use of a variety of promotional techniques, innovation and improvement are always welcome.

RECOMMENDATION

Provide Clear Objectives	State the goals you have for your promotion plan. This could include raising community involvement and raising company exposure.
Know your Target Audience	Identify those who are in your target audience. These could be community members, parents, or students.
Create a Unique Selling Proposition (USP):	Determine what distinguishes your school. This could be in the form of specialized programs, small class sizes, or strict academic requirements.
Develop Key Messages	Create essential messages that help your target audience understand your unique selling proposition.
Select Marketing Channels	Determine which advertising channels will help you reach your target most effectively.
Solid Budget Allocation	Establish your promotional activity budget. Allot funds according to how well each type of promotion works.
Continuous Monitoring and Evaluation	Monitor and assess the results of your marketing initiatives regularly.

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Farmers' Digital Transformation Preferences: Acceptability, Affordability, Accessibility, Awareness, and Availability

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Abstract— *This research outlines the characteristics and preferences of rice farmers when it comes to incorporating digital advancements in farming practices. The study delves into their attitudes, towards the acceptance and use of technology in agriculture particularly focusing on aspects such as affordability, ease of access knowledge levels, and the availability of solutions. The findings reveal that while farmers recognize the benefits of utilizing tools for enhancing productivity various challenges such, as expenses, limited training opportunities, and constrained accessibility hinder their adoption. Farmers are well informed about technology, like the Palay Check App; however, affordability issues persist in markets while access remains limited. The perceived high costs of investing in solutions hinder their potential impact, on smallholder productivity. The research highlights the importance of improving assistance and making technology more accessible to support use among farmers. This could help them improve crop yield and lower expenses result in, in use of tools to advance agricultural methods.*

***Keywords*— Acceptability, Agriculture, Digital Farming, Farmers, Food Problem, Sustainability**

I. INTRODUCTION

The Philippines, an agriculturally dominant country with a significant rural population, relies heavily on agriculture for livelihoods. As of 2022, about a quarter of employed Filipinos work in agriculture, which includes farming, fisheries, livestock, and forestry. Farming and fisheries are particularly crucial due to the country's terrain and tropical climate, with key crops like sugarcane, rice, coconut, and bananas being major national products and exports (Et. al., J.D.U., 2021; Zhang, et al., 2023).

Different levels of human capital, such as education, experience, and pertinent training, are displayed by farmers (Fronda, 2023). Since higher levels of human capital are typically associated with greater willingness and ability to utilize these tools, this diversity has a significant impact on the adoption of digital technology. The digital divide between adopters and non-adopters is frequently mostly caused by disparities in human capital. Therefore, evaluating the digitization of agriculture requires determining the baseline capacities of farmers and the investment required to improve human capital among farm workers. Farmers have different levels of human capital, such as education, experience, and pertinent training. Since higher levels of human capital are typically associated with greater willingness and ability to utilize these tools, this diversity has a significant impact on the adoption of digital technology (Li, et al., 2023).

The digital divide between adopters and non-adopters is frequently caused mainly by disparities in human capital. Therefore, evaluating the digitization of agriculture requires determining farmers' baseline capacities and the investment required to improve human capital among farm workers (De Gruchy, 2020).

Historically, Perkins Gilman identified three core issues in addressing the food problem: efficient food production, effective distribution, and economical meal preparation. Over time, advancements have improved food supply systems, reducing costs and time between production and consumption.

Currently, the agricultural sector is undergoing significant societal changes, referred to as "agriculture 4.0," driven by digitalization. Technologies such as the Internet of Things (IoT), cloud computing, big data analytics, and artificial intelligence (AI) are rapidly transforming agriculture. This digital revolution is leading to a paradigm shift with increased integration of physical and virtual systems, creating dynamic digital representations of agricultural processes. This enables real-time monitoring, direct interaction between consumers and producers, and advanced planning, prediction, automation, and optimization (Sweeney & Kabouris, 2020).

This study will focus on the emerging demands and implications of digitalization for farmers in the Science City of Muñoz, Nueva Ecija. It aims to update and enhance current research on agricultural digital transformation, assessing how these changes impact local farming practices and contributing to the broader understanding of digitalization in agriculture. Specifically, this study will describe the farmers profile, the farmers preferences of digital transformation in agriculture in terms of acceptability, affordability, accessibility and awareness, and availability of digital technology.

II. METHODOLOGY

A descriptive research design was adopted for this study. According to Kumar (2014) as cited by Zabala, Gutierrez, and Subia (2018),"descriptive survey can systematically describe a situation, problem, phenomenon, service or programs, or provide information or describe the attitude towards an issue".

The researchers gathered the primary data through a survey. Before the actual data gathering, the researchers secured a letter of permission from the Dean of the Graduate School that was duly signed by the adviser to conduct the study. Permission to perform these data collection methods was asked from the city mayor down to the barangay captain, who will serve as a key informant of the study.

Upon approval of the request to conduct data gathering, the researcher administered the survey through the combination of digital platforms and a survey questionnaire.

Secondary data such as the list of registered farmers, other data such as their farm location and other important information like farmers' addresses to find one another by the researcher were gathered by requesting the data from the Department of Agriculture in Science City of Muñoz, Nueva Ecija.

The data collected from the locale was encoded, tallied, and analyzed. Appropriate statistical tools were utilized in its analysis. The following table presents the four-point Likert scale to measure and interpret the data specifically for the demand and implication of transformation into digital farming.

III. RESULTS AND DISCUSSIONS

1. Describe the profile of participants in terms of:

Years of Farming

Most surveyed individuals have over 16 years of farming experience, likely making it their primary income source. The next largest group has 6-10 years of experience, suggesting stability. Fewer have 1-5 or 11-15 years, indicating possible turnover or slow entry.

Farm Size

The data provided reveals a clear pattern in the distribution of land holdings among farmers. Most farmers own small plots of 1 to 5 hectares, indicating a prevalence of smallholder agriculture focused on subsistence or small-scale commercial farming.

Types of plants (or crops)

Rice cultivation dominates, with 59 out of 60 instances, highlighting its central role in the region's agriculture. This prevalence reflects rice's importance as a staple food and economic driver in agricultural communities, particularly in Asia (Bellwood, 2023).

Available agricultural technology

The data indicates a significant gap in the adoption of agricultural technologies, with the majority (58 out of 60 instances) reporting the absence of any available technology. This suggests that the majority of farmers within the studied context are operating without the support of modern agricultural tools and innovations. Such a scenario may stem from various factors, including limited access to technology, financial constraints, lack of awareness or training, and infrastructural challenges.

2. The farmers' preferences for digital transformation in agriculture

Acceptability

The weighted mean for the first statement is 250, indicating that, on average, respondents leaned towards disagreement.

The verbal interpretation suggests that the respondents, as a whole, did not find the statement to be particularly acceptable, but not strongly disagreeable either. For the second statement, respondents also rated their agreement on the same scale. This statement has a slightly larger tendency toward disagreement, as indicated by its weighted mean of 2.42. According to the verbal interpretation, the respondents thought this statement was unacceptable. The findings indicate that the respondents tended to disagree or strongly disagree with the comments made about the use of contemporary technologies in agriculture.

Affordability

According to study results, respondents generally believe that current digital technology in agriculture is too expensive. Both statements expressed disapproval of the concept of affordability, with the first receiving a weighted mean of 2.17 and the second displaying an even lower mean of 1.95. These results draw attention to perceived financial constraints that may provide serious obstacles to the uptake and accessibility of cutting-edge digital technology in the agricultural sector. As a result, this view could affect farmers' attitudes and choices about using these technologies, which would ultimately affect agricultural output.

Accessibility

According to the survey's findings, a sizable portion of respondents felt that digital technology in farming was inaccessible. Strong disagreement regarding accessibility was indicated by the weighted mean of 2.33 for the first statement. Similar views were also expressed by the second and third statements, which had weighted averages of 2.37 and 2.28, respectively. These results imply that respondents believe local marketplaces and retailers do not carry digital agricultural technologies. All things considered, the evidence indicates significant obstacles to obtaining and utilizing these technologies, which may prevent the agricultural community from adopting and effectively utilizing them. Farmers' desire to adopt digital tools may be impacted by this sense of limited accessibility, which could eventually have an effect on agricultural innovation and production.

Awareness

The replies to two statements about how the respondents view digital technology in farming are compiled in the table that is presented. With a weighted mean of 3.18, respondents mainly showed agreement with the first statement. This implies that a sizable percentage of participants are aware of the use of digital technologies in agricultural operations. The second statement also showed a substantial trend towards agreement, with a weighted mean of 2.90. This implies that those surveyed are aware of the potential advantages of digital technology in raising agricultural wealth and production. In conclusion, the results of the study show that most participants are aware that digital technology is used in farming and believe it can help to improve agricultural results. This awareness and positive perception suggest a potential openness to embracing and adopting digital solutions within the agricultural sector (Kudama, et al., 2021).

3. Availability of Digital Technology

Different rates of adoption of contemporary digital technologies in agriculture are revealed by the survey. Drones have the lowest adoption rate at 30%, whereas the most popular app is Palay Check (65%), followed by KROPS (43.33%) and AgriDOC (38.33%). These results point to the necessity of increasing these tools' accessibility and awareness. Furthermore, respondents believe that digital technology offers only modest financial advantages, citing slight reductions in the price of seeds, fertilizer, and pesticides (weighted averages of 1.93 to 2.40). They do, however, substantially concur (2.85) that this technology boosts crop yields (2.77) and lowers overhead expenses.

IV. CONCLUSION

Based on the findings of this study, the following are concluded:

1. Farmers with extensive experience and small land holdings primarily focus on rice, emphasizing its role as a staple crop but face limitations in adopting modern agricultural technology.

2. Limited access to agricultural technology among farmers reflects barriers such as cost, availability, and training, which significantly affect technology adoption rates.

3. Farmers view digital technology as generally beneficial for productivity, yet perceive it as unaffordable and largely inaccessible, potentially limiting broader adoption.

4. While farmers show awareness of digital tools in agriculture, affordability, and accessibility issues reduce their likelihood of investing in these innovations.

5.Adoption of available digital tools like the Palay Check App suggests potential, yet broader availability and cost benefits are needed to increase digital integration in farming practices.

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Using Fuzzy AI Delphi Method for dispatching ERP executives of banks

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Abstract— *Enterprise resource planning is an integrated system of real-time information. With the trend of internationalization, most banks hope to use ERP systems to eliminate the shortcomings of bank operation processes, such as the waste of repeated manpower, duplication of information or delays in transmission, etc., and reduce efficiency. Improve to the highest level and minimize waste. With the openness of Taiwan's government financial policy, the banks here are becoming more liberalized and internationalized. Taiwan is becoming a competitive financial market since more new commercial banks have been set up in Taiwan. So, it is important for a bank to dispatch good executives to overseas branch. In this paper, we analyze what kinds of characteristics and traits a bank's manager in overseas branch should have by using Fuzzy Delphi Method. The purposes of the research are 1) to analyze what kinds of characteristics and traits a bank's manager in overseas branch should have, 2) to compare the difference of manager in overseas branch in Japan and HongKong by using Wilcoxon rank sum test, 3) to set up the dispatch criteria with the AI and fuzzy Delphi method. Through the examination of FDM, a fuzzy referent model framework for the bank's dispatch in overseas branch is built. It is anticipated that the fuzzy framework will provide a more objective means for the dispatch of appropriate personnel for overseas branches.*

Keywords— ***Fuzzy, AI, ERP, Bank***

I. INTRODUCTION

Enterprise resource planning is an integrated system of real-time information. With the trend of internationalization, most banks hope to use ERP systems to eliminate the shortcomings of bank operation processes, such as the waste of repeated manpower, duplication of information or delays in transmission, etc., and reduce efficiency. Improve to the highest level and minimize waste.

Bank is a part of service industry that offers their customers financial services. In order to conform to liberalization and internationalization trend of time, banks establish widely their overseas branches. Facing competing environment, bank depends heavily on dispatch of capable staff to overseas branch to keep their competitiveness in markets. If any organization wants to achieve their targets, "right person" is one of most primary and basic factors. It is certainly safe to say "human resources" is the most important resource in any organization. The success or failure of a business depends largely on whether chief officers know their subordinates well enough to assign them jobs commensurate with their abilities. Therefore, for gain competitive advantages, a bank should strengthen education and training for their staff, and, it is very important for the selection of executive s of overseas branches.

In recent years, Fuzzy Theory has been applied widely to various researches. So has Fuzzy Delphi Method (FDM). Scholars like Ishikawa et al. (1993), Chang et al. (1995), Chang, P.T. et al. (2000) have developed many different

FDMs that have been applied to solve matters which mix with large uncertainties. Therefore, the research adopted FDM to screen indexes of capabilities that executives who are dispatched to branches of Japan and Hongkong should have and conducted empirical research on these dispatch. It is hoped that the results of research could help banks to find out right persons to serve at overseas branches to enhance their competitiveness.

II. LITERATURE REVIEW

Based on an earlier policy-capturing study of the general mental ability and Big Five personality traits, Jane W Moy et al. (2004) explore and analyze the hiring preference of Hong Kong employers across five important personal attributes. They think that among knowledge, abilities skills, and personality, the personality of a candidate has a relatively greater impact on the hiring decision.

Dakin et al.(2004) think that despite widespread evidence of low construct and validity predictive, personality testing is increasingly being used for the selection of managers. Based on available research issue it is argued that personality is likely to play an important role as a determinant of managerial performance.

Chang et al.(2000) developed a new fuzzy Delphi method used in managerial talent assessment for a company located in Taiwan . This new method employs the fuzzy statistics and technique of the conjugate gradient search to fit membership functions. Membership functions may be derived for the fuzzy forecasts.

Ana Isabel Canhoto, Fintan Clear.(2020)Refers to the AI shown by machines made by humans. Generally artificial intelligence refers to technology that presents human intelligence through ordinary computer programs. Viswanathan, Y.S.Beh,J.K.U. Brock, F.von Wangenheim(2020) think that the term also refers to the study of whether and how such intelligent systems can be realized. At the same time, through advances in medicine, neuroscience, robotics, statistics, etc., normal predictions believe that many human occupations will gradually be replaced by them.

Mayeh, M., Ramayah, T., & Mishra, A. (2016) think that the introduction of enterprise resource integration system (ERP) and business process reengineering (BPR) by enterprises can systematize enterprise processes and simultaneously optimize enterprise processes, improving the efficiency of internal operations and organizational learning of enterprises.

III. ANALYSIS

1. The construction and induction of selection factors for banks to dispatch ERP executives of overseas branches.

In order to construct and induct abilities that executives of overseas

bank branches should have, after broad literature study and communicating and discussing with other experts, we inducted and constructed selection factors shown as Table 2. The factors covered include 1) traits of ability; 2) diversified intelligence; 3) academic ability and 4) graduated college.

2. The design of Fuzzy Delphi Method

In order to compare factors for selecting dispatched executives of branches in Japan with that of branches, the research uses design of questionnaire.

3. Data collection

Data were collected in a survey of the professors and professional members in Taiwan's Banks. The total of 61 first questionnaires were distributed and 57 usable questionnaires were used in the decision analysis, representing a valid response rate is 61.46%.

4. The Steps of Fuzzy Delphi Method

Fuzzy Delphi Method of Kaufmann and Gupta(1988) is on the basis of triangular fuzzy number

$$u_A(x)=\begin{cases} 0 & , \quad x<a \\ \dfrac{x-a}{b-a} & , \quad a\le x\le b \\ \dfrac{c-x}{c-b} & , \quad b\le x\le c \\ 0 & , \quad x>c \end{cases} \qquad (1)$$

β1 及 β2 are offered as any two convenience value to conduct prediction of Fuzzy. The steps are as follows:

step 1: Ask experts for their prediction (a,b,c). a represents the most pessimistic value, c represents the most optimistic value, b represents the most suitable value in the interval between a and c.

step 2: Average opinions of all experts（a,b,c），obtain（am, bm, cm）average, minus opinions of individual experts （a,b,c）from the average separately and obtain（am -a, bm -b, cm -c）. Distribute those opinions to experts for reference when they are given questionnaires to fill.

step 3: According to the average opinions in Step 2, (am, bm, cm）, calculate with Formula (2) the degree of differentiation of triangular fuzzy numbers between fuzzy opinions and average opinions for every expert in the cycle. If all differentiations are falling within a certain tolerable scope, then we could consider that they have reached convergence. The average opinions in the cycle is the final prediction and go ahead to implement Step 4. If not, return to Step 1.

step 4: Defuzzication

Defuzzication is to transform fuzzy number into a definite value that acts as tool used in the process of fuzzy making. The research adopted OM method introduced by Chang & Lee (1995). The higher OM value is , the more important the factor will be.

$$OM(A_i)=\int_0^1 \{\tfrac{1}{2}w[a_m+w(b_m-a_m)]+(1-\tfrac{1}{2}w)[c_m+w(b_m-c_m)]\}dw \quad (2).$$

IV. DISCUSSION

Fuzzy Delphi Method, provided by Kaufmann and Gupta, is a repeated procedure, its results of the first and second questionnaires are shown as Table 1. Besides, Based on these OM values, calculate the degree of stability of fuzzy opinions between two questionnaires. The calculating method of degree of stability is that 2nd OM minus 1st OM, then pick absolute values.

Table 1. The OM Value and Stability Value of ERP Executives in Japan

Factor		Japan (OM Value)		
		A. 1st	B. 2nd	|B-A|
Traits of Ability	Intelligence Quotient	7.38	7.38	0.00
	PR and Social Ability	7.67	7.73	0.07
	Management Ability	8.37	8.34	0.03
Diversified Intelligence	Decisiveness	7.17	7.09	0.08
	Expression	6.51	6.58	0.07
	Moral Character	7.10	7.01	0.08
Academic Ability	Accounting	7.16	7.16	0.01
	Investment	7.54	7.59	0.05
	Bank Operation and Management	7.06	7.15	0.09

Table 2. The OM Value and Stability Value of ERP Executives in Hongkong

Factor		Hongkong (OM Value)		
		C. 1st	D. 2nd	|C-D|
Traits of Ability	Intelligence Quotient	7.15	7.08	0.07
	PR and Social Ability	7.13	7.07	0.07
	Management Ability	7.01	7.10	0.09
Diversified Intelligence	Decisiveness	7.36	7.31	0.05
	Expression	7.54	7.45	0.09
	Moral Character	8.00	8.02	0.02
Academic Ability	Accounting	7.02	6.96	0.06
	Investment	6.76	6.66	0.10
	Bank Operation and Management	6.88	6.91	0.04

V. CONCLUSION

1. The research adopted Fuzzy Delphi Method to find the weight of evaluation factors for overseas branch manager dispatch. The value of 2nd OM is shown as Table 4. The higher value of OM is, the more attention is paid to the factor during their process of selecting overseas branch executives.

2. The research took advantage of Wilcoxon Rank Sum Test to compare the weighted value of 2nd OM of evaluation factors for dispatching executives to branches in Japan and Hongkong. The results were: there was no significant differentiation on colleges the candidates graduated from. That means that the banks in Taiwan hardly consider which college or departments the candidates graduated from when they selecting executives for their branches.

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APPENDIX

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The Impact of Artificial Intelligence on Digital Privacy: The Mediating Role of Trust in Social Media

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***Abstract*— *Artificial Intelligence (AI), a groundbreaking field of computer science, has surged in prominence, revolutionizing the way machines process information and make decisions. In the rapidly evolving landscape of digital communication, the intersection of AI and privacy has become a focal point of discussion. As the online activities generate an ever-increasing amount of data, concerns about the protection of digital privacy have intensified. This research aims to fill a knowledge gap for AI acts as a crucial guardian of digital privacy on social media, considering the impact of Technological, Regulatory, Cultural, and Educational factors. Trust becomes a critical mediator in social media of this relationship. As social media continues to shape the interconnected world, the responsible use of AI emerges as a key determinant in safeguarding digital privacy. By addressing the challenges posed by technological, regulatory, cultural, and educational factors, AI can contribute to a privacy-respecting social media landscape. Establishing and maintaining user trust through transparent practices and ethical considerations are essential for AI to fulfill its role as a guardian of digital privacy on social media platforms. The findings aim to inform strategic decision-making, enhance user trust, and contribute to the development of ethical guidelines, fostering a balance between innovation and robust privacy measures in the business-oriented realm of AI-driven social media.*

Keywords*— Artificial Intelligence, Privacy, Regulatory, Social media, Technological

I. INTRODUCTION

Developing computers that can carry out activities that normally require human intellect is the goal of the quickly developing discipline of computer science known as Artificial Intelligence (AI). These activities involve language understanding, perception, reasoning, problem-solving, and even decision-making (Shah & Shay, 2019). AI's ability to process vast amounts of data, learn from patterns, and make autonomous decisions has enabled it to play a critical role in enhancing user experience on social media platforms (Shah & Shay, 2019). However, this same capability raises significant concerns regarding digital privacy particularly regarding the extent of data collection and usage, the potential for pervasive surveillance, and the increased risk of data breaches and unauthorized access associated with AI systems (Ahmad et al., 2023). Considering the impact of technological, regulatory, cultural, and educational factors, trust becomes a critical mediator in social media adds another subtle of layer to this relationship. This enhanced trust leads to a greater willingness among users to share personal data, a stronger perception that their privacy is being protected, and increased loyalty to the platform. For example, users might be more willing to provide location data to a platform they trust to use this information responsibly and transparently, enhancing their experience with location-based services or recommendations (Ahmad et al., 2023).

1.1 Background of Research

AI algorithms on social media continuously collect and process enormous volumes of user data, including preferences, behaviours, and personal information. Platforms are able to generate comprehensive user profiles according to this data collecting, which may be used for targeted advertising, content recommendation, and other personalized services (Wang, 2023).

AI in Social Media Size

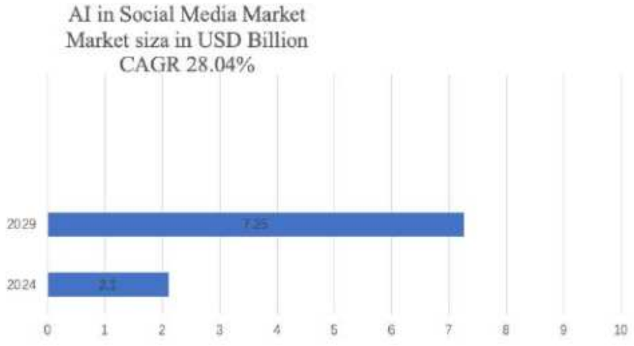

Fig. 1.1: AI in Social Media Size

Source: Mordor Intelligence (2024)

The Figure 1.1 shows AI in Social Media Market size is estimated at USD 2.10 billion in 2024 and is expected to grow at a compound annual growth rate (CAGR) of 28.04% to reach USD 7.25 billion by 2029 (AI In Social Media Market Size | Mordor Intelligence, 2024). As the number of social media users rises, there will likely be a greater need for AI solutions to understand consumer preferences. Social media has emerged as one of the main sources of customer intelligence data.

Market Trends

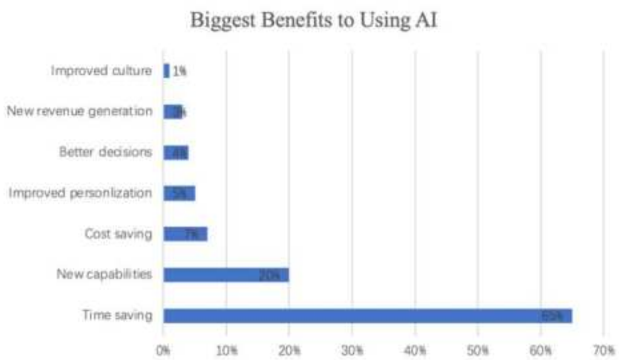

Fig. 1.2: Biggest Benefits to Using AI

Source: Foundation AI Survey (2024)

Time savings is the main advantage when using AI in the workplace, and the advantages of employing AI to produce anything from emails have been experienced by nearly 64% of respondents (Crump, 2024). This resounding majority shows that people firmly believe AI is effective and can simplify procedures. The time that AI saves, which can be used for more difficult, strategic, or creative tasks that call for human participation, is clearly valued by marketers (Crump, 2024).

AI-driven personalization features enhance user experiences on social media by tailoring content and recommendations to individual preferences. However, concerns arise regarding the scope of data collection, transparency about how data is used, and the potential for misuse or unauthorized access to sensitive information (Wang, 2023). Also, AI algorithms play a significant role in making decisions about what content users see on social media platforms but opacity in algorithms can lead to bias and manipulation.

1.2 Research Problem

The tension between personalization and privacy represents a significant challenge in the digital age, particularly with the proliferation of AI technologies (Jiang, 2023). Personalization involves using AI to tailor content, recommendations, and services to individual user preferences, thereby enhancing user experience and engagement. This process, however requires the collection and analysis of vast amounts of personal data, raising serious privacy concerns, and the use of AI in cybersecurity can both enhance and undermine digital privacy, but raise surveillance and misuse worries (Jiang, 2023). Trust is indeed a cornerstone in the relationship between users and social media platforms, particularly concerning data handing (Pan & Mishra, 2023). Transparency, clear privacy settings, and robust user controls are vital for fostering and maintaining trust, when users feel confident about how their data is managed and have the means to control it, they're more likely to engage with the platform positively (Pan & Mishra, 2023).

Besides, government regulations, like the General Data Protection Regulation (GDPR) in Europe (De Lucca et al., 2023) and the California Consumer Privacy Act (CCPA) in the United States (Blanke, 2020), are significant in shaping the use of AI and safeguarding digital privacy. Users have the right to access their personal data, request its deletion, and exercise control over how their information is used on social media platforms (Blanke, 2020). These regulatory frameworks reinforce user trust and confidence in social media platforms by holding them accountable for their data practices. By imposing restrictions and requirements on data handling practices, these regulations promote transparency, accountability, and user empowerment, thereby safeguarding privacy rights in an AI-driven digital landscape.

Next, cultural attitudes toward privacy vary, influencing how individuals perceive and prioritize privacy concerns related to AI on social media (Dong, 2020). Factors such as generational differences, attitudes toward technology, and trust in social media platforms can impact individuals' willingness to share personal information and engage with

AI-driven features. Then, societal norms also shape expectations regarding data privacy and user consent, which can differ significantly across regions and demographic groups (Dong, 2020). Also, improving media literacy and educating users about privacy risks associated with AI is essential for empowering individuals to make informed decisions online. Educating users about recognizing signs of data misuse, understanding privacy policies, and exercising their privacy rights can help mitigate risks and promote responsible use of social media platforms (Lee, 2020).

Trust serves as a bridge between users and AI-driven systems when users trust that their data is handled responsibly, and that AI recommendations are aligned with their preferences, a symbiotic relationship emerges (Singh et al., 2022). This trust becomes a crucial buffer, potentially preserving digital privacy by fostering confidence in users regarding the ethical use of their data. However, trust can be compromised if users perceive AI as invasive or if there are concerns about data misuse (Singh et al., 2022). Instances of data breaches, algorithmic biases, or unclear data handling practices can erode user trust, leading to a breakdown in the delicate balance between personalization and privacy. In such scenarios, AI's role shifts from a privacy-preserving tool to a potential threat (Almada, 2021), to investigate this intricate interplay, researchers delve into the mediating role of trust in the AI-social commerce-digital privacy nexus. Studies scrutinize user perceptions, attitudes, and behaviors within social commerce platforms, aiming to discern how trust mediates the impact of AI on digital privacy. Insights derived from these investigations can inform the development of ethical AI practices, privacy-centric design, and communication strategies that enhance user trust.

1.3 Research Gap

Policymakers may lack a comprehensive understanding of how AI can effectively safeguard digital privacy on social media platforms (Almada, 2021). This gap may result in regulatory frameworks that are not sufficiently or adaptable to address the complexities of digital privacy in different contexts (Zhang et al., 2020). While there is a growing body of research on AI and privacy, gaps may still exist in understanding how various factors interact to influence the effectiveness and user acceptance of AI-driven privacy measures. Social media companies and tech firms have varying levels of understanding of the factors affecting digital privacy, some prioritize technological solutions, while others focus more on compliance with regulations, leading to discrepancies in approaches (Zhang et al., 2020).

AI acts as a crucial guardian of digital privacy on social media, considering the impact of technological, regulatory, cultural, and educational factors. However, despite AI's potential to enhance digital privacy, there is a lack of comprehensive understanding of how these various factors influence its effectiveness and user acceptance, specifically the balance between AI's data processing capabilities and the safeguarding of user data remains unclear (Guo et al., 2022). Compliance with data protection laws is crucial, yet the adaptability of AI to various regulatory environments needs further exploration, And cultural differences significantly impact privacy expectations and behaviors, requiring tailored AI systems that respect diverse norms and privacy expectations (Guo et al., 2022).

1.4 Research Questions

1. How do technological factors influence digital privacy in the context of Artificial Intelligence?
2. What is the impact of regulations on digital privacy in the era of Artificial Intelligence?
3. How do cultural and educational factors affect digital privacy in relation to Artificial Intelligence?
4. What role does trust in social media play in mediating the relationship between technological factors and digital privacy?
5. How does trust in social media mediate the relationship between regulations and digital privacy?
6. Does trust in social media mediate the relationship between cultural and educational factors and digital privacy?

1.5 Research Objectives

1. To examine the influence of technological factors on digital privacy in the context of Artificial Intelligence.
2. To analyze the impact of regulations on digital privacy in the era of Artificial Intelligence.
3. To investigate how cultural and educational factors affect digital privacy in relation to Artificial Intelligence.
4. To assess the mediating role of trust in social media between technological factors and digital privacy.
5. To evaluate the mediating role of trust in social media between regulations and digital privacy.
6. To determine the mediating role of trust in social media between cultural and educational factors and digital privacy.

II. LITERATURE REVIEW

2.1 Artificial Intelligence

The ability of a digital machine, computer, or computer-controlled robot to do activities that are normally performed by intelligent individuals is referred to as

Artificial Intelligence (AI) (Wang, 2023). The phrase is most frequently used when creating systems that are meant to replicate human cognition and intelligence, including reasoning, the capacity to delve deeper, the ability to make inferences and generalisations, and even experience learning (Wang, 2023).

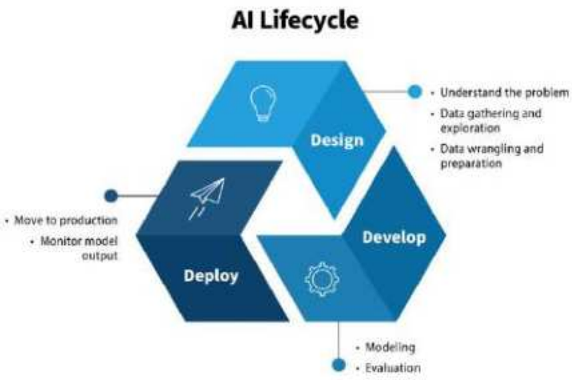

Fig. 2.1: AI lifecycle, 2024

Source: Understanding and managing the AI lifecycle (2024)

The cyclical process of going from a business challenge to an AI solution that resolves that problem is known as the AI lifecycle. During the phases of design, development, and deployment, every step in the life cycle is reviewed several times (Understanding and managing the AI lifecycle, 2024).

AI enhances personalization by tailoring content and services to individual preferences, creating a more satisfying user experience. It boosts efficiency by automating repetitive tasks and supporting decision-making (Pan & Mishra, 2023). The. AI-driven chatbots improve customer engagement by offering instant, round-the-clock responses, and predictive analytics enable better planning by forecasting trends and demands. Additionally, AI strengthens security by detecting potential cyber threats, providing organizations with an extra layer of protection against fraud. Also, AI fosters accessibility and inclusivity, making digital content more usable for people with disabilities or language barriers, and driving innovation by uncovering new insights and opportunities (Pan & Mishra, 2023).

The use of AI has given rise to a number of ethical and legal concerns, including those related to civil and criminal liability, insurance, data protection and privacy, user safety and information, and contracts (Reis et al., 2020). Given the vast amount of data that AI systems process, privacy and data protection are among the most important concerns (Reis et al., 2020). At the same time, there are viable mitigation techniques that make use of AI as well as the changing legal environment to support ethical AI deployment and responsible development that respects individual rights, including the fundamental right to privacy.

2.2 Social Media

Social media engagement has become an essential component of any marketing plan as social media platforms develop to reward authentic social connections (Mano, 2021). The phrase social media engagement refers to a wide range of activities on all social media platforms and is a measure of how users interact with their accounts and content. For example likes, favorites, comments, and shares, with billions of users sharing vast amounts of data on sites like Facebook, Instagram, and Twitter every day, social media has become an essential aspect of everyday life (Mano, 2021). In order to provide users with personalised content, AI algorithms examine this data and behaviour, by examining posts, pages, and profiles that users interact with, AI may see trends and suggest new material that users might find interesting. This procedure, known as content curating, is essential for maintaining user engagement and increasing platform usage (Paluch & Wirtz, 2020). Additionally, AI is used to identify and remove harmful or dangerous information, which has grown to be a major problem for social media companies. Social media companies have been under attack recently for their failure to control material, which has allowed hate speech, disinformation, and other dangerous material to spread. The companies can quickly and efficiently detect and remove such information using AI algorithms, minimising the harm it can do (Paluch & Wirtz, 2020), all things considered, AI significantly affects social media by assisting in the personalisation of content and ensuring a safer and more satisfying online experience for users.

2.3 Digital Privacy

Online privacy, or internet privacy, is another name for digital privacy, it refers to protecting private persons' internet data. However, privacy could appear more like an ideal than a reality in the virtual world where everything we do can be recorded (Wu et al., 2020). Social media postings, employment histories, shopping and entertainment choices, geolocation data, and financial and healthcare information are just a few examples of the digital "footprint" that comes with online activities and may be used to identify it. Additionally, a typical digital footprint is massive, for example The average person has 90 online identities, while in the United States, there are on average 130 accounts connected to a single email address, according to an analysis of data from over 20,000 users

(Wu et al., 2020). The importance of data privacy in an era where personal and professional digital boundaries are increasingly blurred, especially with remote work and personal devices being used for work purposes, that protecting customer and employee privacy is essential for organizational security and integrity.

2.3.1 Personalization

Personalisation is the process of tailoring outputs to a specific user and scenario, the user's location, educational and professional history, connection with groups, hobbies, preferences, opinions, and other characteristics may be taken into consideration (O'Hara, 2020). Numerous web-based services employ personalisation for various reasons, recommending products, components, or general information that a user has not yet thought of but would find helpful is a popular type of personalisation. Personalisation strategies are used by general-purpose social networks like Facebook.com to find potential friends based on the user's current connections and group membership. Professional social networks like LinkedIn.com exploit user profiles' talents and professional background information to suggest possible hires, and search engines like Google.com utilise user search history to tailor the user's current queries (O'Hara, 2020). AI-powered personalization features on social media platforms are designed to enhance user experience by tailoring content to individual preferences. These features analyze user behavior and preferences to deliver more relevant content, advertisements, and recommendations, while personalization will significantly improve user satisfaction and engagement, it raises important concerns about privacy.

2.4 Technological

The integration of AI into social media platforms has significantly transformed the user experience, content delivery, and platform management. However, this technological advancement also poses various challenges and implications for digital privacy, key factors outlining the technological impact of AI on digital privacy in social media include, AI algorithms, AI-driven, and AI systems (Park et al., 2021). AI algorithms require vast amounts of data to function effectively, and also analyzes user behavior to create detailed profiles and predict future actions, enhancing user experience through personalized content and recommendations, but simultaneously giving social media platforms deep insights into users' private lives, which can be invasive (Park et al., 2021).

Besides, AI-driven content personalization and targeted advertising enhance engagement and user satisfaction by personalizing the content users see in their feeds and enabling highly targeted advertising based on user profiles (Lang et al., 2021). However, this involves extensive tracking and data sharing with third-party advertisers, compromising user privacy, then, The systems frequently function as 'black boxes' using complex algorithms to make judgements that are opaque to users (Lang et al., 2021). Concerns over the decision-making process for user bans, content moderation, and other platform restrictions may arise from this lack of transparency, furthermore, biases in the training data may be inadvertently perpetuated by AI algorithms, leading to discriminatory behaviours that compromise users' privacy and social media experiences.

2.5 Regulatory

Important data protection regulations include the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR) (De Lucca et al., 2023) (Blanke, 2020). In order to ensure transparency and accountability in data handling, social media platforms that use artificial intelligence (AI) must get users' explicit consent before collecting and analysing their data. This is made possible by the General Data Protection Regulation (GDPR), a comprehensive data protection law in the European Union (De Lucca et al., 2023). Social media companies are required by law to get users' informed permission before collecting and using AI to process their data, this involves offering users with clear information about the types of data that will be gathered, how they will be used, and the consequences of processing data using AI. In order to give users simple access to details about how their data is being used and the decisions made by AI systems, platforms must also be transparent and forthright about their AI algorithms and data processing procedures, and laws such as the CCPA and GDPR guarantee that consumers may ask for and obtain a copy of their data in order to comprehend how AI systems are using it (Baik, 2020). Furthermore, individuals have the right to ask for their personal data to be erased, and social media companies are required to abide by these requests, making sure that AI systems no longer use the removed data for analysis or decision-making.

2.6 Cultural and Educational

Culturally, the widespread use of AI in social media has shifted societal perceptions of privacy (Baik, 2020), users are increasingly sharing personal information online, often without fully understanding the implications. This cultural shift impacts how privacy is valued and protected, leading to a more relaxed attitude toward personal data sharing. AI-driven surveillance practices, such as data collection and behavioral tracking, have become normalized (Baik, 2020), this normalization leads to a culture of acceptance where users are less likely to question or resist privacy invasions, seeing them as a standard part of their online experience. AI algorithms can inadvertently perpetuate cultural biases present in their training data. This affects the representation of different cultures on social media platforms, potentially marginalizing minority groups and influencing cultural narratives based on biased data interpretations (Seo et al., 2021). On the positive side, AI can facilitate global cultural exchange by connecting users from different backgrounds and recommending culturally diverse content, however, this requires careful handling to ensure respectful and accurate representation of all cultures (Seo et al., 2021).

Besides, education serves as a key factor in understanding the impact of artificial intelligence on digital privacy because it shapes an individual's knowledge, awareness, and attitudes toward emerging technologies (Lee, 2020). People with higher levels of education are often more familiar with digital technology and the underlying mechanisms of AI, making them more likely to understand both the benefits and risks associated with data-driven algorithms used by social media platforms. This knowledge influences their digital literacy, which includes the ability to critically assess privacy policies, recognize data collection practices, and make informed decisions about data sharing (Lee, 2020). Additionally, education can impact trust in technology, individuals with a higher level of education may either be more cautious and skeptical about AI's role in data privacy or more trusting of technology due to familiarity with its development and applications (Dong, 2020). As a result, education can directly affect how comfortable or concerned users feel about privacy on social media platforms that leverage AI, ultimately shaping their behavior and level of trust in these platforms.

2.7 Trust

Trust is a fundamental component of user relationships with social media platforms, users have to trust that platforms will protect their privacy, safeguard their data, and deliver reliable and relevant content. Trust can be influenced by various factors, including transparency, accountability, security, reliability, and consistency in platform behavior (Mohamed et al., 2024). Users' trust in the platform influences how they perceive and interact with AI-driven features, for example when users trust that AI algorithms are reliable, transparent, and aligned with their interests and preferences, they are more likely to engage with the platform actively. However, if users lack trust in the platform's AI capabilities or are concerned about privacy and data misuse, they may be less inclined to engage with AI-driven features and may even disengage from the platform altogether (Mohamed et al., 2024).

Moreover, trust is essential in user-platform relationships, particularly concerning privacy, data protection, transparency, and ethical use of technology. Users need to trust that social media platforms will respect their rights, safeguard their data, and use AI responsibly to enhance their experience without compromising their privacy or security (Liu et al., 2021). The presence of regulations influences users' trust in social media platforms' AI practices, because when regulations are in place to ensure transparency, accountability, and ethical use of AI, users are more likely to trust that platforms will adhere to these standards (Liu et al., 2021), as a result, they may feel more comfortable engaging with AI-driven features on social media platforms. Otherwise, in the absence of regulations or when regulations are perceived as inadequate, users may lack trust in platforms' AI practices, leading to concerns about privacy violations, data misuse, algorithmic bias, and other ethical issues. This lack of trust can undermine user confidence in AI-driven features and diminish user engagement on social media platforms.

Last, cultural and educational factors shape individuals' perceptions, attitudes, and knowledge about AI technology and its implications, these factors, in turn, influence users' trust in social media platforms' AI practices (Ali et al., 2023). Such as when users trust that platforms respect their cultural values, prioritize their educational needs, and use AI in a responsible and transparent manner, they are more likely to engage positively with AI-driven features (Ali et al., 2023). But if users perceive cultural insensitivity, educational deficiencies, or ethical concerns regarding AI use, their trust in the platform may be undermined, leading to negative responses or disengagement.

III. HYPOTHESIS

H1:Technological factors positively influence digital privacy in the context of Artificial Intelligence.

H2: Regulations positively influence digital privacy in the context of Artificial Intelligence.

H3: Cultural and educational factors positively influence digital privacy in the context of Artificial Intelligence.

H4:Trust in social media mediates the relationship between technological factors and digital privacy.

H5:Trust in social media mediates the relationship between regulations and digital privacy.

H6:Trust in social media mediates the relationship between cultural and educational factors and digital privacy.

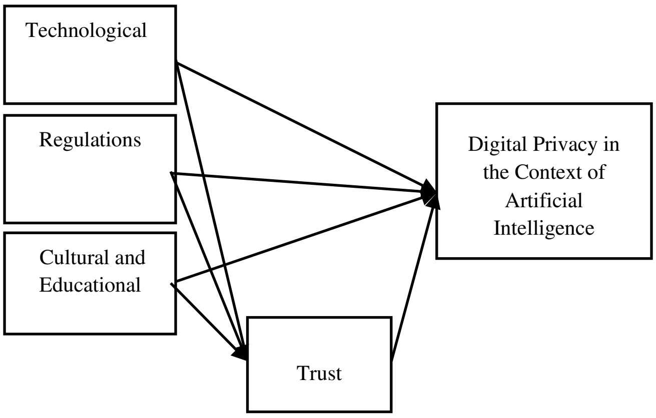

Fig 3.1: Conceptual Framework

IV. CONCLUSION

The impact of artificial intelligence on digital privacy is multifaceted, shaped by technological advancements, regulatory frameworks, cultural attitudes, and educational factors, all of which influence users' perceptions and behaviors on social media. Technological developments in AI have enabled unprecedented data collection and personalization, raising significant privacy concerns. Regulatory measures play a critical role in setting boundaries and protecting users, though they often struggle to keep pace with the rapid evolution of AI technologies. Culturally, varying societal norms and expectations around privacy affect how people approach and trust digital platforms. Education further shapes this landscape by influencing digital literacy and awareness, impacting how individuals understand and navigate privacy issues. Trust in social media acts as a mediating force, determining how users balance the convenience and engagement of AI-driven features with their privacy concerns. Altogether, these factors underscore the need for a balanced approach that fosters innovation in AI while safeguarding user privacy and building trust in digital environments.

The expected outcomes of this research include practical recommendations for strengthening digital privacy practices on social media platforms through a deeper understanding of the technological, regulatory, cultural, and educational factors that impact users' trust in artificial intelligence. By identifying the role trust plays in users' willingness to engage with AI-driven features, this research aims to help organizations build safer and more trusted digital environments, ultimately leading to increased user satisfaction and responsible data practices. Additionally, this study will contribute to academic literature by offering insights into the complex interplay between AI, privacy, and trust within the context of social media, especially as it applies to diverse regional and cultural settings.

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Effectiveness of Internal Seed Quality Control Training Program on Selected PhilRice Branch and Satellite Stations: A Comprehensive Analysis

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***Abstract*— *This descriptive mixed-methods study surveys how the Philippine Rice Research Institute's (PhilRice) internal seed quality control has been enhanced by training activities. PhilRice, which focuses on generating durable and high-yielding rice varieties through exhaustive research and development, is essential to the Philippines' agricultural industry. However, problems with seed production, like low germination rates and varietal impurity, present stern difficulties to crop yields and agricultural productivity in general. The study evaluates how PhilRice's training initiatives have upgraded the expertise, abilities, and procedures of employees engaged in seed production, particularly in conserving seed quality from fieldwork to packaging. The finding reveals that the training program has enhanced seed quality control procedures, which has improved varietal purity and germination rates. However, problems like lack of resources and cultural obstacles still exist, indicating areas that require more focus. Although the training program is beneficial, the results suggest that it needs to be continuously improved for long-term success.*

***Keywords*— Agricultural Productivity; High-Quality Seeds; Internal Seed Quality Control; Seed Production; Training.**

I. INTRODUCTION

The Philippine Rice Research Institute (PhilRice), established in 1985 under Executive Order No. 1061 by President Ferdinand Marcos, is a government-owned corporation initially under the Department of Agriculture (DA). Its administrative oversight was shifted to the Office of the President in 2002 under Executive Order No. 76 but was returned to the DA in 2003 by Executive Order No. 219 to align with the Hybrid Rice Program.

PhilRice research activities are geographically centered at its Central Experiment Station in Brgy. Maligaya, Science City of Muñoz, Nueva Ecija. Complementing this main facility, are the seven branch stations strategically located nationwide. These include PhilRice Batac in Ilocos Norte, PhilRice Isabela in Isabela, PhilRice Los Baños in Laguna, PhilRice Agusan in Agusan del Norte, PhilRice Midsayap in North Cotabato, PhilRice Negros in Negros Occidental, and PhilRice Bicol in Bicol.

In 2013, a significant development for PhilRice was the approval of its Rationalization Plan (RP) in line with Executive Order (EO) No. 366 and its Implementing Rules and Regulations, along with Memorandum Order (MO) No. 190, s. 2005. This approval led to the establishment of the satellite stations in Central Mindanao University (CMU) under PhilRice Agusan, Zamboanga and USM under PhilRice Midsayap, and Mindoro under PhilRice Los Baños, expanding the institute's reach and capabilities.

PhilRice is mandated to develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos. Under the Republic Act No. 7308, also known as "The Seed Industry Development Act of 1992”, PhilRice’s mandate on research and development particularly in breeding programs to develop high-yielding, pest-resistant, and climate-resilient rice varieties. Additionally, PhilRice is responsible for producing high-quality inbred seeds and hybrid parental lines. This work involves collaboration between the central experiment station and all branch stations, each of which is tasked with ensuring the best quality seeds in their area.

The Philippine rice sector faces significant challenges related to seed production, including low production volume, an increased occurrence of off-type seeds, and a low percentage of germination. These issues hinder the availability of quality seeds for farmers, leading to reduced planting areas and lower crop yields. The presence of off-type seeds, which deviate from desired characteristics, compromises varietal purity and uniformity, resulting in inconsistent crop performance and economic losses for farmers. Moreover, low germination rates indicate poor seed viability, leading to uneven crop emergence and reduced yield potential.

To improve seed quality control, it's important to train staff involved in seed production. The main goal of this training is to ensure high-quality inbred seeds are produced efficiently and made available on time.

This study describes, assesses, and analyzes the impact of training and improving practices and operations to strengthen internal seed quality control at selected PhilRice Branch and Satellite Stations. Specifically, it aimed to describe the participants’ profile and seed production situation before the training through SWOT analysis, the improvement of the seed production through training, the effectiveness of the training program, and the evaluation of the challenges of the training program.

II. METHODOLOGY

A descriptive, mixed-method research design was employed to evaluate the impact of PhilRice's internal seed quality control training. Quantitative data was collected via surveys from participants at PhilRice's branch and satellite stations, assessing demographics. Qualitative data was gathered through interviews with the training team to explore experiences, strengths, weaknesses, and suggestions for improvement.

The study was conducted at PhilRice's Central Experiment Station in Nueva Ecija and its branch stations across the Philippines, including Batac, Isabela, Los Baños, Agusan, Midsayap, Negros, and Bicol. Satellite stations in Bukidnon, Zamboanga, the University of Southern Mindanao, and Mindoro were also included to represent diverse agro-ecological zones.

Participants included PhilRice personnel involved in seed quality control and those who participated in internal training programs. Through stratified random sampling, the study ensured that there was a representative per group, this comprised the Internal Seed Quality Control Team and staff trained at various PhilRice stations in 2023.

Distribution of Participants

Table 1. Distribution of Participants, n=50

PhilRice Branch/Satellite Stations	No. of Training Participants	No. of Participants
PhilRice Negros	13	3
PhilRice Agusan	16	4
PhilRice CMU	14	4
PhilRice Midsayap/USM/Zamboanga	16	4
PhilRice Bicol/Samar	16	4
PhilRice Isabela	19	5
PhilRice Los Baños/Mindoro	19	5
PhilRice Batac	15	4
Central Experiment Station	68	17
TOTAL	**196**	**50**

Internal Seed Quality Control Training Team	No. of Participants
12	**7**

III. RESULTS AND DISCUSSION

3.1. Profile of the Participants

Training Participants

Table 2. Participants' Profile (Training Participants)

Participants' Profile		Frequency	Percentage
Age	21-30	35	70%
	31-40	12	24%
	41-50	3	6%
Total		***50***	***100%***
Gender	Male	38	76%
	Female	12	24%
Total		***50***	***100%***
Educational Background	High School Graduate	27	54%
	College Graduate	23	46%
Total		***50***	***100%***
Position/Job Role	Researcher	23	46%
	Field Worker	27	54%
Total		***50***	***100%***
No. of Years in PhilRice	Less than 1 year	2	4%
	1-5 years	32	64%
	6-10 years	13	26%
	11-15 years	3	6%
Total		***50***	***100%***
Language	Tagalog	5	10%
	Tagalog/English	19	38%
	Bisaya	3	6%
	Bisaya/English	8	16%
	Tagalog/Bisaya	15	30%
Total		***50***	***100%***

The participants' profile shows that they are mostly young, with 70% aged between 21 and 30, and the majority being male (76%), highlighting a noticeable gender imbalance. With regards to education, 54% have a high school diploma, while 46% have college degrees. The participants are divided between field workers, 54%, and researchers, 46%. Most of them (64%) have been with PhilRice for 1 - 5 years, indicating that many are relatively new to the organization, with only a small number having over 10 years of experience. Language diversity is also evident with 38%

speaking both Tagalog and English and 30% using a mix of Tagalog and Bisaya dialect, which could cause some communication challenges during the training.

Training Team

Table 3. Participants' Profile (Training Team)

Participants' Profile		Frequency	Percentage
Age	21-30	4	57.14%
	31-40	1	14.29%
	41-50	1	14.29%
	61 and above	1	14.29%
Total		***7***	***100%***
Gender	Male	3	42.86%
	Female	4	57.14%
Total		***7***	***100%***
Educational Background	College Graduate	5	71.43%
	Master's Degree	2	28.57%
Total		***7***	***100%***
Position/Job Role	Researcher	7	100%
	Field Worker	0	0%
Total		***7***	***100%***
No. of Years in PhilRice	Less than 1 year	2	28.57%
	1-5 years	3	42.86%
	16-20 years	1	14.29%
	20 years and above	1	14.29%
Total		***7***	***100%***
Language	Tagalog/English	6	85.71%
	Bisaya/English	1	14.29%
Total		***7***	***100%***

The results show that 57% are female, which suggests the team has a strong academic background, with 71.43% holding college degrees and 28.57% holding master's degrees. Every member of the team is participating in research, demonstrating a strong emphasis on this field of study. With regards to experience, 42.86% have 1 to 5 years in the field, while the remaining participants either bring new perspectives as newcomers or contribute with long-standing expertise. The combination of experience levels results in a well-rounded and capable workforce.

3.2. Situation of Seed Production Before the Training

Strengths	***Weaknesses***
Efficient Seed Production Processes in some areas: Most participants agreed that the seed production processes	**Inconsistent Seed Quality**: Participants indicated that the quality of seeds produced was inconsistent and variable.

were efficient. This indicates that participants generally perceive that the methods and workflows used in seed production were effective and productive. However, the presence of some disagreement suggests that there may be room for improvement or varying opinions on certain aspects of efficiency. **Effective Use of Advanced Technologies**: Most participants agreed that advanced technologies were effectively utilized in seed production. This indicates that there is recognition of the benefits of modern technologies in enhancing productivity and quality in seed production processes. The disagreement from some participants might stem from varying experiences with technology implementation or perceived effectiveness.	This points to issues in maintaining uniformity and reliability in seed output, which is critical for meeting market demands and ensuring customer satisfaction. **Lack of Training and Development**: Participants noted a lack of training and development opportunities for personnel involved in seed production. This weakness highlights potential gaps in skill development, which can affect the team's ability to adopt new techniques, improve processes, and enhance overall productivity. **Reliance on Outdated Methods**: There was recognition that seed production relied on outdated methods and practices. This suggests a need for modernization and adoption of advanced technologies to improve efficiency, reduce costs, and enhance the quality of seeds produced.

Opportunities	***Threats***
Expanding into New Markets: Participants recognized significant potential for expanding into new markets. This suggests that there are untapped opportunities to introduce seeds to new regions or customer segments, potentially increasing market share and revenue streams. **Adopting New Technologies:** There were opportunities identified to adopt new technologies to improve seed production. This indicates potential benefits in leveraging modern innovations to enhance efficiency, quality, and sustainability in seed production processes. **Collaboration with other Research Institutions:** Participants noted opportunities for collaboration with research institutions to enhance seed production. This suggests potential partnerships that could lead to advancements in breeding techniques, disease resistance, and overall seed quality improvement.	**Competitive Pressure from Other Seed Producers:** Participants acknowledged significant competitive pressure from other seed producers. This suggests a competitive landscape where other companies are vying for market share, potentially impacting pricing, innovation, and market positioning for seeds. **Environmental Factors as a Threat:** Environmental factors were perceived as posing a significant threat to seed production. This could include issues such as climate change, weather variability, pests, and diseases that can affect crop yields and seed quality, thereby impacting production outcomes. **Economic Instability Impacting Production:** Economic instability was noted to negatively affect seed production. This suggests vulnerabilities to factors such as inflation, currency fluctuations, market volatility, and economic downturns that can impact investment, costs, and profitability in seed production.

Table 4. SWOT Analysis

3.3. Training on Seed Production

Low Production Volume

In agriculture, increasing production volume requires technology integration and focused training. By teaching the best practices for handling, storing, and distributing seeds, seed management training improves production cycles. These initiatives aim to empower farmers with the necessary skills (Fronda, 2023). Automated equipment and digital monitoring systems are examples of modern technology that increases operating efficiency, reduces personnel costs, and guarantees consistent yields and quality. Crop health is improved and resource utilization is maximized when staff members are properly trained in the use of inputs like fertilizers and irrigation. Training on efficient scheduling and planning, which takes into account resource availability and seasonal demand, also improves workflows and decreases downtime, which boosts output even more.

High Occurrence of Off-Types

Stricter standards, enhanced quality inspections, and focused training are all necessary to lower the high frequency of off-types in seed production. Maintaining genetic purity is aided by training staff to recognize and quickly eliminate off-types. Strict criteria for genetic integrity, frequent quality inspections, and improved auditing techniques all help to prevent off-type contamination by spotting problems early. Proper harvesting techniques, which are reinforced by training, guarantee that seeds stay uncontaminated, and continuing education keeps staff members abreast of industry best practices. By successfully reducing off-types, this all-encompassing method to training and quality control guarantees consistently high-quality seed batches.

Low Percentage of Germination

Comprehensive training and quality control throughout planting, treatment, and storage procedures are necessary to increase germination rates in seed production. Employee education on the best ways to store seeds—temperature, humidity, and ventilation—maintains seed viability and promotes more germination. Training helps break dormancy and promote consistent seedling emergence by introducing pre-sowing treatments including scarification and priming. Applying fertilizer and insecticides correctly is also essential; instruction on time and amount protects seeds without compromising their ability to germinate. Only seeds with a high germination capacity are delivered to farmers thanks to improved seed quality testing. To maximize seed performance in the field, staff training on optimal planting conditions—soil preparation, depth, and moisture—promotes quicker, consistent germination.

IV. EFFECTIVENESS OF THE TRAINING PROGRAM

The training program received favorable reviews from the participants. Participants' technical proficiency and decision-making improved as a result of acquiring new information and abilities. Their learning experience was improved because they were supported by the teachers, understood the training objectives, and valued real-world examples. They reported advances in tactics and procedures as a result of their successful application of the knowledge to their farming activities. To maintain consistency in their farming operations, participants followed the principles and the criteria that were taught. Furthermore, the training enabled them to resolve issues about the farm, indicating its usefulness in tackling and identifying agricultural problems and difficulties (Mina, Subia & Ermita, 2020).

V. CHALLENGES OF THE TRAINING PROGRAM

The main challenges encountered in the training program are the following (Abelardo, et al., 2019):

1. Maintaining participant engagement was challenging due to lengthy discussions and frequent distractions.

2. Limited resources, like inconsistent access to a projector and the need for an indoor venue, affected presentation quality due to sunlight interference.

3. Cultural and language differences among participants, such as varying dialects, and complicated communication and understanding, making it harder to deliver technical content effectively.

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Fostering Resilience: Assessing the Role of Green Public Procurement in Strengthening the Agricultural Sector at the Philippine Rice Research Institute

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***Abstract*— *This study investigates how Green Public Procurement (GPP) can strengthen the resilience of the rice sector in the Philippines, highlighting sustainability - with the primary efforts of the Philippine Rice Research Institute (DA-PhilRice) being centered in the research. The Philippines, a major rice-producing country, has undergone several troubles and challenges in the mentioned commodity production such as environmental degradation, unpredictable weather patterns caused by climate change, and various social and economic susceptibility. GPP offers a strategic approach to addressing these issues by promoting agricultural practices that reduce negative environmental impact while supporting local economies. Through qualitative methods such as key informant interviews, field observations, and secondary data analysis, the study assesses how DA-PhilRice's GPP strategy—including sustainable farming techniques, pest management, and climate-resilient technologies—contributes to agricultural sustainability. It also highlights key challenges such as institutional barriers, market volatility, and resistance to innovation, while evaluating the broader market impacts of GPP on pricing and access for farmers. The research provides valuable insights for policymakers and stakeholders offering recommendations to improve GPP frameworks and strengthen the agricultural sector's resilience through enhanced sustainability practices and stakeholder engagement in the Philippines.*

Keywords*— agricultural resilience, environmental impact, Green Public Procurement, rice production, sustainable farming practices, sustainability

I. INTRODUCTION

Green Procurement and Sustainable Agriculture

Green Procurement (GP), particularly Green Public Procurement (GPP) when applied in the public sector, refers to the purchasing of goods, services, and works that reduce environmental impacts throughout their life cycle. It ensures that procurement decisions favor products that are eco-friendly and resource-efficient, thereby promoting sustainability (Philippine Green Public Procurement Roadmap Foreword, 2017). GPP ponders into environmental impacts to reduce ecological damage while attaining the same functional needs, unlike the conventional procurement methods that center the procedure on cost-efficient practices.

Governments and other prominent market stakeholders are increasingly adopting GPP policies to drive sustainable consumption, which can influence production patterns to become eco-friendlier. By encouraging demand for sustainable goods and services, GPP helps shift market dynamics, pushing producers toward greener, more sustainable practices (Philippine Green Public Procurement Roadmap Policy Brief, 2017).

The role of GPP in the agricultural sector is "fundamental" or "substantial". It is a well-known fact that agriculture, as important as it is, is a major contributor to ecological degradation due to many factors like excessive usage of chemicals, resource abuse due to a particular need for volume, and synthetic alternatives. By promoting sustainable inputs such as organic fertilizers, water-saving technologies, and renewable energy, GPP can mitigate the negative impacts of farming (Bratt et al., 2013). These align well with achieving sustainability since they balance economic prosperity and environmental preservation.

Green procurement in agriculture not only reduces environmental harm but also supports long-term sustainability. This approach helps drive the transition toward a circular economy, where waste is minimized, and resources are reused or recycled. As such, green procurement supports the broader goals of sustainable development (Balaria, et al., 2017) by ensuring that economic activities today do not compromise future generations' ability to meet their own needs.

According to Bratt et al. (2013), green procurement fosters innovation by encouraging producers to adopt environmentally friendly technologies and practices. Walker et al. (2012) further emphasize that GPP can result in long-term cost savings by reducing resource consumption, minimizing energy usage, and diminishing waste produced. Also, Darnall et al. (2008) noted that green procurement policies can induce market transformation that provides an opportunity for a demand for sustainable products that inspires industries to switch to environmentally friendly practices.

When talking about rice farming, many problems are already encountered by the local farmers (Fronda, 2023) that disparage productivity both in farming practice and harvesting yield. Environmental and socio-economic challenges encountered by the rice industry in the Philippines are deforestation, soil erosion, climate change, and the predominance of smallholder farming (David, 2020). Many researches have shown that climate change, in particular, poses a significant risk to rice yields, necessitating the adoption of sustainable practices to ensure long-term resilience (Rosenzweig et al., 2014).

The Philippine Rice Research Institute is engaged in a vital role in fostering sustainable production of rice and advancing it through any means. Through research and the promotion of climate-resilient rice varieties and farming practices. The adoption of green procurement by DA-PhilRice can further strengthen its sustainability efforts and influence the entire rice value chain. By implementing green procurement practices, DA-PhilRice can reduce its environmental impact and encourage its suppliers to adopt sustainable technologies, contributing to the resilience of the agricultural sector (DA-PhilRice, 2019).

By evaluating the overall potency of GPP initiatives, this study aims to give a valuable understanding of how this special type of procurement practices may impact the overall agriculture industry in the country. The problems are as follows:

1. Assess how GPP initiatives administered/adapted by the DA-PhilRice assist in strengthening agricultural sector resilience, especially in rice farming in the Philippines.

2. Point out challenges faced by the agency in the implementation/adaptation of GPP practices in the agricultural sector and evaluate how these deficiencies affect the resiliency efforts that have been made so far.

3. Explore the scope into which GPP practices of the agency stimulate sustainable agricultural efforts and practices.

4. Explore how GPP initiatives impact market behavior and market performance within the agricultural sector and its constituents.

5. Provide policy recommendations for enhancing the GPP system/framework and its associated strategies at both micro and macro levels in assisting the resilience-building efforts of the agricultural sector.

II. METHODOLOGY

A qualitative approach was applied in the research to value the efforts of GPP initiatives towards agricultural resilience. Programs from DA-PhilRice were the focus of this study. The research paper begins with a comprehensive literature review in which the basis or source comes from academic data, government reports, and various documents focusing on the GPP practices in sustainable agriculture. This features pest control and waste management that utilizes sustainable farming techniques and climate-resilient technologies.

All Project Managers, researchers, and farmers participating in GPP programs were interviewed through a key informant interview (KII) to share practical insights into the types of challenges and benefits that these programs bring. Field observations were also done in the rice fields being managed by DA-PhilRice during the period of the study on the different changes in the physical farming practices regarding water usage, soil health, and pest control. Secondary data analysis from already existing reports on GPP and rice production complemented the findings.

Thematic analysis was done on the interview and observational data gathered, extracting relevant themes such as farmer perceptions, institutional barriers, and cultural factors that influence sustainable practices. Triangulation is a means of establishing validity through the comparison of literature with interviews and field observation data sources. Informed consent and confidentiality would be observed in all participants. This methodology combines data sources into a strong assessment of GPP on agricultural resilience.

III. RESULTS AND DISCUSSIONS

1. Evaluating the Contribution of GPP Initiatives to Agricultural Resilience

1.1. Waste Management Projects

1.1.1. Alternate Wetting and Drying (AWD) Technique

Alternative Wetting and Drying (AWD) is a method used for rice farming that involves irregularly drying the fields instead of the usual practice of continuously flooding them. This not only conserves the usage of water up to 30% but also produces a result of decreased emission of methane, thus providing a vital role in environmental sustainability. DA-PhilRice adapts the AWD system thoroughly through detailed training on the involved farmers and farm demonstrations which enhances their overall understanding and application of the said technique.

1.1.2. Rice-Specific Weather Forecasting Tools

Weather forecasting also plays a huge role in agriculture. In this regard, DA-PhilRice developed a tool to make this possible, which is specially tailored to rice farming and enables farmers to respond accordingly to weather changes and optimize their resources such as the usage of irrigation/water. This is implemented through various features such as mobile apps and extension services. An example of such a mobile app is the "Rice Crop Manager" which provides irrigation advice based on weather forecasts and assists farmers in setting water usage to a conservative amount and increasing resilience against drought.

1.2. Development of Pest-Resistant Rice Varieties

1.2.1. Golden Rice Project

"Golden Rice", is a variety of rice that is genetically modified to address shortcomings such as Vitamin A deficiency and resistance to usual pests. The agency conducted field trials and various efforts to assure the safety and effectiveness of the mentioned variety. This innovation is of great assistance to farmers since it also, in turn, reduces the need for pesticides, enhances the resilience of crops, and supports food security.

1.2.2. NSIC Rc222 (Tubigan 18) Variety

Another variety to be included is the NSIC Rc222. This variety of rice is a high-yielding, pest-resistant rice variety developed by the agency. From the aforementioned characteristics, it is an undeniable fact that farmers greatly benefit from higher yield numbers and reduced costs due to reduced pesticide use which ultimately leads to lower environmental harm. The agency facilitated the widespread adoption of the variety through large-scale seed distribution and training programs.

1.3. Sustainable Farming Techniques

1.3.1. Organic Fertilizer Use

Modern agriculture gives special emphasis on resourcefulness through different means. One of these means is the use of biodegradable agricultural waste and residues as an agent of a utilizable organic fertilizer which can enhance the fertility of the soil, better water retention, and improve the structure of the land. DA-PhilRice promotes the usage of such fertilizers which may foster sustainability in agriculture for a considerable length of time while also reducing farmer's dependence on chemical alternatives.

Also, DA-PhilRice encourages composting as an essential to sustainable rice farming and actually has a program called the "Palayamanan" system where rice farmers are suggested to use composted residues that results in better soil fertility (richer), water retention, and also provide necessary nutrients for strengthening and enhancing crop growth.

Aside from such adapted practices by the institution, trainings are also implemented to further enhance farmer's knowledge and expertise in sustainable farming.

1.3.2. Integrated Pest Management (IPM)

DA-PhilRice places special emphasis on Integrated Pest Management (IPM) through different educational programs and initiatives that target the improvement of the rice production of farmers. Farmer Field Schools (FFS), which are somehow similar to Farm Business Schools (FBS) have proven to have of significant impact when it comes to knowledge and skills enhancement, particularly in the topic of pest and disease management. Participants decided to adopt the taught methods and strategies from the said program such as reducing dependence on chemical pesticides which highlights the use of natural alternatives instead.

The Rice Competitiveness Enhancement Fund (RCEF) training lectures and courses also highlight environment-friendly approaches that encourages the use of pest-resistant rice varieties.

All of these community-based efforts resulted in many important changes that improved pest management among farmers.

1.4. Climate-Resilient Technologies

1.4.1. Stress-Tolerant Rice for Africa and South Asia (STRASA) Project

The Stress-Tolerant Rice for Africa and South Asia (STRASA) project, a rice variety that can withstand events such as drought and flooding, is a resilient rice variety that is handled by the International Rice Research Institute (IRRI) together with the Philippine Rice Research Institute (DA-PhilRice). The project centers on ensuring these adaptive varieties provide the expected performance in varying conditions through extensive trials. This project aims to help farmers adapt to rapidly changing climate conditions that significantly affect agriculture which in turn enhances food production capability in vulnerable regions thus, securing farmers' income and food sources.

2. Barriers and Challenges Faced by DA-PhilRice in Implementing GPP Strategies

2.1 Institutional Barriers

2.1.1. Lack of Funding

DA-PhilRice relies on national funding to carry out its respective mandates. Constraints in securing adequate funding despite the agency's efforts to do so, can significantly affect its outputs negatively in Research and Development (R&D). This includes funding for pest-resistance projects on a multi-year scale - which may force the agency's researchers to either downsize the project's development and goals or cast aside the project resulting in a jeopardized rice production potential breakthrough.

2.1.2. Bureaucratic Red Tape

Bureaucratic procedures are part of every organization's framework of operations. Being vital as it is, it still hinders the punctuality of response to immediate agricultural challenges. This can provide inefficiency especially to prompt needs in rice farming. An example of this is when a new and promising rice variety has emerged, the variety still needs to undergo a process of multiple approvals before being deployed. Although this is essential to ensure its potential and safety, unnecessary administrative processes can be trimmed down just to the important ones so the deployment can be hateful as possible.

2.1.3. Insufficient Training

Knowledgeable staff with real expertise is the backbone of any organization and one contributing factor to this is exposing them to necessary training and seminars. Being limited to this, DA-PhilRice personnel are deprived of being equipped with the latest knowledge in technologies and various methodologies. This can affect the overall productivity and efficiency of the agency, especially on the side of R&D activities.

2.2 External Barriers

2.2.1. Market Volatility

One factor that is uncontrollable on the side of the agency is the global price fluctuations of rice. This fluctuation can provide constraints in developing and implementing research necessities that may help the stakeholders. This is due to price drops having a significant effect on rice programs and R&D funding, which in turn impacts the focus on GPP strategies as well. This will also affect the long-term sustainability of rice farming in the nation.

2.2.2. Climate Change Impacts

Climate change proves to be a challenge, especially in the agriculture sector. Rapidly changing weather and unpredictability in its pattern may induce the risk of different pests and diseases and can also result in a deviation in sustainable farming practices. To possibly diminish its effect, the agency should also provide emphasis on research efforts regarding this which will require more resources to be depleted.

2.2.3. Resistance from Traditional Practices

Cultural or traditional embracement is often a thing for many societies and communities and this includes farmers. They usually deviate from adapting new techniques, despite their known benefits and advantages compared to traditional ways. This is possibly caused by various reasons such as a lack of awareness or readiness (Subia, Jocson & Florencondia, 2019), or simply just rejecting the idea of the technology entirely due to distrust. The agency should be proactive in engaging educational programs such as training and dissemination of information materials explaining the benefits and advantages of adopting these new technologies. Overcoming this ordeal is highly crucial in ensuring that GPP practices are widely accepted and adapted in the future.

3. **Promoting Sustainable Agricultural Practices through Green Public Procurement**

3.1. Resource Conservation

Initiative	Approach	Impact
Water-Saving Technologies	PhilRice emphasizes the procurement of technologies that save water such as drip irrigation and the AWD technique.	Incorporating strategies such as the GPP approach provides the rice farmers with the idea of how to reduce usage of water thus applying the technique in their practices. As aforementioned, the practice decreases the usage by up to 30% when compared to the traditional method of continuously flooding fields which improves

		resource efficiency, supports resilience against droughts, and cuts significant costs.

DA-PhilRice gave priority to the adaptation of technologies that reduce water usage such as drip irrigation and the AWD system. As explained before, the process of AWD is the irregular drying of fields in between irrigation schedules/cycles instead of the usual practice of continuously flooding them. So far, the results have been promising and by including this under the GPP, DA-PhilRice can promote the continuous reduction in water consumption. The practice has several benefits such as saving a significant number of resources (e.g. water and energy for irrigation use) and supporting resilience against droughts which makes it in line with sustainable agricultural practices.

3.2. Chemical Inputs Reduction

Initiative	Approach	Impact
Integrated Pest Management (IPM)	IPM ideas and techniques are adapted by DA-PhilRice in procuring pest control maintenance such as biological alternatives, pheromone traps, and resistant crop varieties. This is to promote the use of natural methods instead of chemical ones.	DA-PhilRice supports rice farmers by implementing the IPM approach through GPP. This generally reduces hazards in the environment and the use of natural alternatives eliminates the health hazards that chemical solutions may possibly pose. This practice also provides solutions such as better soil health and lower costs of production which is highly beneficial for farmers.

DA-PhilRice has adapted IPM principles and incorporated them into their procurement standards such as procuring biological alternatives to reduce or totally remove dependence on chemical ones, pheromone traps, and a resistant variety of different crops. Through GPP and by educating farmers and all related stakeholders, the agency can encourage them to adapt the practices, reducing both environmental and health hazards that chemical pesticides may pose. Also, this practice may promote better soil health and lower production costs in the future.

3.3. Environmentally Friendly Techniques

Initiative	Approach	Impact
Agroforestry Systems	DA-PhilRice promotes and involves agroforestry in their procurement policies which fosters a variety of cropping systems (e.g. intercropping, integrated, etc.) which strengthens biodiversity and soil health, and isolates carbon.	Using agroforestry through GPP practices, the agency assists farmers promote a mixed source of income with timber and non-timber products. Agroforestry also assists in diminishing climate change's impact on agriculture by isolating carbon dioxide, which may help in sustaining ease of land management and ecological resilience.
ill Farming	DA-PhilRice promotes the use of a method called "no-till farming" in agriculture through their procurement policies which support practices that reduce or avoid soil erosion, strengthen soil health, and also conserve energy, and reduce labor needs that lead to cutting-down costs.	Through incentivizing the practice of no-till farming through GPP, the agency improves the soil fertility in the fields and the productivity as well, reducing the need for additional labor and fuel. This supports the conservation of biodiversity and sustainable agricultural practices.

DA-PhilRice involves agroforestry in their procurement policies which fosters a variety of cropping systems such as intercropping and integrated cropping that not only show a strong illustration of biodiversity but also help in improving soil health, and sequester carbon. The agency's use of agroforestry adaptation through GPP practices assists the farmers in having mixed timber and non-timber products as their source of income.

DA-PhilRice also promotes the use of *no-till farming* in agriculture through its procurement policies. The practice minimizes or eliminates soil erosion possibilities, thus strengthening soil health, and also reduces the use of energy and labor. This incentivized practice under GPP supports the conservation of biodiversity and sustainable agricultural practices.

4. Influence of Green Public Procurement on Market Dynamics

4.1. Procurement Processes

The procurement policies of DA-PhilRice are in accordance with Green Public Procurement (GPP) principles, which therefore promotes viable agricultural inputs. This further reaches to even sourcing different materials/equipment such as laboratory equipment and apparatus, appliances like Energy Star-rated freezers, and air conditioners. By incorporating the practice of GPP throughout the operations, the agency supports sustainability in both administrative and research functions.

4.2. Pricing Mechanisms

The GPP practices of DA-PhilRice create a demand from concerned suppliers thus, affecting the prices that are offered in the procurement/bidding efforts of the agency. This forms a competitive pricing standard for the agency's suppliers which will be beneficial to the agency in the long run. For example, often putting a procurement request for a pest-resistant varieties for various crops creates a steady market demand. This will be beneficial to farmers due to the fact that more competition will further reduce costs and also, and sustainable agricultural products are often marked as premium products, thus attaching premium prices which will ultimately result in an increased profitability on the side of the farmers and incentivize eco-friendly practices.

4.3. Market Access for Small-Scale Farmers

The GPP program of DA-PhilRice helps farmers gain access to larger or better markets through methods like partnership and fair-trade certifications. There are specific market segments or niche markets that emphasize the demand for organically-grown food products which are willing to pay premium prices to avail some. The initiative greatly assists in helping farmers build a steady income source over periods.

To summarize, the agency’s GPP practices give a focal point to sustainability, promote innovation, and provide better economic opportunities for farmers, which provides the Philippines with a more sustainable agricultural sector.

5. Policy Recommendations for Improving GPP Frameworks and Strategies

5.1 Improving GPP Frameworks

The DA-PhilRice might want to adapt existing GPP policies and practices which are already refined and may provide a more comprehensive sustainability criterion that is beyond just environmental impacts (e.g. social and economic factors) such as GPP benchmarks from international models like Sweden and Netherlands. These countries' GPP models or frameworks highlight clear criteria for sustainability and meticulous evaluations. Ensuring that the procurement staff/personnel and stakeholders are equipped with the right capacity-building initiatives paves the way to an effective GPP implementation across one organization, enhancing transparency and accountability within the processes of the procurement.

5.2 National-Level Strategies

DA-PhilRice is a renowned attached agency of the Department of Agriculture and with its reputation, the agency can advocate for policies that center on GPP application across the agricultural sector at a national level. Such advocacies may include eco-friendly agricultural inputs, tax incentives for businesses with strict GPP compliance, and generally, a well-built regulatory framework mandating GPP in government/public procurement. These mentioned strategies can induce a condition that enables sustainable and economically viable practices which develops innovation while making the associated sustainable agricultural technologies cheaper and more affordable even for farmers.

5.3 Stakeholder Engagement

In the end, the key to successful and widespread GPP execution comes down to enticing stakeholders such as farmers, NGOs, businesses, and even the private sector to adopt the GPP framework. To make this possible, the agency can establish forums and consultations that give a chance to the concerned parties to integrate their decisions and perspectives into procurement decisions. This can ensure that the sustainable practices being promoted by the agency are viable and practical on the side of the other party. Also, capacity-building efforts that center on educating farmers about the benefits of adapting GPP and then training them to adopt sustainable practices are vital in incorporating this scheme. For other stakeholders such as NGOs, the private sector, and other businesses, beneficial collaborations and joint initiatives that promote sustainable procurement can be arranged.

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Service Quality Analysis of Technical Education and Skills Development Authority (TESDA) Training Centers in Nueva Ecija Province

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***Abstract*— *Using the SERVQUAL model, this study analyzed the service quality provided by TESDA Training Centers in Nueva Ecija, Philippines. The research aimed to define service quality through five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The study revealed that there is a strong positive perception among respondents regarding various service dimensions of the SERVQUAL model. Participants expressed high satisfaction with the tangible services, reliability, responsiveness, professionalism, and empathy demonstrated by the staff of the training centers. Overall, the findings indicate that the TESDA training centers in Nueva Ecija effectively meet the needs of their clients, fostering a supportive and competent learning environment.*

***Keywords*— Empathy, Professionalism, Reliability, Service Quality, Tangibles**

I. INTRODUCTION

Technical Education and Skills Development Authority (TESDA) seeks to enhance workforce skills development through partnerships among businesses, labor, local government agencies, and technical-vocational institutions (TESDA, 2024). TESDA is chiefly responsible for developing manpower and skills strategies, establishing skills standards and evaluations, overseeing manpower policies and programs, and offering policy guidance and resource allocation frameworks for TVET institutions in both commercial and governmental sectors (Subia, et al., 2019).

Over the years, TESDA has grown into a business that offers many services to its customers quickly, effectively, and efficiently. To reach its objectives, the TESDA Board has created plans and activities that are meant to have the biggest effect on developing people in a wide range of institutions and industries.

Many important issues come up in vocational education, especially in TESDA Accredited Training Centers. These issues show how complicated service quality and customer happiness can be. Some of these are the quality of the infrastructure, how well management practices match the needs of trainees and teachers, and how quickly services can adapt to changing market needs. It is also important to think about how marketing tactics can be used to attract and keep trainees, as well as how the SERVQUAL Model can be used to measure the quality of service (Salleh, et al, 2019).

Rolo, et al. (2023) stated that SERVQUAL is a multidimensional research tool developed to assess service quality by evaluating expectations and perceptions of respondents across five domains of service quality. The primary aim of the SERVQUAL methodology is to create measurement scales that assess service quality by analyzing the disparity between customer expectations and perceptions. The service anticipated by the consumer serves as the norm or "benchmark" for comparing experiences; when execution surpasses expectations, service quality improves, and conversely.

The assessment of service quality is complicated, abstract, multivariate, and intangible, described as the extent to which the service characteristics align with the criteria valued by the consumer (Santi & Guntarayana, 2020). The characteristics of this service are challenging to articulate due to its inherent nature, which includes intangibility (lacking physical existence, rendering precise specifications unattainable), perishability (simultaneous production and consumption), inseparability (customer involvement in the production process, allowing for both passive participation and co-production), and variability (performance differing among individuals, consumers, and across different days) (Ulusoy, 2015).

The objective of the author in listening to the experiences of consumers was to identify areas for improvement to retain existing customers and attract new ones. The involvement of the customers presents an exceptional opportunity to engage with him indicating that all significant service quality research concur that service quality is inherently subjective and can only be assessed based on consumer preferences or definitions of quality. This is what this study aimed to analyze. Specifically, it explored the service quality of TESDA training centers in Nueva Ecija using the SERVQUAL model. The SERVQUAL methodology is extensively employed for assessing service quality across diverse industries. The framework has five aspects, including tangibles, reliability, responsiveness, assurance, and empathy.

II. METHODOLOGY

This study utilized a descriptive research design. According to Kumar (2014) as cited by Mina, Subia & Ermita (2020), “descriptive survey can systematically describe a situation, problem, phenomenon, service or programs, or provide information or describe the attitude towards an issue”. The study was done at authorized training centers in Nueva Ecija that are known to the Technical Education and Skills Development Authority (TESDA). 230 TESDA trainees from accredited training centers in the province were chosen purposively based on the following inclusion criteria (Subia, 2018):

1. At the time of the study, there were ongoing training programs.
2. A minimum of three years of operational experience.
3. The institution was a TVET school that did not provide any college degree programs.

The researcher obtained permits and ethical approvals from authorities to ensure participants' safety and compliance with ethical standards. A modified survey questionnaire from the study of Sankar (2018) was developed, and subjected to expert validation and pilot testing. Participants, particularly TESDA trainees, enrolled in accredited training centers in Cabanatuan City. The questionnaires were distributed using Google Forms and face-to-face interaction, with multiple reminders and explicit instructions for completion and return. A comprehensive analysis was conducted using appropriate statistical tools.

III. RESULTS AND DISCUSSION

SERVICE QUALITY OF TESDA TRAINING CENTERS IN NUEVA ECIJA USING THE SERVQUAL MODEL

Table 1. Tangibles

Tangibles	WM	Verbal Description
1. The TESDA Training Center has modern equipment.	4.47	Strongly Agree
2. Physical facilities (shelves, customer service counters, computers, lights) are visually appealing.	4.32	Strongly Agree
3. Employees are well dressed and appear neat.	4.57	Strongly Agree
Overall Weighted Mean	**4.45**	**Strongly Agree**

Table 1 presents the service quality of TESDA training centers as to tangibles. Overall, the respondents strongly agreed that the tangible services provided by the TESDA training centers in Nueva Ecija are very high, with a weighted mean of 4.45.

The data shows that the modern equipment and employees' uniforms got high-weighted means of 4.47 and 4.57, respectively, which means that most people agreed that the center has the latest technology. This number is so high because it shows how important modern equipment is for good training. On the other hand, item number 2, the physical facilities got the lowest weighted mean of all the tangibles, at 4.32. This slightly lower score means that while the facilities were usually nice to look at, some things could be done to make them look even better.

This implies a strong consensus among users regarding the center's commitment to utilizing the latest technology, highlighting its significance in enhancing training quality (Faoziansyah, Rohayati & Iqbal, 2024). Conversely, physical facilities suggest that while they are generally well-regarded, there is room for improvement to elevate their overall appeal and effectiveness.

This study contradicts previous research, which suggests that consistently high performance in all aspects of tangibles, including the visual appeal of physical settings, is required to promote complete customer satisfaction. Rojek, Mikołajewski & Dostatni (2021) mentioned that all tangible parts must be well-maintained and visually appealing to fully meet customer expectations. The somewhat lower TESDA score shows a gap, which, if filled, might further align the center with the high standards indicated in this research.

Table 2. Reliability

Reliability	WM	Verbal Description
1. When they promise to do something by a certain time, they do.	4.43	Strongly Agree
2. When a customer has a problem, they show a sincere interest in solving it.	4.51	Strongly Agree
3. Provider performs the service right the first time.	4.43	Strongly Agree
4. The TESDA Training Center provided the service at the time they promised to do so.	4.50	Strongly Agree
5. Employees keep their records accurately.	4.53	Strongly Agree
Overall Weighted Mean	**4.48**	**Strongly Agree**

Table 2 exhibits the service quality of TESDA training centers as to reliability. This table shows that participants rated the reliability of the TESDA Training Centers very positively, with an overall weighted mean of 4.48 showing that a lot of people strongly agreed that the center always does what it is supposed to do.

Item number 5 with the highest weighted mean, which states "employees keep their records accurately," obtained a rating of 4.53, indicating remarkable consistency in the service delivery schedule.

Item numbers 1 and 2, "When they promise to do something by a certain time, they do," and "Provider performs the service right the first time," had somewhat lower ratings of 4.43, indicating minor areas for possible improvement.

The high-reliability ratings show that TESDA Training Center was regarded as dependable and consistent in its service delivery. The highest score indicates employees keep records accurately. Also, this highlights the center's dedication to addressing difficulties and providing services appropriately on the first try. While lower ratings indicate that while the center performs well in terms of reliability, there may be certain areas, such as punctuality and record-keeping, where minor improvements could be made to improve overall service reliability.

The TESDA Training Centers in Nueva Ecija's high-reliability ratings' demonstrate that they efficiently achieve these requirements. However, significantly lower scores for individual issues highlight places for future work. Addressing these issues, such as improving adherence to promised timetables and record-keeping accuracy, would allow the center to align even more closely with the high dependability standards emphasized in the research, resulting in increased overall participant satisfaction and trust (Leninkumar, 2017).

Table 3. Responsiveness

Responsiveness	WM	Verbal Description
1. Employees make information easily obtainable by trainees.	4.53	Strongly Agree
2. Employees give prompt service to trainees.	4.54	Strongly Agree
3. Employees are always willing to help trainees.	4.68	Strongly Agree
4. Employees are never too busy to respond to trainees' requests.	4.50	Strongly Agree
Overall Weighted Mean	**4.57**	**Strongly Agree**

Table 3 displays the service quality of TESDA training centers in Nueva Ecija as to their responsiveness. The overall weighted mean of 4.57 indicates a robust culture of support and responsiveness.

These findings correspond with the study by Fida, et al., (2020), which underscored the essential importance of responsiveness in customer (or trainee) satisfaction. In contrast, insufficient reactivity results in discontent, underscoring the significance of this factor in effective training settings (Chernozub, 2020).

The table shows that staff demonstrates a significant level of responsiveness to trainees, particularly in item number 3 with a weighted mean of 4.68, "Employees are always willing to help trainees". The lowest in terms of the weighted mean is the item "Employees are never too busy to respond to trainees' requests" with a weighted mean of 4.50.

The findings imply that staff responsiveness indicates that trainees feel well-supported and valued, fostering a positive learning environment. However, staff availability suggests that there may still be occasional challenges in meeting all trainee requests promptly, highlighting an area for potential improvement (Khalafi & Matin, 2021).

Table 4 Assurance

Assurance	WM	Verbal Description
1. The behavior of the employees instills confidence in trainees.	4.51	Strongly Agree
2. Customers feel safe in their transactions with employees in the customer service counters.	4.53	Strongly Agree
3. Employees are polite with trainees.	4.56	Strongly Agree
4. Employees of TTC have the knowledge to answer trainees' questions.	4.57	Strongly Agree
Overall Weighted Mean	**4.54**	**Strongly Agree**

Table 4 demonstrates the service quality of TESDA training centers in Nueva Ecija as their assurance. The overall weighted mean of 4.54 indicates an underscore of a persistent perception of professionalism and competence among employees.

Additionally, the table shows that "Employees of TTC have the knowledge to answer trainees' questions" with the highest weighted mean of 4.57, while item number 1 "The behavior of the employees instills confidence in trainees" has the lowest weighted mean of 4.51.

The findings imply that staff responsiveness indicates that trainees feel well-supported and valued, fostering a positive learning environment. However, staff availability suggests that there may still be occasional challenges in meeting all trainee requests promptly, highlighting an area for potential improvement (Khalafi & Matin, 2021).

These findings align with the research of Ginting, Chandra, Miran & Yusriadi, (2023) which indicated that the conduct of service employees—especially in exhibiting competence and courtesy—directly influences consumer trust and satisfaction. Consistent with this study, the present evidence indicates that trainees exhibit greater confidence and assurance when personnel are competent and courteous, hence enhancing their entire training experience.

Table 5. Empathy

Empathy	WM	Verbal Description
1. Employees give trainees individual attention.	4.50	Strongly Agree
2. Their operating hours are convenient to all their trainees.	4.55	Strongly Agree
3. Employees give trainees personal service.	4.28	Strongly Agree
4. The employees understand the specific needs of their trainees.	4.50	Strongly Agree
Overall Weighted Mean	**4.46**	**Strongly Agree**

Table 5 presents the service quality of TESDA training centers in Nueva Ecija in terms of their empathy. The overall weighted mean of 4.46 signifies that respondents "Strongly Agree" that staff exhibit empathy throughout service delivery.

The item with the highest rating is item number 2, "Their operating hours are convenient to all their trainees" exhibiting a mean score of 4.55, indicative of substantial satisfaction about operational flexibility. The item with the lowest rating is item 3, "Employees give trainees personal service" which has a robust mean score of 4.28, reflecting a marginally diminished, yet still highly favorable, perception of the personal service dimension.

The results correspond with the study by Joung et al. (2015), which underscores that internal marketing techniques, particularly regarding employee interactions with consumers (in this instance, trainees), profoundly influence service quality and customer satisfaction. This indicates that trainees perceive they are receiving individualized attention and that personnel at TESDA Accredited Training Centers are attentive to their particular requirements. The facets of empathy are essential in cultivating healthy interactions between trainees and staff, thereby improving overall satisfaction.

The satisfactory scores correspond with Parasuraman et al.'s (1988) SERVQUAL model, which designates empathy as one of the five essential service quality characteristics. This indicates that TESDA training centers are successfully catering to the emotional and personalized dimensions of service, which profoundly influences trainees' views of service quality. Nonetheless, despite the elevated scores, these sectors remain susceptible to enhancements to guarantee continuous service delivery. Improving personalized attention and comprehension of trainee requirements may result in increased satisfaction and loyalty among trainees.

IV. CONCLUSIONS

The findings regarding the service quality of TESDA training centers in Nueva Ecija lead to the following conclusions:

1. The tangible services offered by TESDA training centers are perceived as exceptionally high-quality, reflecting strong satisfaction among respondents.

2. Reliability is a significant strength for TESDA training centers, with participants consistently acknowledging that the centers fulfill their commitments effectively.

3. There is a notable emphasis on responsiveness within TESDA training centers, indicating a strong culture of support that meets the needs of participants.

4. The assurance provided by employees at TESDA training centers is highly regarded, showcasing a widespread perception of professionalism and competence.

5. Staff members at TESDA training centers demonstrate considerable empathy, contributing positively to the overall service experience for respondents.

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The Contribution of Human Resource Management in Health Service Innovation: A Case Study of Sekou-Toure Regional Hospital, Mwanza, Tanzania

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Abstract— *Human Resource Management (HRM) plays a greater role in driving health service innovation by creating an environment where healthcare professionals are motivated and equipped to implement new ideas. This study examines how specific HRM practices compensation, job security, and labour relations contribute to raise innovation at Sekou-Toure Regional Hospital in Nyamagana District, Mwanza, Tanzania. It addresses the gap in understanding how HRM can support innovation, particularly in resource-constrained healthcare settings, by exploring the influence of these factors on healthcare professionals' readiness and ability to engage in innovative practices. A mixed-methods approach was used, involving both quantitative and qualitative data collection. Quantitative data were gathered through structured questionnaires from 225 healthcare professionals and management staff, while qualitative insights were derived from in-depth interviews with key hospital administrators. The findings reveal a significant positive relationship between fair compensation and health service innovation, with a Pearson correlation of 0.525, demonstrating that adequate compensation enhances healthcare workers' commitment to innovative efforts. Job security also contributes, with a beta coefficient of 0.250, highlighting the importance of stable employment in raising a supportive environment for new ideas. Labour relations, with a Pearson correlation of 0.498, underline the value of fair working conditions and employee involvement in decision-making, both of which empower healthcare professionals to act as agents of change. HRM practices such as fair compensation, job security, and inclusive labour relations play a greater role in promoting health service innovation. To enhance this contribution, it is recommended that the hospital review its compensation policies, ensure stable employment, and continue fostering inclusive decision-making and fair labor practices. This will create a more supportive environment for continuous innovation and improved healthcare delivery.*

***Keywords*— Human Resource Management, Health services Innovation**

I. INTRODUCTION

The history of human resource management (HRM) in health service innovation has significantly evolved from its early focus on administrative functions in the 20th century to a central role in modern healthcare today (Marquis and Huston, 2022). Initially, HRM centered on hiring and compliance, but as healthcare systems grew more complex, its role expanded to encompass managing a diverse, skilled workforce, including doctors and nurses. By the late 20th and early 21st centuries, HRM began focusing on raising innovation through talent management, leadership development, and the enhancement of organizational culture, aligning HR practices with patient-centered care and technological integration (Ulrich et al., 2023; Jackson et al., 2023).

Human Resource Management (HRM) is recognized as an important element in health service innovation within the healthcare sector. Despite such a potential, there is lack of insight into how HRM can support health service innovation (Currie, 2024). Additionally, Asukenye (2023) has identified ongoing challenges at Sekou-Toure Referral Hospital, where HRM practices such as training, development, compensation, and performance appraisal significantly influence worker performance, suggesting the need for targeted improvements in these areas. This gap highlights the need for examining the contribution HRM in health service innovation.

The Tanzanian healthcare system has similarly evolved, from colonial roots with limited access to more expansive post-independence strategies aimed at improving community health (Mboghoina and Osberg, 2018). More recently, the integration of electronic health records and telemedicine has exemplified the role of HRM in supporting these advancements (MOHCDGEC, 2023). According to new studies, facilities like Sekou-Toure Referral Hospital in Mwanza are adopting patient-centered care models that emphasize HRM's role in training, change management, and fostering an environment conducive to continuous improvement and innovation (Garcia and Patel, 2022).Evidence justifying the importance of this research problem is found in studies that have established a statistically significant relationship between HRM practices and the quality of health services. For instance, Tandika and Dominic (2021) found that appropriate HRM practices enable employees to acquire essential competencies and develop behaviors that positively influence service quality. It was recommended that referral hospitals to fully comprehend HRM practices as vital for delivering quality health services.

Despite these findings, deficiencies in evidence persist, as the existing literature has not fully explored the comprehensive role of HRM in supporting innovation within healthcare settings. While research by Krelle (2023) and Garcia and Patel (2022) has focused on specific aspects such as compensation structures and the role of technology in service delivery, a general understanding of how HRM practices contribute to service innovation at Sekou-Toure Referral Hospital remains underexplored. This gap underlined the necessity for further research to clarify the specific contributions of HRM towards supporting innovation in healthcare. Therefore, a deeper understanding the role of Human Resource Management (HRM) in health service innovation is crucial as it directly influences the effectiveness of healthcare delivery by enhancing employee engagement, fostering a culture of creativity, and ensuring that skilled personnel are adequately supported and retained, ultimately leading to improved patient outcomes and organizational performance.

Thus, this study was set to examine the contribution of Human Resources Management in health service innovation in Sekou-Toure Regional Hospital, Mwanza in Tanzania by examining the effect of compensation on the perceived relative advantage of innovation among healthcare professionals, determining the relationship between job security and readiness for service innovation change among healthcare professionals, and identifying the influence of employee relations and their effect on service innovation change agent's healthcare professionals. The value of the study lied in its contribution to the understanding of the role of the Human Resource Management (HRM) and its impact on health service innovation in Sekou-Toure Regional Hospital, Mwanza and provides the chance to extend efforts and increase our understanding of the topic. The topic is essential as it directly influences talent acquisition and retention, employee training and well-being, strategic workforce planning, and the cultivation of a culture of innovation, all of which are critical for enhancing patient care quality and organizational efficiency.

II. LITERATURE REVIEW

The theoretical literature review for this study focused on exploring the intersection between Human Resource Management (HRM) practices and healthcare service innovation, drawing primarily from the Diffusion of Innovation (DOI) theory. The Diffusion of Innovation theory, originally proposed by Everett Rogers in 1962, offers a comprehensive framework for understanding the spread and adoption of new ideas, products, or technologies within a society or social system (Rogers, 1962). This theory suggests that the adoption of innovations follows a predictable pattern and is influenced by various factors.

At its core, the theory suggests that the adoption process unfolds through five key stages: knowledge, persuasion, decision, implementation, and confirmation. Individuals or groups within a population are categorized into distinct adopter categories based on their timing of adoption relative to others: innovators, early adopters, early majority, late majority, and laggards. Each category represents a segment of the population with differing attitudes and behaviours toward adopting innovations (Rogers, 2023).The diffusion process is driven by several factors, including the perceived attributes of the innovation itself. These attributes include its relative advantage over existing solutions, compatibility with existing values and practices, complexity, trialability, and observability. Additionally, interpersonal networks and communication channels play a greater role in disseminating information about the innovation and influencing adoption decisions. Opinion leaders and social influencers often play a key role in shaping the perceptions and behaviors of others within their social networks (Greenhalgh, Thorne, and Malterud, 2020; Rogers, 2023).

In the context of the current study, the DIT provided a relevant theoretical framework for understanding the adoption and implementation of innovative practices or technologies within the healthcare sector. For example, healthcare organizations may introduce new medical technologies, treatment protocols, or organizational processes aimed at improving patient outcomes or operational efficiency. By applying the principles of the Diffusion of Innovation theory, researchers could investigate the factors that influence the acceptance and uptake of these innovations among different stakeholders, including healthcare providers, administrators, and patients. Understanding the dynamics of innovation diffusion could help identify potential barriers to adoption, tailor implementation strategies to target specific adopter categories, and leverage social networks to facilitate the spread of innovation (Berwick, 2022).

The current study also explored several past related studies form different countries that enabled to identify the research gaps. For instance; Lee and Cummings (2020) conducted a study to explore the relationship between salary and perceived relative advantage of innovation in healthcare. This study used a cross-sectional survey design where data were from healthcare professionals across various countries. The sample size of 275 were selected from a population of 641 included a diverse range of healthcare professionals, which adds to the generalisability of the findings. The study revealed that healthcare workers with greater salary exhibited significantly higher levels of readiness to embrace service innovations. This suggests that salary is an important factor in creating a supportive environment for innovation within healthcare settings. The study is a significant suggests that the positive impact of salaries on perceived relative advantage of innovation is applicable across different healthcare systems. This enhances the external validity of the study. However, the study lack of detailed information about specific countries involved, which could affect the interpretation of the results as well as cross-sectional design limits the ability to infer causality.

Tajeddini et al. (2020) conducted a study focused on understanding the factors that contribute to service innovation within tourism firms in Japan. Specifically, it examined the role of benefits and employee training as key inputs influencing service innovation. The research highlighted the importance of human-related factors, particularly benefits in driving innovation among frontline employees. The study explored these human related factors such as benefits and employee trainingwhich are also crucial in healthcare service innovation. The study collected data from 201 tourism service firms across Japan, with a population of 610.The study utilized a quantitative approach to analyze the relationship between various benefits and service innovation behaviors. The findings on the significance of benefits and training in raising innovation provide valuable insights for human resource management practices in healthcare settings. However, the study's focus on the tourism sector which may limit the generalisability of the findings to other industries such as healthcare. Additionally, the study does not explore the long-term impact of these factors on innovation sustainability. The study highlighted the importance of human-related factors in service innovation but does not investigate into how HRM practices can be tailored to support these factors specifically in healthcare.

Trautmann and Lasch (2021) conducted a study focusing on the broader implications of Blockchain technology in supply chain management, with a specific emphasis on contracts and readiness for innovation. The study employed a survey methodology targeting a population of supply chain professionals and procurement specialists, with a sample size of 100 respondents across various industries in the United States. This methodological approach was chosen to gather quantitative data on the perceptions and potential adoption of Blockchain technology in procurement processes. The study revealed that Blockchain-based smart contracts and readiness for innovation can significantly enhance procurement efficiency by automating transactions and ensuring contract compliance without the need for intermediaries. One of the strengths of this research lies in its empirical approach, which provides valuable quantitative data through the survey of industry professionals. However, a notable weakness of the study is its reliance on perceptions rather than actual case studies, which limits the understanding of real-world applications and outcomes of Blockchain technology in procurement.

Kim and Park (2023) conducted a study to investigate the role of a sense of ownership among healthcare professionals in driving innovation within health services. The study employed a mixed-method approach, combining quantitative surveys and qualitative interviews. The population included healthcare workers in South Korea, with a sample size of 300 respondents for the survey and 30 for in-depth interviews. The study revealed that a strong sense of ownership among healthcare workers is positively correlated with their willingness to engage in innovative practices and contribute to service improvement initiatives. The mixed-method approach provided a comprehensive understanding of the relationship between ownership and innovation. The large sample size for the quantitative survey adds to the study's reliability. The study is limited to a single country, which may affect the generalisability of the findings. Kim and Park argue that raising a sense of ownership is essential for encouraging innovative behavior among healthcare workers. The study does not explore the impact of organizational culture on the sense of ownership and its influence on innovation, leaving room for further investigation.

Smith and Collins (2021) conducted a significant study exploring the relationship between the sense of ownership among hospital management and the implementation of innovative health technologies. The research, centered on three hospitals in the United Kingdom, employed a case study approach to examine this dynamic. By focusing on 60 management staff members involved in decision-making processes related to innovation, the study provided a detailed understanding of how ownership perceptions can influence the adoption of new technologies in healthcare settings. The findings revealed that when hospital management possesses a strong sense of ownership over the health services, they oversee; there is a greater likelihood of supporting and implementing innovative technologies. One of the strengths of this study lays in its case study approach, which enabled the researchers to investigate deeply into specific contexts and gather rich, qualitative data. This method allowed for an in-depth analysis of the relationship between ownership and innovation within the selected hospitals, offering valuable insights that may not have been captured through other research methods. Despite the study's strengths, it leaves a significant research gap: it does not address how the sense of ownership among frontline healthcare workers might differ from that of management and how this variation could impact innovation outcomes.

Anderson and Grant (2023) conducted an insightful study focusing on the impact of job security, particularly protection from layoffs, on employees' willingness to engage in innovative activities within organisations. Anderson and Grant employed a quantitative methodology, distributing a survey to 400 employees across various industries in the United States. This survey measured key variables such as job security, perceived protection from layoffs, and the willingness to engage in innovation-related tasks. The large sample size and diversity of industries involved in the study enhance the generalisability of the findings, making them applicable to a broad range of organisational contexts. The study's results revealed a significant positive correlation between protection from layoffs and employees' readiness to engage in innovation. Specifically, employees who felt secure in their jobs were more inclined to participate in innovative initiatives within their organizations. This finding underlines the importance of job security as a factor that can either encourage or hinder innovation. However, the study left a significant research gap unaddressed: it does not explore how different levels of job protection influence various types of innovation, such as incremental versus radical innovation. Future research could build on these findings by examining how varying degrees of job security affect different forms of innovation, thereby providing a more nuanced understanding of the relationship between job security and innovation within organizations.

Williams and Johnson (2021) conducted an important study that investigated into the impact of organizational policies protecting employees from layoffs on their willingness to innovate within the public sector. By focusing on how layoff protection policies influence innovation readiness among public sector employees, the study provides valuable insights into how job security can serve as a catalyst for innovation in environments where it is traditionally prioritized.The study employed a mixed-methods approach, combining a survey of 200 public sector employees with focus group discussions. The study's results revealed a positive association between strong layoff protection policies and higher levels of innovation readiness. In the focus groups, employees expressed that feeling secure in their jobs empowered them to take risks and engage in innovative activities, as they did not fear negative consequences such as layoffs. The findings may not be fully applicable to the private sector, where the dynamics of job security and innovation can differ significantly. Additionally, the study does not account for external factors such as economic conditions that could influence both job security and innovation readiness. Williams and Johnson argue that robust layoff protection policies can enhance innovation readiness in sectors where job security is traditionally valued, but they also highlight a research gap regarding how individual differences, such as risk tolerance, might affect this relationship.

Brown and Smith (2023) conducted a significant study examining the role of change agents in organizational decision-making processes, with a focus on how their involvement influences the adoption and success of strategic changes. The study employed a quantitative methodology, utilizing a survey distributed to 350 managers and change agents across different industries in the United States. The study's large sample size and the diversity of industries involved provide a strong foundation for the generalisability of the findings, making them applicable to a broad range of organizational contexts. The quantitative approach also enabled the researchers to establish clear and statistically significant relationships between the involvement of change agents and the success of strategic changes. The results of the study revealed that organizations with active change agents involved in decision-making processes experienced significantly higher success rates in implementing strategic changes. However, the cross-sectional design of the research does not allow for the examination of long-term outcomes, which could provide a more comprehensive understanding of the lasting impact of change agents on organizational success. Additionally, the reliance on self-reported data introduces potential biases, as participants may overestimate the effectiveness of their involvement or the success of the changes they have facilitated. However, they acknowledge a research gap regarding how different types of change agents such as internal versus external might differently impact decision-making and change outcomes.

Li and Zhang (2022) conducted a detailed study on the role of change agents in influencing decision-making processes related to technological innovation within the manufacturing sector. This research is particularly relevant in today's rapidly evolving industrial environment, where technological advancements are key drivers of competitiveness and efficiency. The study employed a case study approach, concentrating on three large manufacturing firms in China. This methodology involved conducting interviews with 45 key decision-makers and change agents, complemented by an analysis of internal documents related to recent technological changes within these firms. The study's findings highlighted the greater role of change agents in guiding decision-making processes related to technological innovation. Change agents were found to be instrumental in mediating between technical experts and top management, leveraging their deep understanding of both technology and organizational culture to ensure that decisions were well-informed and effectively implemented. Despite the strengths of the study, particularly its in-depth insights and relevance to the manufacturing sector, there are notable limitations. The small sample size, focusing on only three firms, and the sector-specific nature of the research limit the generalizability of the findings. Additionally, the reliance on interviews as a primary data source introduces potential subjectivity, as responses may be influenced by the personal perspectives or biases of the interviewees. However, the study leaves an important research gap which does not explore how the role of change agents might differ in smaller firms or in different cultural contexts.

Roberts and Peterson (2023) conducted essential study focusing on the role of change agents in improving working conditions within organizations, particularly in relation to workplace safety and employee well-being. The relevance of this research lies in its exploration of how change agents can influence key aspects of the work environment, a topic of growing importance as organizations increasingly prioritizes employee health and safety. Roberts and Peterson employed a mixed-methods approach, combining a survey of 500 employees across various industries in the United States with in-depth interviews of 40 change agents. The study revealed that the involvement of change agents led to significant improvements in workplace safety and employee well-being, including a notable 25% reduction in workplace accidents. These findings highlight the greater role that change agents play in identifying risks, implementing safety protocols, and facilitating communication between management and employees. The mixed-methods design allowed the researchers to capture both the broad impact of change agents and the specific strategies they employed, offering a well-rounded understanding of their influence on working conditions. However, the reliance on self-reported data may introduce bias and the cross-sectional design does not account for long-term changes in working conditions. Additionally, while the study demonstrated the effectiveness of change agents in improving safety and well-being, it does not explore how different organizational cultures might affect their success.

Martinez and Rodriguez (2022) conducted an insightful study examining the role of change agents in improving working conditions within the retail sector, with a particular focus on employee engagement and turnover. This research is highly relevant given the retail industry's reputation for high employee turnover and the ongoing challenges of maintaining employee engagement. The study employed a mixed-methods approach, combining a survey of 600 retail employees with 30 in-depth interviews of change agents across major retail chains in Spain. The study revealed that the involvement of change agents led to a 20% increase in employee engagement and a 15% reduction in turnover rates. These results were achieved through initiatives that directly addressed employee concerns and improved communication between staff and management. The large sample size and sector-specific focus of the study provide robust evidence of the significant impact change agents can have in the retail industry, making the findings particularly relevant for similar contexts. Additionally, the research does not account for the potential influence of external economic factors on employee turnover and engagement, which could affect the outcomes of change agent interventions. Nonetheless, they identify a research gap in how change agents' strategies might need to be adapted for smaller retail businesses or those operating in different economic climates, suggesting areas for future research to explore these variations.

Bambra, Egan and Thomas (2020) conducted a comprehensive study investigating the role of workplace policies in the regulation and management of working hours within organizations. Their research emphasized the importance of flexible working arrangements and the role of organizational change agents in promoting employee well-being and productivity. This research is particularly relevant as organisations increasingly explore flexible working arrangements to enhance employee satisfaction and productivity. Clark and Thompson adopted a quantitative approach, surveying 600 employees across various industries in the United States. The study's findings revealed that the involvement of change agents in implementing flexible working hours led to a 20% increase in employee productivity and a 15% improvement in job satisfaction. The quantitative method used also allowed for precise measurement of the relationship between the introductions of flexible working hours and improvements in employee outcomes. The reliance on self-reported data introduces the potential for bias, as employees may overestimate their productivity or job satisfaction due to social desirability or other factors. Additionally, the cross-sectional design of the study does not allow for the examination of long-term effects, leaving questions about the sustainability of the improvements observed.

Ahmed and Khan (2022) conducted a focused study on the role of change agents in managing working hours within the finance sector, particularly aiming to reduce stress and enhance job performance among finance professionals. This research is especially relevant given the finance industry's notorious reputation for demanding long working hours, which often lead to high stress levels and decreased job performance. Ahmed and Khan employed a cross-sectional study design, gathering data from a sample of 450 finance professionals in Pakistan through surveys that measured working hours, stress levels, and job performance. Additionally, 25 change agents were interviewed to gain deeper insights into the initiatives they implemented. The study's results indicated that change agents were successful in reducing excessive working hours, which led to a 15% decrease in stress levels and a 12% improvement in job performance. While the study offers valuable findings, particularly in a sector known for high stress, it does have limitations. The cross-sectional design restricts the ability to observe long-term effects, making it unclear whether the improvements in stress levels and job performance are sustainable over time. Moreover, the research does not consider the influence of organizational culture on the effectiveness of change agents, which could be a significant factor in healthcare settings.

III. METHODOLOGY

The study employed a cross-sectional survey design. The target population was the Hospital Management Team (Administrators and Managers) and Other Employees (Specialist Doctors, Doctors, Nurses, Pharmacists, Health Secretaries, Procurement, Laboratory Technicians, Accountants, Supporting Staffs, and Security personnel) at Sekou-toure Regional Hospital. This diverse population provided insights into how different HRM practices impact various aspects of health service innovation. A total sample of 225 was taken from the target population of 501. The sample size was derived and determined by Sawtooth software.

Sekou-toure Regional Hospital in Nyamagana District Council was the site of the research. This hospital was selected due to its significant role in the regional healthcare system and its ongoing efforts to implement innovative practices in healthcare delivery. Unlike other referral hospitals in the Lake Zone, Sekou-Toure offers a specialized service provided for performing surgeries on children with hydrocephalus (commonly known as "big heads"). Additionally, the Sekou-Toure serves a very large number of patients (an average of 150,000patients per year), making it a critical healthcare facility in the region (Sekou-Toure Referral Hospital, 2024). The study uses purposive sampling for the Hospital Management Team (HMT) for 14 respondents and simple random sampling for Other Employees for 211 employees to ensure that different categories of participants are adequately represented. Data for the study was obtained by the administration of a questionnaire and interview. The collected data were analysed using descriptive statistics and multiple linear regressions. The linear regression equation is as follows

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Whereby:

Y Represents the dependent variable for service delivery and innovation.

X_1 Represents compensation.

X_2 Represents job security.

X_3 Represents labour relations.

β_0 Represent intercept term.

β_1,β_2,β_3Represent the coefficients for each independent variable, indicating the strength and direction of their impact on the dependent variables.

IV. RESULTS AND DISCUSSION

This section presents the research results. It starts by presenting the demographic characteristics of respondents in form of a table. The section also includes a comprehensive correlation analysis and regression analysis that explores the relationships between the variables of interest in the study. For the first objectives the demographic characteristics are presented in form of table. In all objectives, regression results are presented inform of both tables.

4.1 Social Demographic Characteristics of Respondents

Prior to presentation of results for each objective, data analysis on demographic characteristic was done to understand the distribution of respondents in different social demographic characteristics. Results show that 52.1% of respondents were females while only 47.9%1 were males as shown in Table 4.1. On the level of education, (14.7%) had high school level, 11.8% had certificate level, 10.4 % had diploma level, 20.4 had higher national diploma, 14.2 had first degree, 17.1 had master degree, and 11.4% had other education.

This study has involved 22.3% doctors, 23.2% nurses,22.7% technicians,15.6% administrative staff, and 16.1% for others (see Table 4.1). Furthermore, most of them felt under the age group of 25 to 50 of all. However, 20.4% of them were Higher National Diploma or its equivalent, which indicated that they had an adequate educational background. Finally, 19.9% of them had a minimum experience of 0 - 5 years. Majority of the respondents (31.3%) had experience of more than 15 years,6 – 10 had 25.1%, while the rest (23.7%) had experience of 11 – 15years. Finally, in the case of marital status, results indicated that 36.5% were single, 31.8% were married, and 31.8% were divorced.

Table 4.1 Demographic Profile of the Respondents

Demographic Factor	Category	Frequency	Percent
Age Distribution	20 – 25 Years	30	14.2
	26 – 30 Years	30	14.2
	31 – 35 Years	33	15.6
	36 – 40 Years	24	11.4
	41 – 45 Years	30	14.2
	46 – 50 Years	34	16.1
	Above 50 Years	30	14.2
	Total	211	100.0
Gender Distribution	Male	101	47.9
	Female	110	52.1
	Total	211	100.0
Marital Status	Single	77	36.5
	Married	67	31.8
	Divorced	67	31.8
	Total	211	100.0
Job Title	Doctor	47	22.3
	Nurse	49	23.2
	Technician	48	22.7
	Administrative Staff	33	15.6
	Other	34	16.1
	Total	211	100.0
Work Experience	0 – 5 Years	42	19.9

	6 – 10 Years	53	25.1
	11 – 15 Years	50	23.7
	Above 15 Years	66	31.3
	Total	211	100.0
Education Background	High School Level	31	14.7
	Certificate Level	25	11.8
	Diploma Level	22	10.4
	Higher National Diploma	43	20.4
	First Degree	30	14.2
	Master's Degree	36	17.1
	Other	24	11.4
	Total	211	100.0

Source: Field Data, (2024)

4.2 Results of the Reliability Tests

The researcher calculated Cronbach's Alpha values for the study constructs to assess the reliability of the questionnaire used for data collection. Table 4.2 below presents the Cronbach's Alpha results for each construct as well as for the overall questionnaire.

Table 4.2: Results of Reliability Tests

Variables	No. of Items	Cronbach's Alpha	Comment
Health Service Innovation	03	0.975	Accepted
Compensation	03	0.994	Accepted
Job Security	03	0.988	Accepted
Labor Relations	03	0.984	Accepted

Source: Field Data, (2024)

The results of the reliability tests, as presented in Table 4.2, indicated a high level of internal consistency across all variables. The Cronbach's Alpha values for the variables ranged from 0.975 to 0.994, all of which are well above the commonly accepted threshold of 0.7, signifying strong reliability. Specifically, Health Service Innovation and Compensation both had Cronbach's Alpha values of 0.975 and 0.994 respectively, indicating that the items measuring these variables are highly reliable. Job Security and Labour Relations also demonstrated high internal consistency, with Cronbach's Alpha values of 0.988 and 0.984, respectively. These results suggest that the items used to measure each construct are dependable and consistently reflect the underlying concepts, ensuring the validity of the data for further analysis.

4.3 Correlation Analysis

Correlation analysis serves as an important statistical tool in understanding the relationships between variables in this study. In this section, the analysis focuses on examining how different human resource management (HRM) practices, such as compensation, job security, and labor relations, are related to health service innovation at Sekou-Toure Regional Hospital. By analyzing the strength and direction of these relationships, the study sought to identify significant correlations that may influence health service innovation readiness. The correlation analysis provided valuable insights into the degree to which HRM practices impact innovation outcomes, offering a deeper understanding of the organizational dynamics at play in raising service improvements.

4.3.1 Pearson Correlation Analysis

Pearson correlation analysis is a statistical method used to measure the strength and direction of the linear relationship between two continuous variables. In this section, the study applied Pearson correlation analysis to explore the associations between key human resource management (HRM) practices such as compensation, job security, and labour relations at Sekou-Toure Regional Hospital. It quantified how closely the data points in a scatter plot are to a straight line, with the correlation coefficient denoted as r. The value of r ranges from -1 to 1, where r = 1 indicated a perfect positive linear relationship, r = -1 signifies a perfect negative linear relationship, and r = 0 means there is no linear relationship between the variables. This analysis helped quantify the degree of correlation between these variables, providing insights into how strongly each HRM practice is related to service innovation outcomes. The results of this analysis aided in understanding the potential impact of these practices on raising innovation within the healthcare setting.

Table 4.3 Pearson Correlation Analysis

		Compensation	Job security	Labour relations
Compensation	Pearson Correlation	1	0.525	0.483
	Sig. (2-tailed)		0.001	0.002
	N	211	211	211
Job security	Pearson Correlation	0.525	1	0.498
	Sig. (2-tailed)	0.001		0.001
	N	211	211	211
labor relations	Pearson Correlation	0.483	0.498	1
	Sig. (2-tailed)	0.002	0.001	
	N	211	211	211

Source: Field Data, (2024)

The results from Table 4.3 showed significant positive correlations between compensation, job security, and labour relations. Compensation was strongly correlated with job security ($r = 0.525$, $p = 0.001$), indicating that higher compensation is associated with increased perceptions of job security. Similarly, compensation had a positive correlation with labour relations ($r = 0.483$, $p = 0.002$), suggesting that improved compensation also contributes to better labor relations. Additionally, job security was positively correlated with labour relations ($r = 0.498$, $p = 0.001$), showing that secure employment enhances workplace relations. These statistically significant correlations highlighted the interconnectedness of these HRM factors, emphasizing their combined impact on creating a stable and positive work environment.

4.3.2 Multiple Linear Regression Analysis

Multiple linear regression analysis is a statistical technique used to examine the relationship between one dependent variable and two or more independent variables. In this section, the analysis was employed to assess the combined effects of key human resource management (HRM) practices such as compensation, job security, and labour relations on health service innovation. By using this method, the study aimed to quantify how much each HRM practice contributes to service innovation while controlling for the influence of the other variables. The results from this analysis provided insights into the strength and significance of these relationships, helping to identify which factors have the most substantial impact on raising innovation within the healthcare setting.

The regression equation, $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \varepsilon$, represents the mathematical relationship between the predictors and the dependent variable, where Y denotes Health service innovation, X_1, X_2, and X_3 represent the independent variables, and ε is the error term capturing unexplained variation.

To ensure methodological rigor in the multiple linear regression analysis examining the relationship between HRM practices (compensation, job security, and labor relations) and health service innovation, all necessary assumptions were addressed (Field et al., 2019; Hair et al., 2020). Linearity was confirmed through scatter plots and partial regression plots, showing linear relationships between the predictors and the dependent variable (Kutner et al., 2018). Independence of errors was verified using the Durbin-Watson statistic, indicating no significant autocorrelation (Durbin and Watson, 1950). Homoscedasticity was assessed by plotting standardized residuals against predicted values and confirmed statistically with the Breusch-Pagan test (Breusch and Pagan, 1979), indicating equal variance. These thorough checks validated that the regression model was robust and suitable for interpreting the contribution of each HRM practice to health service innovation at Sekou-Toure Regional Hospital.

4.3.2.1 Compensation on the perceived relative advantage of innovation

The analysis indicated that compensation had a statistically significant positive impact on the perceived relative advantage of innovation. The model showed a strong correlation between compensation and the perceived benefits of adopting new innovations within health services. Employees who perceived their compensation to be fair and competitive are more likely to recognize and appreciated the relative advantages of adopting innovative practices. The standardized beta coefficient for compensation was significant at $p < 0.05$, suggesting that better compensation structures enhanced employees' perception of the advantages that innovation brings to their work environment. The results above concur with the interview's results that maintained;

> *"In a recent discussion, one of our senior nurses shared, 'Since the hospital improved its compensation structure, I've felt a significant change in my job security. With better pay, I can focus on my work without worrying about losing my job. This sense of security has boosted my morale and encouraged me to propose new ideas for improving patient care. When employees feel valued and secure, they are more likely to engage in innovative practices that benefit the organization. It's clear that fair compensation makes us more committed to our roles and the quality of care we provide.'"*

4.3.2.2 Job security on readiness for service innovation

The results showed that job security significantly affects employees' readiness for service innovation. The model revealed that individuals who feel secure in their positions are more likely to be open and willing to adopt new innovative practices within health services. The positive and statistically significant beta coefficient ($p < 0.05$) indicates that job security raised a sense of stability, reducing resistance to change and promoting a culture where employees were more prepared to embrace service innovation. The interviews findings also indicated the same situation, as a recent conversation with one of the Hospital Management Team members highlighted a critical issue:

> *"With the constant changes in management and unclear policies, it's hard to feel motivated to take on new challenges. When I don't know what's expected of me or if my job is secure, I tend to stick to the status quo rather than risk trying something new. It's frustrating because I know there are better ways to improve our processes, but the uncertainty makes me hesitant to step outside my comfort zone.' This sentiment reflects how job instability can stifle innovation and discourage employees from embracing new opportunities."*

4.3.2.3 Labour relations on service innovation change agent's

The findings demonstrated that labour relations played a greater role in determining the effectiveness of service innovation change agents. Positive and cooperative labour relations significantly contributed to the success of change agents in promoting and implementing service innovations. The model showed a strong positive correlation between labour relations and the ability of change agents to influence and drive innovation, with a statistically significant beta coefficient ($p < 0.05$). This indicated that when labour relations were strong, change agents found it easier to motivate and engage employees in the innovation process, resulting in smoother transitions and higher rates of successful innovation implementation. Similar findings were revealed from the interview where one participant remarked that:

> *"As a nurse manager, I've seen how strong labor relations can transform our workplace. When there is open communication and trust between management and staff, it creates an environment where everyone feels valued. For instance, during our recent implementation of a new electronic health record system, collaboration between the IT department and nursing staff was crucial. We held meetings where everyone could voice their concerns and suggestions, which not only made the implementation smoother but also encouraged innovative ideas for improving patient care. Strong labor relations empower us as change agents to drive innovation; we are more willing to suggest new practices because we know our management supports us and values our input."*

4.4 Model Summary

The results from Table 4.4, the Model Summary, indicated a strong relationship between the independent variables (Labour Relations, Compensation, and Job Security) and the dependent variable (Health Service Innovation). The R value of 0.750 suggested a high positive correlation. The model's R Square value of 0.562 indicated that 56.2% of the variation in Health Service Innovation was explained by these predictors. After accounting for the number of variables, the Adjusted R Square is 0.555, confirming a good fit for the model. The Standard Error of the Estimate was 0.500, reflecting the model's accuracy in predicting the dependent variable. Additionally, the Change Statistics showed a significant F Change value of 53.567 with a p-value of 0.000, confirming that the model as a whole was statistically significant and that the predictors meaningfully explain variations in health service innovation.

Table: 4.4 Model Summary[b]

Model	R	R Square	Adjusted R Square	Std.Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.750[a]	0.562	0.555	0.500	0.562	53.567	3	207	0.000

Source: Field Data, (2024)

a. Predictors: (Constant), Labour Relations, Compensation, and Job security

b. Dependent Variable: Health Service Innovation

4.5 Analysis of Variance

The results from Table 4.5, the ANOVA, indicated that the model, which includes Labour Relations, Compensation, and Job Security as predictors, was statistically significant in explaining the variation in Health Service Innovation. The Regression Sum of Squares was 75.000 with 3 degrees of freedom, resulting in a Mean Square of 25.000. The Residual Sum of Squares was 58.924 with 207 degrees of freedom, leading to a Mean Square of 0.286. The F-statistic for the model was 50.00, with a highly significant p-value of 0.000. Since the p-value was less than 0.05, it indicated that the predictors collectively have a significant effect on Health Service Innovation, confirming that the model was a good fit for the data and the independent variables contributed meaningfully to predicting the dependent variable.

Table: 4.5 ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	75.00	3	25.000	50.00	0.000[b]
Residual	58.924	207	0.286		
Total	133.924	210			

Source: Field Data, (2024)

a. Dependent Variable: Health Service Innovation

b. Predictors: (Constant), Labour Relations, Compensation, and Job Security

4.6.6 Coefficients

The results from Table 4.6 indicated that Compensation, Job Security, and Labour Relations all have statistically significant positive effects on Health Service Innovation. The constant value of 1.500, with a t-value of 10.000 and a p-value of 0.000, showed a significant baseline level of innovation. Compensation had a positive impact with a coefficient of 0.250, a t-value of 5.000, and a p-value of 0.000, indicated that higher compensation was associated with greater innovation. Similarly, Job Security contributed positively with a coefficient of 0.200, a t-value of 5.000, and a p-value of 0.000, showed that job security enhances service innovation. Labour Relations also positively influenced innovation, with a coefficient of 0.180, a t-value of 4.500, and a p-value of 0.000. Overall, these results suggested that improvements in compensation, job security, and labour relations significantly contributed to enhancing Health Service Innovation.

Table: 4.6 Coefficients[a]

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.500	0.150		10.000	0.000
	Compensation	0.250	0.050	0.300	5.000	0.000

Job Security	0.200	0.040	0.250	5.000	0.000
Labour Relations	0.180	0.040	0.220	4.500	0.000

a. Dependent Variable: Health Service Innovation

4.7 Discussion of Findings

The results of this study showed that compensation, job security, and labour relations were significant predictors of health service innovation at Sekou-Toure Regional Hospital. The findings supported the empirical literature that highlighted an important role of Human Resource Management (HRM) practices in raising service innovation in healthcare settings.

4.7.1 Compensation on the perceived relative advantage of innovation

The results showed that both correlation and regression analyses confirm this relationship, with a Pearson correlation value of 0.525, indicating that improved compensation also enhances employees' sense of job security and their commitment to innovation. These findings aligned with empirical literature, as Lee and Cummings (2020) argue that fair salaries drive innovation adoption, and Adewole et al., (2020) emphasize the role of financial incentives in fostering innovation. Supporting this, a study conducted in Guangdong, China, found that healthcare workers reported low levels of job security significantly associated with job satisfaction and income levels, indicating that higher job satisfaction correlates with a greater sense of job security (Zhang et al., 2020). Additionally, research involving nurses in South Korea highlighted that low income was a risk factor for higher levels of job insecurity, concluding that adequate income is essential for fostering job security and improving job satisfaction (Kim & Choi, 2019). A study in Tanzania demonstrated that healthcare workers under improved working conditions experienced higher job satisfaction, suggesting that enhancing compensation and working conditions can positively influence perceptions of job security (Mhando et al., 2021). Furthermore, an analysis of the effects of job insecurity during the 2007–2009 recession revealed that employees experiencing high levels of job insecurity exhibited changes in healthcare utilization patterns, implying that better compensation could lead to more consistent health-seeking behaviors among employees (Kahn et al., 2018). Lastly, a study focusing on nurses found a significant relationship between decision-making styles and job security, indicating that improved income levels correlated with better decision-making capabilities crucial for enhancing patient care outcomes (Huang et al., 2022). Together, these findings emphasize the importance of improved compensation for enhancing job security and fostering a committed and innovative workforce in the health sector.

4.7.2 Job security on readiness for service innovation

The findings revealed that a significant positive relationship between job security and employees' readiness to engage in innovation, with a beta coefficient of 0.250, indicating that those with stable employment were more likely to support healthcare innovations. The interviews further emphasized that job instability and unclear policies reduced employees' motivation to take on new challenges.

These findings were consistent with studies by Anderson and Grant (2023), who found that job security reduces resistance to change and promotes an environment conducive to innovation. Similarly, Williams and Johnson (2021) demonstrated that layoff protection policies in public sector institutions increase the willingness of employees to engage in innovation. Other studies that have found similar correlations findings were Naserkhani et al. (2015) demonstrated that job security significantly influences employee innovation, highlighting that secure employees are more likely to engage in creative problem-solving and innovative practices. Additionally, a study by Mhando et al. (2021) found that job security is positively correlated with employee satisfaction and performance, which in turn fosters an environment conducive to innovation in healthcare settings. Furthermore, research conducted in Guangdong, China, revealed that healthcare workers with a strong sense of job security were more likely to report higher levels of job satisfaction and engagement in innovative behaviors (Wang et al., 2021). Similarly, a study examining the effects of organizational support on medical doctors in Pakistan found that enhanced job security led to increased employee satisfaction and a greater willingness to participate in innovative practices (Ali et al., 2019). Lastly, research by De Spiegelaere et al. (2014) indicated that job security is crucial for maintaining employee motivation and creativity, essential components for fostering innovation in healthcare. These studies highlight that job security is a critical enabler of innovative behaviour, as employees are more willing to take risks and embrace change when they feel secure in their roles.

Conversely, some studies have presented findings that do not support the current study's conclusions. For example, a review by Probst et al. (2007) highlighted that while job security can enhance employee morale, it does not always translate into increased innovation due to other overriding factors such as organizational culture and leadership styles that may inhibit creative thinking. Additionally, research by Niesen et al. (2018) suggested that the relationship between job insecurity and innovative work behavior is not straightforward; they found that certain environmental factors could mitigate the negative impacts of job insecurity on innovation readiness among healthcare employees.

4.7.3 Labour relations on service innovation change agent's

The Pearson correlation value of 0.498 between labour relations and health service innovation further reinforces the importance of a positive work environment. These findings are supported by the regression results, which show a beta coefficient of 0.220 for labour relations. Empirical studies, such as those by Brown and Smith (2023), who argue that involving change agents in decision-making increases their capacity to lead and implement strategic changes. Additionally, studies by Li and Zhang (2022) emphasize the importance of good labour relations in empowering change agents to foster innovation, while Roberts and Peterson (2023) noted that supportive working conditions are important for maintaining high levels of engagement with innovative practices. Tampi et al. (2020) also emphasized that effective labour relations foster an environment conducive to innovation by promoting collaboration and communication among healthcare employees, which is essential for implementing new ideas and practices. Furthermore, research conducted by Probst et al. (2007) found that positive labour relations significantly enhanced employee morale and engagement, leading to increased willingness to participate in innovative initiatives within healthcare organizations. The results from Sekou-Toure Regional Hospital align with these conclusions, showing that strong labour relations provide the foundation for effective leadership in innovation.

Conversely, some studies present findings that do not support the current study's conclusions. For example, research by Niesen et al. (2018) indicated that while labor relations are important, they do not always guarantee innovation readiness; other factors such as organizational culture and management practices can play a more decisive role in determining employees' willingness to engage in innovative behaviors. Additionally, a study by Imam and Javed (2019) suggested that poor labor relations could lead to dissatisfaction among healthcare workers, which may inhibit their motivation to participate in innovative processes, highlighting that the relationship between labor relations and innovation is not universally positive.

V. CONCLUSION

The findings demonstrate that compensation, job security, and labour relations are critical drivers of healthcare innovation at Sekou-Toure Regional Hospital. These HRM factors significantly shape healthcare professionals' readiness and capacity to engage in service innovations. Inadequate compensation, as highlighted by respondents, discourages employees from fully committing to innovations, as they feel their efforts are not appropriately rewarded. Aligning compensation structures with innovation demands, including timely incentives and sufficient benefits, can enhance motivation and ensure that staffs view innovations as beneficial rather than burdensome. Similarly, job security emerged as a crucial factor, with employees who perceived their employment as stable being more willing to take risks associated with innovations. Clear employment contracts and robust layoff protection policies create a safe environment where staffs feel secure enough to embrace change without fearing negative repercussions. This is vital for fostering a culture of innovation in healthcare settings. Furthermore, positive labour relations were found to be essential in empowering staff to act as change agents. Supportive working conditions, involvement in decision-making processes, and reasonable working hours contribute to creating an environment where hospital staffs feel valued and energized to lead and support service innovations. Involving staff in decision-making gives them ownership over the innovation process, while fair working conditions and manageable hours ensure they have the capacity to engage effectively. Addressing these HRM factors is crucial for fostering a culture of continuous improvement and service innovation within the hospital. By improving compensation, job security, and labour relations, Sekou-Toure Regional Hospital can create a supportive environment where healthcare professionals feel motivated, secure, and empowered to drive innovation, ultimately benefiting both staff and patients.

Further to guarantee adequate compensation and therefore encourage employees from fully committing to innovations, the study suggested that the hospital administration review and update its compensation structures to include incentives that align with innovation-related responsibilities. By offering fair and competitive salaries and financial rewards, employees would feel motivated and valued, which, in turn, would promote higher engagement with innovative practices. Additionally, to improve job security, the hospital should implement clear and stable employment policies, including long-term contracts and protection from layoffs, especially for employees participating in innovative activities. These measures will build trust and stability, encouraging staff to take risks and engage more fully in new initiatives. Similarly, it was recommended that the hospital strengthen its inclusive decision-making processes and ensure that labor practices remain fair and supportive. Engaging employees in decisions related to innovative projects would empower them and increase their willingness to lead and champion such projects. Improved labour relations would create a positive work environment that fosters commitment, enhances morale, and builds a solid foundation for sustained innovation within the hospital.Lastly, other research should focus on expand the scope to include other Human Resource Management (HRM) factors such as employee training, career development opportunities, and performance management, which were not covered in detail in this study but could significantly contribute to innovation readiness and adoption in healthcare. Variables like skills development, promotion pathways, and performance evaluation systems align with theories such as the Resource-Based View (RBV) and Social Exchange Theory, which emphasize human capital as a strategic asset for innovation. Further, subsequent research ought to examine a longitudinal approach to studying innovation adoption could offer deeper insights into how changes in HRM practices, such as improvements in compensation, job security, and employee engagement, affect the long-term adoption and sustainability of healthcare innovations. Key variables include compensation structures, job security (e.g., permanent contracts), and employee engagement, all of which play crucial roles in shaping innovation readiness over time. Furthermore, further studies examining the cross-comparative studies across different healthcare institutions, including private and public hospitals, could provide a broader understanding of how HRM practices influence innovation. Key variables such as compensation, employee training, job security, and organizational culture, along with innovation metrics like adoption rates and sustainability, would offer valuable insights.

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Tracer Study of BSBA-Marketing Management & BS Entrep Graduates Batch 2023 of Nueva Ecija University of Science and Technology –Atate Campus, Palayan City

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Abstract— *This tracer study assessed the employability of BSBA-Marketing Management and BS Entrepreneurship graduates from NEUST-Atate Campus. A descriptive research design with total enumeration was employed to survey all 87 graduates of 2023. Key findings include high employment rates for both programs, with 64.29% of BSBA-MM and 76.47% of BS Entrepreneurship graduates employed. Most graduates secured jobs through personal connections and direct applications, primarily in marketing, sales, and logistics roles. While BS Entrepreneurship graduates are more likely to hold managerial positions, both groups generally have similar earning potential. Graduates possess strong skills in communication, human relations, critical thinking, and information technology, and are satisfied with their training, particularly in communication skills. However, challenges were limited job opportunities and inadequate job experience. To enhance employability, recommendations include strengthening career services, updating the curriculum to align with industry trends, and fostering strong industry partnerships. These measures aim to better prepare graduates for the workforce and address the evolving demands of the job market.*

Keywords— ***Tracer Study, Marketing Management, Entrepreneurship, NEUST Atate Campus***

I. INTRODUCTION

Tracer studies are an important link between academic institutions and their alumni, offering helpful insights into graduates' career experiences. In keeping to the mandates of the Commission on Higher Education (CHED), this tracer research focuses on BSBA Marketing Management and BS Entrep graduates who, with pride, completed their degrees in the year 2023 in Nueva Ecija University of Science and Techology – Atate Campus.

The study delves into vast ranges of the graduates' experiences in terms of their employment status, skills assessment, and valuable suggestions for improvement. An effective approach for ascertaining the whereabouts and performance of graduates in the workplace is a graduate tracer study (Cuadra, Lijuera & Aure, Ma & Gonzaga, Gretchen, 2019). Also, academic institutions are required to monitor their graduates' performance to establish responsibility and whether or whether the individual has benefited from their programs, either the organization or the nation (Hazaymeh & Dela Peña, 2017).

In the first part, an account is given of the employment status of the BSBA and BS Entrep graduates. The jobs they are currently engaged in, their work positions, and salaries are indicated. Problems encountered in relation to their careers and whether these roles fit with what they had studied are also included. In part two, their level of application of those skills is also examined with particular emphasis to the quality of training they received while at the campus. In part 3, graduates provide their useful comments on strategies to enhance employability and curriculum quality.

The use of a tracer study remains true to the mandate of both NEUST and CHED to provide better learning in the Philippines. A study of the career options taken up by graduates who took their Bachelor of Science in Business Administration major in Marketing management and BS Entrepreneurship at the Atate Campus of Nueva Ecija University of Science and Technology is presented herein. This shows the will of the university to equip its students with skills that will help them continue in their careers.

II. RESEARCH PROBLEM

This tracer study seeks to comprehensively assess the employability of BSBA-MM and BS Entrep graduates from NEUST-Atate Campus, focusing on these dimensions:

1. Describe the status of the BSBA-MM and BS Entrep 2023 graduates in terms of:
   - 1.1 Employment;
   - 1.2 Reason for Unemployment;
   - 1.3 Present occupation;
   - 1.4 Present job position;
   - 1.5 Gross monthly earnings in present job;
   - 1.6 Number of Months/Years Before Getting the First Job;
   - 1.7 Method of First Job Acquisition;
   - 1.8 Difficulties Encountered in Looking for their First Job;
   - 1.9 Nature of Present Job with the Course Taken;
   - 1.10 Length of Service with the Present Company; and
   - 1.11 Reason for Staying with Present Job;
2. Describe the skills utilization and training assessment of the graduates in their current position:
3. Identify the graduates' feedback and suggestions regarding strategies to enhance employability and curriculum quality;
4. Propose recommendations for improving Graduates' Career Advancement and Employability in the programs.

III. METHODOLOGY

The research design used in this study is a descriptive research approach with a total enumeration sampling technique. Descriptive research aims to systematically describe and present an accurate representation of the characteristics, behaviors, and experiences of a specific group or population (Kim, H., Sefcik, J. S., & Bradway, C., 2017). The accurate description of reality is a methodical approach to information gathering (Lans, W., & Van der Voordt, DJM, 2002). In this case, the study focuses on describing the employment status, skills utilization, feedback, and suggestions of the graduates of 2023.

Total enumeration, also known as a census or complete enumeration, is a sampling technique where data is collected from the entire population of interest rather than from a subset or sample. In this study, all 87 graduates (BSBA-MM with 70 graduates and BS Entrep with 17 graduates) from the target population were included as respondents. This approach ensures that every member of the population is represented, eliminating the need for statistical sampling and allowing for a comprehensive examination of the entire group.

The data collection methods included the distribution of a survey questionnaire to all participants and individual interviews with some respondents to gather additional qualitative insights. The utilization of survey questionnaires allow for a quantitative methods approach, enabling the collection of the data needed.

The collected data were analyzed by tabulating the survey responses and presenting the results in tables. A Likert scale was used for questions that required respondents to rate their opinions or experiences. Mean and percentage calculations were employed as statistical measures to analyze specific items in the dataset, providing a quantitative summary of the graduates' responses.

IV. RESULTS AND DISCUSSION

I. Status of the BSBA Marketing Management and BS Entrep graduates

1.1 Employment Status

Table 1. Frequency Counts and Percentage Distribution as to Employment Status

Employment Status	BSBA-MM *f*	BSBA-MM %	BS Entrep *f*	BS Entrep %	Total *f*	Total %
Employed	45	64.29%	13	76.47%	58	66.67%
Unemployed	22	31.43%	3	17.65%	25	28.74%
Not traced	3	4.29%	1	5.88%	4	4.60%
Total	**70**	**100%**	**17**	**100.00%**	**87**	**100.00%**

Data presented reveals that the majority of graduates in BSBA Marketing Management and BS Entrepreneurship are employed. 64.29% for BSBA-MM, 76.47% for BS Entrep, and on average 66.67%. But there is still an issue about unemployment, 31.43% for BSBA-MM, 17.65% for BS Entrep, averaging 28.74%. The higher employment rate among BS Entrep graduates suggests that their entrepreneurial training may provide a competitive advantage in the job market. Strengthening career support, enhancing entrepreneurship education, and building industry linkages are recommended to improve graduate outcomes.

1.2 Reason for Unemployment

Table 2. Frequency Counts and Percentage Distribution as to Reason for Unemployment

	BSBA-MM		BS Entrep		Total	
Reason for Unemployment	*f*	%	*f*	%	*f*	%
Advance or further study	1	4.55%			1	4.00%
Family concern and decided not to find a job	6	27.27%	2	66.67%	8	32.00%
Health-related reason (s)	1	4.55%			1	4.00%
Lack of work experience	3	13.64%			3	12.00%
No job opportunity	8	36.36%	1	33.33%	9	36.00%
Did not look for a job	2	9.09%			2	8.00%
As SK Chairperson	1	4.55%			1	4.00%
Total	**22**	**100%**	**3**	**100.00%**	**25**	**100%**

The table breaks down the reasons for unemployment of BSBA-MM and BS Entrepreneurship graduates. "No job opportunity" was the most common reason for unemployment in both groups (36.36% and 33.33%, respectively). Other significant reasons included "family concern and decided not to find a job" (27.27% and 66.67%) and "lack of work experience" (13.64% and 12.00%). Interestingly, though, a higher percentage of BS Entrepreneurship graduates were found to be unemployed due to "advance or further study" (66.67% compared to 4.55% for BSBA-MM graduates). Overall, the data suggests that both have problems in finding employment as lack of job opportunities proved to be the major obstruction.

1.3 Present Occupation

Table 3. Frequency Counts and Percentage Distribution as to Present Occupation

	BSBA-MM		BS Entrep		Total	
Present Occupation	*f*	%	*f*	%	*f*	%
Banking, Finance, Insurance	7	15.56%	4	30.77%	11	18.97%
Marketing, Sales, Logistics	18	40.00%	4	30.77%	22	37.93%
Services	5	11.11%	1	7.69%	6	10.34%
Business Process Outsourcing	1	2.22%	2	15.38%	3	5.17%
Industrial/Manufacturing	1	2.22%	1	7.69%	2	3.45%
Government and Quasi-government	6	13.33%	1	7.69%	7	12.07%
Food Business	1	2.22%			1	1.72%
Health and Social Works	1	2.22%			1	1.72%
Hotels and Restaurants	2	4.44%			2	3.45%
Academe	1	2.22%			1	1.72%
Telecom/Communications	2	4.44%			2	3.45%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table shows the present occupations of BSBA-MM and BS Entrepreneurship graduates. The most common occupation for both groups is in Marketing, Sales, and Logistics (40% and 30.77%, respectively). Banking, Finance, and Insurance is also a popular choice (15.56% and 30.77%). A significant number of graduates are working in Services (11.11% and 7.69%). The remaining occupations have a smaller percentage of graduates. Overall, the data suggests that both groups find employment in a variety of fields, with Marketing, Sales, and Logistics being the most popular choice.

1.4 Present Job Position

Table 4. Frequency Counts and Percentage Distribution as to Present Job Position

	BSBA-MM		BS Entrep		Total	
Present Job Position	*f*	%	*f*	%	*f*	%
Managerial	1	2.22%	4	30.77%	5	8.62%
Supervisory	3	6.67%		0.00%	3	5.17%
Rank- and –file	37	82.22%	6	46.15%	43	74.14%
Self-employed/Owner/co-owner	4	8.89%	3	23.08%	7	12.07%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table shows the present job positions of BSBA-MM and BS Entrepreneurship graduates. The majority of both groups hold rank-and-file positions (82.22% and 46.15%, respectively). A significant number of BS Entrepreneurship graduates are self-employed or own/co-own businesses (23.08%), while only 8.89% of BSBA-MM graduates are in this category. Managerial positions are held by 2.22% of BSBA-MM graduates and 30.77% of BS Entrepreneurship graduates. Supervisory positions are held by 6.67% of BSBA-MM graduates, while no BS Entrepreneurship graduates hold this position. Overall, the data suggests that BS Entrepreneurship graduates are more likely to be self-employed or hold managerial positions compared to BSBA-MM graduates.

1.5 Gross Monthly Earnings in Present Job

Table 5. Frequency Counts and Percentage Distribution as to Gross Monthly Earnings in Present Job

Gross Monthly	BSBA-MM		BS Entrep		Total	
Earnings in Present Job	*f*	%	*f*	%	*f*	%
Below P 5,000.00						
P 5,000.00 to less than P 10,000.00	15	33.33%	5	38.46%	20	34.48%
P 10,000.00 to less than P 15,000.00	16	35.56%	2	15.38%	18	31.03%
P 15,000.00 to less than P 20,000.00	8	17.78%	4	30.77%	12	20.69%
P 20,000.00 to less than P 25,000.00	4	8.89%	2	15.38%	6	10.34%
P 25,000.00 and above	2	4.44%		0.00%	2	3.45%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table depicts gross monthly earnings of BSBA-MM and BS Entrepreneurship graduates in their present occupations. Most of the individuals both in BSBA-MM and BS Entrepreneurship falls between P5,000.00 and P10,000.00 monthly earners with 33.33% and 38.46%, respectively. Between P10,000.00 to P15,000.00, the group under BSBA-MM was still significantly represented at 35.56%, but smaller groups of BS Entrepreneurship individuals were found to obtain above P15,000.00. Overall, the data reveals that both groups have approximately the same earning potential. Most of them earn within the lower to middle income range.

1.6 Number of Months/Years Before Getting the First Job

Table 6. Frequency Counts and Percentage Distribution as to number of months/years before getting the first job

Number of Months/Years	BSBA-MM		BS Entrep		Total	
Before Getting the First Job	***f***	**%**	***f***	**%**	***f***	**%**
1-3 months	16	35.56%	9	69.23%	25	43.10%
4-6 months	10	22.22%	1	7.69%	11	18.97%
7-9 months	3	6.67%	2	15.38%	5	8.62%
10-12 months	7	15.56%		0.00%	7	12.07%
more than 1 year but less than two years	9	20.00%	1	7.69%	10	17.24%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table shows the number of months or years it took BSBA-MM and BS Entrepreneurship graduates to land their first job. Both groups had a similar distribution, with most graduates finding employment within the first three months (43.10% and 69.23%, respectively). However, a higher percentage of BS Entrepreneurship graduates secured jobs within the first three months compared to BSBA-MM graduates. For both groups, the number of months to secure employment decreased as the time frame increased. A significant proportion of both groups found jobs within the first year, with only a small percentage taking more than a year but less than two years to find their first job.

1.7 Method of First Job Acquisition

Table 7. Frequency Counts and Percentage Distribution as to Method of First Job Acquisition

Method of	BSBA-MM		BS Entrep		Total	
First Job Acquisition	***f***	**%**	***f***	**%**	***f***	**%**
recommended by someone	19	42.22%	5	38.46%	24	41.38%
as walk-in applicant	13	28.89%	7	53.85%	20	34.48%
information from friends	3	6.67%			3	5.17%
family business	1	2.22%			1	1.72%
job fair	2	4.44%	1	7.69%	3	5.17%
response to an advertisement	1	2.22%			1	1.72%
arranged by school's placement services	1	2.22%			1	1.72%
absorbed by the company with OJT	1	2.22%			1	1.72%
job online platforms / jobstreet	3	6.67%			3	5.17%
Public Employment Service Office (PESO)	1	2.22%			1	1.72%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table shows the methods through which BSBA-MM and BS Entrepreneurship graduates acquired their first jobs. For both groups, the most common method was being recommended by someone (42.22% and 38.46%, respectively). Another significant method was applying as a walk-in applicant (28.89% and 53.85%). Other methods, such as information from friends, family business, job fairs, responses to advertisements, school placement services, company absorption with OJT, online platforms, and PESO, were used by a smaller percentage of graduates from both groups. Overall, the data suggests that personal connections and direct applications were the most effective methods for both groups to secure their first jobs.

1.8 Difficulties Encountered in Looking for their First Job

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DOI: https://dx.doi.org/10.22161/ijaems.107.10

Table 8. Frequency Counts and Percentage Distribution as to Difficulties Encountered in Looking for Their First Job

Difficulties Encountered in Looking for their First Job	BSBA-MM		BS Entrep		Total	
	f	%	*f*	%	*f*	%
few job vacancies	18	40.00%	2	15.38%	20	34.48%
inadequate experience	12	26.67%	2	15.38%	14	24.14%
low compensation offer	3	6.67%		0.00%	3	5.17%
mismatch of educational qualifications	4	8.89%	1	7.69%	5.0	8.62%
passing the pre-employment interview					0.0	0.00%
lack of skills/competencies			1	7.69%	1.0	1.72%
low opportunity for advancement			1	7.69%	1.0	1.72%
personality factors	4	8.89%			4.0	6.90%
passing the pre-employment exam	2	4.44%			2.0	3.45%
not meeting paper requirements	2	4.44%	1	7.69%	3.0	5.17%
No previous job			5	38.46%	5.0	8.62%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table shows that the major challenges that BSBA-MM and BS Entrepreneurship graduates faced in finding their first job were limited job vacancies (40% and 15.38%, respectively) and lack of experience (26.67% and 15.38%). Other challenges that both groups faced included low compensation offers, mismatched educational qualifications, and passing pre-employment interviews. These findings suggest that both groups need to focus on gaining relevant experience and developing strong skills to increase their employability and overcome these obstacles.

1.9 Nature of their Present Job with the Course they Finished

Table 9. Frequency Counts and Percentage Distribution as to Nature of their Present Job with the Course they Finished

Nature of Present Job with the Course they Finished	BSBA-MM		BS Entrep		Total	
	f	%	*f*	%	*f*	%
Completely related	20	44.44%	1	7.69%	21	36.21%
Somehow related	18	40.00%	8	61.54%	26	44.83%
Not related at all	7	15.56%	4	30.77%	11	18.97%
Total	**45**	**100%**	**13**	**100.00%**	**58**	**100%**

The table shows a gap between what the current job is and the course completed for both BSBA-MM and BS Entrepreneurship graduates. Indeed, while a big share of BSBA-MM graduates (44.44%) was in completely related jobs, a bigger percentage of BS Entrepreneurship graduates (61.54%) had somehow related jobs to their course. Interestingly, a large proportion of the graduates from both programs (15.56% and 30.77%, respectively) are engaged in non-degrees-related employment, which implies that a good portion of the graduates are perhaps not applying their academic knowledge satisfactorily in their jobs.

1.10 Length of Service with the Present Company

Table 10. Frequency Counts and Percentage Distribution as to Length of Service with the Present Company

Length of Service with the Present Company	BSBA-MM		BS Entrep		Total	
	f	%	*f*	%	*f*	%
1-3 months	4	8.89%	1	7.69%	5	8.62%
4-6 months	11	24.44%	2	15.38%	13	22.41%
7-9 months	10	22.22%	2	15.38%	12	20.69%
10-12 months	8	17.78%	2	15.38%	10	17.24%
more than 1 year but less than 2 years	10	22.22%	6	46.15%	16	27.59%
more than 2 years but less than 3 years	2	4.44%			2	3.45%
Total	**45**	**100%**	**13**	**100.00%**	58	100.00%

The table shows that there is a difference in the service length with the current company between BSBA-MM and BS Entrepreneurship graduates. The percentage of longer service tenure among BS Entrepreneurship graduates is higher, at 46.15% who have served for more than a year but less than two years. Meanwhile, BSBA-MM graduates are more spread out in the length of service, with no single category dominating. This means that the BS Entrepreneurship graduates are likely to be more retentionist with their existing employers than the BSBA-MM graduates.

The data shows a diverse range of length of service among NEUST BSBA Marketing Management graduates in Palayan City with their current employers. 1-3 months: A quarter of the graduates (25%) have been with their present companies for a relatively short period of 1 to 3 months. This suggests that a portion of the graduates recently joined their current employers. Another 25% of the graduates have a slightly longer length of service, ranging from 4 to 6 months. This indicates that a similar proportion of graduates have been in their current jobs for a bit longer but still within the first half-year of employment. While a portion has relatively shorter tenure, others have gained more extended experience, indicating different stages in their professional careers.

1.11 Reason for Staying with Present Job

Table 11. Frequency Counts and Percentage Distribution as to Reason for Staying with Present Job

Reason for Staying with Present Job	BSBA-MM		BS Entrep		Total	
	f	%	*f*	%	*f*	%
Good salary	8	17.78%	4	8.89%	12	20.69%
Good relationship with coworkers	11	24.44%	5	11.11%	16	27.59%
Career challenge	4	8.89%			4	6.90%
Job enjoyment	5	11.11%			5	8.62%
Proximity to residence						
Good management	2	4.44%	1	2.22%	3	5.17%
Stable company	1	2.22%			1	1.72%
Related to course or program study	1	2.22%			1	1.72%
Family influence	1	2.22%			1	1.72%
To gain experience	12	26.67%	3	6.67%	15	25.86%
Total	**45**	**100%**	**13**	**100.00%**	58	100.00%

The table reveals that good salary and good relationships with coworkers are the primary reasons for staying with the present job for both BSBA-MM and BS Entrepreneurship graduates. While BSBA-MM graduates prioritize good relationships more (24.44%), BS Entrepreneurship graduates are more likely to stay due to good salary (17.78%). Other factors such as job enjoyment, proximity to residence, and stable company also play a role, although to a lesser extent. Interestingly, a significant number of BSBA-MM graduates (26.67%) stay to gain experience, indicating a focus on career development.

II. Skills Utilization and Training Assessment of the Graduates in their Position

2.1 Extent of Use of Different Skills to Present Job of the Respondents

Table 12. Extent of Use of Different Skills to Present Job of the Respondents

	BSBA-MM		BS Entrep	
Skills	**WM**	**VD**	**WM**	**VD**
Communication Skill	3.57	SA	3.62	SA
Human Relation Skill	3.45	SA	3.69	SA
Critical Thinking Skill	3.36	SA	3.54	SA
Entrepreneurial Skill	3.14	A	3.42	SA
Comprehension Skill	3.36	SA	3.54	SA
Decision-making Skill	3.43	SA	3.54	SA
Problem Solving Skill	3.36	SA	3.46	SA
Leadership Skill	3.30	SA	3.46	SA
Information Technology Skill	3.36	SA	3.54	SA
Research Skill	3.27	SA	3.23	SA
Grand Mean	**3.36**	SA	**3.5**	SA

Legend: Strongly Agree (SA) 3.25 – 4.00; Agree (A)2.5 – 3.24; Disagree (D) 1.75 – 2.49 Strongly Disagree (SD) 1:00 – 1.74

Both BSBA-MM and BS Entrepreneurship graduates have a good skillset because average ratings are above 3.00 on a 5-point Likert scale. These two groups highly rate themselves for their skills in communication (3.57 and 3.62), human relation (3.45 and 3.69), critical thinking (3.36 and 3.54), and information technology (3.36 and 3.54). However, there are some differences that are notable. BS Entrepreneurship graduates rated themselves a little higher in entrepreneurial skills (3.42) than BSBA-MM graduates (3.14). On the other hand, BSBA-MM graduates rated themselves a little higher in research skills (3.27) than BS Entrepreneurship graduates (3.23). Overall, both groups of graduates demonstrate a strong foundation of skills, which likely contributes to their success in the workforce.

2.2 Adequacy of training acquired form NEUST Atate Campus

Table 13. Extent of Adequacy of Training Acquired from NEUST Atate Campus

	BSBA-MM		BS Entrep	
Skills	**WM**	**VD**	**WM**	**VD**
Communication Skill	3.59	SA	3.62	SA
Human Relation Skill	3.57	SA	3.62	SA
Critical Thinking Skill	3.48	SA	3.62	SA
Entrepreneurial Skill	3.42	SA	3.54	SA
Comprehension Skill	3.45	SA	3.58	SA
Decision-making Skill	3.45	SA	3,54	SA
Problem Solving Skill	3.49	SA	3.62	SA
Leadership Skill	3.48	SA	3.5	SA
Information Technology Skill	3.41	SA	3.62	SA
Research Skill	3.44	SA	3.46	SA
Grand Mean	**3.48**	**SA**	**3.57**	**SA**

Legend: Strongly Agree (SA) 3.25 – 4.00; Agree (A)2.5 – 3.24; Disagree (D) 1.75 – 2.49 Strongly Disagree (SD) 1:00 – 1.74

The table shows that BSBA-MM and BS Entrepreneurship graduates perceive the training they acquired from NEUST Atate Campus as very adequate. Both groups rate their training in communication (3.59 and 3.62), human relation (3.57 and 3.62), critical thinking (3.48 and 3.62), and information technology (3.41 and 3.62) skills as strongly agree, with average ratings above 3.50 on a 5-point Likert scale. Interestingly, both groups also rate their entrepreneurial skills training as strongly agree (3.42 and 3.54), which means that the university has successfully equipped graduates with the knowledge and skills required in this area. In general, the table indicates that BSBA-MM and BS Entrepreneurship graduates are generally satisfied with their quality of training in NEUST Atate Campus. This likely contributes to their success upon entering the labor force.

3. Graduates' Feedback and Suggestions Regarding Strategies to Enhance Employability and Curriculum Quality 3.1 Suggestions to Improve the Employability of the NEUST Atate Campus graduates

Table 14. Suggestions to Improve the Employability of the NEUST Atate Campus graduates

Suggestions to Improve the Employability of the NEUST Atate Campus graduates	BSBA-MM			BS Entrep		
	f	*%*	*Rank*	*f*	*%*	*Rank*
Provide students with more training programs and seminars	17	37.78%	1	5	38.46%	1
Invite more companies to participate in the school job fair	10	22.22%	2	3	23.08%	2
Develop partnership with more companies for the OJT program	8	17.78%	3	2	15.38%	3-4
Improvement of the OJT program	1	2.22%	6-7	1	7.69%	5
Improvement of the teaching methodology	1	2.22%	6-7			
Improve student communication skill	2	4.44%	5	2	15.38%	3-4
Motivate and inspire students	6	13.33%	4			

The table shows that BSBA-MM and BS Entrepreneurship graduates suggest and rank ideas on how NEUST Atate Campus should improve employability. One of the highest suggestions for improvement in both groups is to prepare students more for training and seminars. Interestingly, inviting a greater number of companies for the school job fair received the second-highest score in the suggestion of improvement for both groups, considering the industry involvement in achieving better employability. While there are different rankings in the other lists, the two groups agree on the priorities of practical training, links with industry, and communicating effectively. These findings serve as useful information for prioritizing NEUST Atate Campus efforts to improve graduate employability.

3.2 Suggestion to further improve the course curriculum

Table 15. Suggestion to further improve the course curriculum

Suggestion to further improve the course curriculum	BSBA-MM			BS Entrep		
	f	*%*	*Rank*	*f*	*%*	*Rank*
Offer more major courses / subjects based on the needs of the indusrty	36	80.00%	1	7	53.85%	1
Major courses must be taught by highly competent professors and with industry experience	3	6.67%	4-6			
Apply various classroom and practical activities, not just reporting	3	6.67%	4-6	1	7.69%	4-6
Integrate trainings, seminars and more job exposure in the curriculum	5	11.11%	3	2	15.38%	3
Researches such as feasibility studies, capstone projects, business plans must be conducted by each group under advisorship of another professors	1	2.22%	8			
Application of more current trends in business and information technology and less paper works and theories	3	6.67%	4-6	1	7.69%	4-6
Invite outside speakers with expertise in the field of business				1	7.69%	4-6

management and information technology						
Add more subjects on technical writing, business and oral communications	2	4.44%	7			
Provide more opportunities where students can apply what they learned in the business and information technology	6	13.33%	2	6	46.15%	2

The table presents suggestions from BSBA-MM and BS Entrepreneurship graduates on how to further improve the course curriculum. Both groups prioritize offering more major courses/subjects based on the needs of the industry as the top suggestion, with 80.00% of BSBA-MM graduates and 53.85% of BS Entrepreneurship graduates advocating for this. Interestingly, both groups also emphasize the importance of practical application, with suggestions like integrating more training, seminars, and job exposure (11.11% and 15.38%), and conducting research projects under the guidance of professors (2.22% and 7.69%). While there are some differences in the rankings of other suggestions, both groups generally agree on the need for highly competent professors with industry experience (6.67% and 7.69%), the integration of current trends in business and information technology (6.67% and 7.69%), and opportunities for students to apply their learning through practical activities (13.33% and 46.15%). These findings provide valuable insights into the areas where NEUST Atate Campus can focus its efforts to improve the curriculum and better prepare graduates for the workforce.

V. CONCLUSIONS

1. Both BSBA-MM and BS Entrepreneurship graduates have high employment rates, particularly BS Entrepreneurship graduates. However, challenges such as job vacancies and family concerns persist. Graduates often secure jobs through personal connections and direct applications, and tend to work in marketing, sales, and logistics roles. While BS Entrepreneurship graduates have a higher likelihood of managerial positions and longer tenure, both groups generally have similar earning potential and job satisfaction. Both BSBA-MM and BS Entrepreneurship graduates possess a strong skillset, particularly in communication, human relations, critical thinking, and information technology.
2. Both BSBA-MM and BS Entrepreneurship graduates possess a strong skillset, particularly in communication, human relations, critical thinking, and information technology. They are also satisfied with the quality of their training, especially in communication skills.
3. To improve employability, NEUST Atate Campus should prioritize increased training programs, industry engagement, and improved communication skills. To enhance the curriculum, the university should focus on industry-relevant courses, practical application, and experienced faculty.

VI. RECOMMENDATIONS

Based on the comprehensive findings of the study, several recommendations can be made to address the key areas of employment status, career alignment, skills utilization, and curriculum quality:

1. NEUST Atate Campus should strengthen its career services by providing comprehensive career counseling, expanding internship opportunities, organizing job fairs, and fostering alumni networks.
2. The university should review and update its curriculum to align with industry trends and incorporate more practical training, internships, and real-world projects.
3. NEUST Atate Campus should establish strong industry partnerships to facilitate internships, job placements, and collaborative research projects.

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Determinants of Work Performance of Hotel Employees in Cabanatuan City

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Abstract— *The study mainly was aimed to determine the emotional challenges of BS Tourism Management Students of Nueva Ecija University of Science and Technology. The study focused on the emotional challenges encountered by the Tourism Management students of Nueva Ecija University of Science and Technology during the COVID-19 Pandemic. The findings of this study gave the researcher the understanding the emotions of the Tourism Management students with the " new normal" when it comes to the Academic Situation due to the COVID-19 especially for the students who are first time in experiencing the College life that was cut short because it was decided by the Government to conduct classes online. To prevent the escalation of the virus to the students.*

***Keywords*— Determinants, Hotel, Cabanatuan City, Employees, Work Performance**

I. INTRODUCTION

Employees are the assets for an organization. This is true because the success or failure of any organization depends upon its employee too. The importance of an employee in hospitality industry becomes more significant because of its nature- manpower intensive industry. In hospitality industry and hotel sector especially it is very important for organizations to stay focused on employee performance and so how to get enhancement in the employee performance.

There are many reasons of providing training to the employees. One basic reason is to fill the performance gap after having been identified the same. This gape can be known while having performance evaluation process. These days' hotels have been taking continuous efforts to provide most practical and relevant training to the employees of all the functional area of the hotel concerned. These efforts of the hotels are more towards integration and getting more concrete results. Those hotels earning good profit have their well-developed training systems and they resort to a planned approach to training its employees. This level of hotel organization has regular training programmers regardless of its concrete tangible gains or not. There are many hotels where they have different approach to train the employees, that approach is intentional training, this includes providing training to all the employees irrespective of their deficiencies and strengths. This kind of approach of training goes on as one of the function of the organization. Srivastava.V.N, Shafiq.M, Ghosh.K (2015)

Employee performance is more important in this industry because employees are having direct interaction with the guest and secondly it is employee of the hotel industry that satisfies its guest. So it is very important for the manager concerned to know the factors that affects employee performance.

There is a saying that perfection of work depends on pleasure at job. So pleasure and performance both can be achieved by quality education about the subject area and systematic training of the same. As far as Indian hospitality industry is concerned, a report commissioned by the department of tourism, Government of India, revealed that the annual demand for trained manpower in hotels and restaurants is likely to touch 29,000 by the year 2010. This figure is likely to increase to approximately 39,000 by the year 2020. And the actual supply of manpower? A total of approximately 18,000 students are being trained in hotel management and food craft annually in the country. Currently, in hotels, attrition rates are at 18-25 percent per annum, and growing at an alarming rate of 10 per cent per annum. This, exacerbated by an escalating wage bill of 10-12 per annum with a five-year forecast pegged at a minimum increase of 40 percent over current levels. Thus systematic training will play a life saving role in hospitality industry to counter with the current scenario.

A work determinant is seen as a person's adherence to work ethic, commitment to a career/profession, job involvement, and organizational commitment (Morrow, 2017). Individuals can feel committed to an organization, top management, supervisors, or a particular work group. Commitment has been examined with regard to "career, union and profession" (Darolia, Darolia, & Kumari, 2010). Studies showing instances of high work commitment have also proven to highly relate to organizational performance. It is the second most commonly studied job attitude in I/O psychology for this reason (PSUWC, 2016). It affects all organizations at some level and enables companies to evaluate issues like turnover during times of varying economic stability. All of these attitudes interact to shape the conceptual framework of each individual's work commitment. The following information analyzes these attitudes as well as other organizational concepts, research, and real world applications.

The purpose of this study is to investigate and identify the determinants of work performance of hotel personnel in Cabanatuan City that focus on their Job satisfaction, Work motivation and organizational commitment.

STATEMENT OF THE PROBLEM

Statement of the Problem

The purpose of this study was to identify the work performance of hotel personnel in Cabanatuan city. Specifically, it seeks to answer to :

1. How may the socio- demographic profile of the respondents be describe in terms of:

a) Age;

b) Sex;

c) Civil Status;

d) Ave. monthly income;

e) Educational attainment;

f) Number of work hours in a week; and

g) Employment status?

2. How may the hotel personnel’s work performance be described in terms of their:

a) Job satisfaction

b) Work motivation

c) Organizational commitment

II. METHODS OF RESEARCH

The researcher used the descriptive survey method or type of research where data were gathering through dissemination of questionnaires, books and through the internet.

The term descriptive research refers to the type of research question, design, and data analysis that applied to a given topic. Descriptive statistics tell what is, while inferential statistics try to determine cause and effect. The descriptive function of research is heavily dependent on instrumentation for measurement and observation (The Association for Educational Communications and Technology 2013).

III. CONCEPTUAL FRAMEWORK

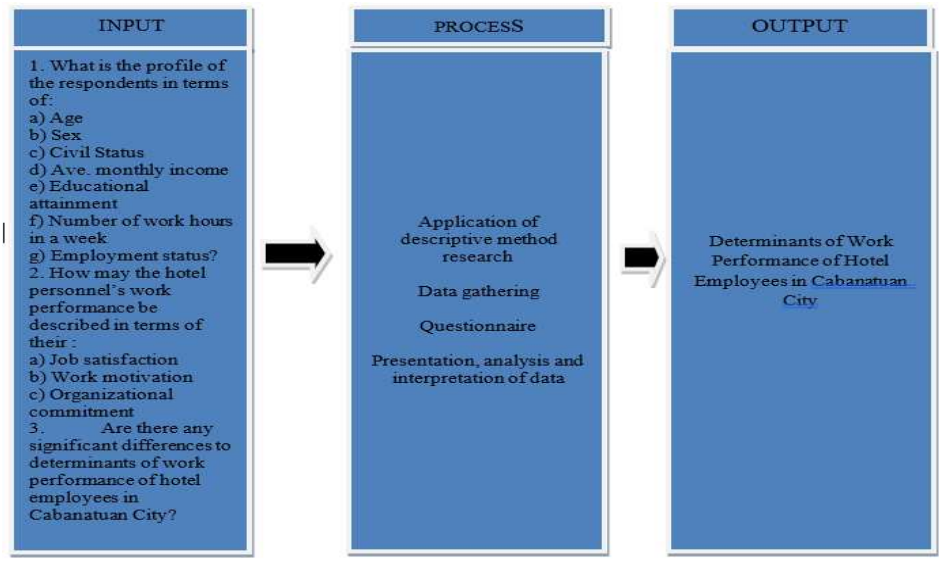

Figure 1

Research Paradigm

Figure 1, as shown in research paradigm: explained the conceptual framework of this study. Each variable are interrelated with the other. It includes profile of the respondents based on age, sex, civil status, average monthly income, educational attainment and number of hours in a week.

IV. RESULTS AND DISCUSSIONS

1.SOCIO-DEMOGRAPHICAL PROFILE

Table 1.1: Frequency and Distribution to Age

Age	Frequency	Percentage
16 – 20	9	9.27
21 – 25	37	38.41
26 – 30	37	38.41
31 years old and above	14	14.33
Total	97	100.00

Table 1.1 showed the frequency distribution of the respondents based on age, it showed that 37 respondents with the percentage of 38.14 % of the respondents are from the age of 21-25 years old and 26-30 years old followed by 31 years old (14.33) and above. There are 9 (9.27%) respondents with the age bracket of 16-20 years old. There are respondents below 15 years old (0%); The result also determined that hotel employees' ages are in the mid 20's or youth.

Table 1.2: Frequency and Percentage Distribution of Respondents as to Sex

Sex	Frequency	Percentage
Male	46	47.43
Female	51	52.57
Total	97	100.00

Table 1.2 shows that male students have a population of 46 or 47.43 % while there are 51 female students or 52.57 %.

Table 1.3: Frequency and Percentage Distribution of Respondents as to Civil Status

Year	Frequency	Percentage
Single	54	55.67
Married	43	44.33
Widow/ Widower	0	0
Total	97	100.00

As shown in Table 1.3, showed the respondents frequency distribution based on civil status, it shows that majority of the respondents are single with the total of 54 with a percentage of 55.67 and there were forty three respondents who atre married with a percentage of 44.33. It implies that most of the employees working in the hotels are single.

Table 1.4: Frequency and Percentage Distribution of Respondents as to Average Monthly Income

AVERAGE MONTHLY INCOME	FREQUENCY	PERCENTAGE
Below Php 3000	**4**	**4.12**
Php 3001-5000	**9**	**9.27**
Php 5001-10,000	**27**	**27.83**
Above Php 10,000	**57**	**58.76**
Total	**97**	**100%**

Table 1.4 showed the frequency distribution of the respondents based on average monthly income, it shows that 57 respondents with a percentage of 58.76 has an average monthly income of Php 10,000.00 and above followed by average monthly income of Php 5001.00-10,000.00 with a percentage of 27.83 while there are 9 respondents with a percentage of 9.27 with an average monthly income of Php 3001.00-5000.00 and there were 4 respondents with a percentage of 4.12 with an average monthly income of Php 3000.00 below. It implies that average monthly income of hotel personnel can provide an effect to their work performance.

The salary of employees varies depending on the company. It is safe to say that the position and the company are factors to the kind of salary an employee will receive.

Table 1.5: Frequency and Percentage Distribution of Respondents as to Educational Attainment

Educational Attainment	Frequency	Percentage
High School Graduate	4	4.14
Vocational	2	2.06
College Undergraduate	19	19.6
College Graduate	72	74.2
Total	97	100

Table 1.6: Frequency and Percentage Distribution of Respondents as Work Hours in a Day

Number of Work Hours in a Day	Frequency	Percentage
1 hour	0	0
2-5 hours	1	1.04
6-9 hours	94	96.9
10 hours above	2	2.06
Total	97	100%

Table 1.6 showed the frequency distribution of the respondents based on number of work hours in a day, it shows that 94 respondents or with a percentage of 96.90 are working for 6-9 hours followed by 2 respondents with a percentage of 2.06 that are working for 10 hours and above. There is one (1) respondents with a percentage of 1.03 that the number of work hours in a day and there were no respondents for the category of an hour. It implies that major work force for of the hotels in Cabanatuan works for 6-9 hours.

Employees are expected to work their regular schedule based on the standard hours or full time equivalent(FTE) for each week or supplement non-worked time up to their FTE or standard hours with the use of flex PTO.

Table 1.7: Frequency and Percentage Distribution of Respondents as of Employment Status

Employment Status	Frequency	Percentage
Part-time	1	1.03
Full-time	96	98.97
Total	97	100

Table 1.7 showed the frequency distribution of the respondents based on Employment Status, it shows that there are 96 respondents with a percentage of 98.97 are full time while there is only 1 respondent with a percentage of 1.03 that is a part time employee. It implies that the work force of the hotels in Cabanatuan are full time employees.

According to The Bureau of Labor Statistics sets the benchmark for full-time employees a little higher at 35 hours a week. Most of the companies will require a full-time employees to work.

Table 1.8: Frequency and Percentage Distribution of Respondents as of Department Assigned

Employment Status	Frequency	Percentage
Housekeeping	48	49.48
Front Office	43	44.32
Kitchen	4	4.12
Administration	2	2.08
Total	97	100

Table 1.8 showed the frequency distribution of the respondents based on the department assigned, it shows that there are forty eight (48) respondents with a percentage of 49.48 are assigned at the housekeeping department followed by forty three respondents (43) with a percentage of 44.32 are assigned at front office while there are four (4) respondents with a percentage of 4.12 that are assigned in the kitchen area and lastly, there are two (2) respondents with a percentage of 2.06 are assigned in the administrative department . It implies that the work force of the hotels in Cabanatuan is mostly assigned in the Housekeeping Department.

According to Jinisys Software Inc. Housekeeping is the department which offers basically with hygiene and also al ancillary support attached to that. The conventional performs an essential role in the trustworthiness of the hotels.

HOTEL'S PERSONNEL'S WORK PERFORMANCE

Table 2.1: Job Satisfaction

Job Satisfaction	4	3	2	1	M	VI	R
Wages, Benefits, Training, Workplace, Safety Working Conditions, Salaries, and Promotions	31	63	1	2	3.26	strongly agree	6
The Type of Work and the Feeling of Doing Things	30	64	1	2	3.25	Agree	7
Socialization	23	70	3	1	3.18	Agree	11.5
Entrepreneurial Behavior	30	62	4	1	3.24	Agree	8

Organizational Justuce	39	50	7	1	3.30	strongly agree	5
Relationships with colleagues and physical conditions at work	40	51	5	1	3.34	strongly agree	3.5
Leadership	41	48	8	0	3.34	strongly agree	3.5
perception and support	37	52	7	1	3.38	strongly agree	1
flexible working hours	31	58	8	0	3.23	Agree	9
tourist involvement and commitment	17	72	7	1	3.08	Agree	14
the working environment	20	71	5	1	3.13	Agree	13
the type of organization	25	69	3	0	3.22	Agree	10
the importance of the work	34	59	4	0	3.35	strongly agree	2
affective commitment and autonomy	29	64	4	0	3.29	strongly agree	6
empowerment	28	59	10	0	3.18	Agree	11.5
an innovation climate	30	62	5	0	3.25	Agree	7
financial result	20	71	0	0	3.02	Agree	1

Table 2.1 showed frequency distribution based on the degree of agreement based on job satisfaction, it shows that perception and support got the highest score with average weighted mean of 3.38 and rank number 1 on the other hand the lowest mean obtained 3.08 item number 10 which is "tourist involvement and commitment".

Perception and support is the higher rank of the respondents because determinant of work performance in organizational include an identification with the organization, shared goals and values between the organization and the individual, continuing membership in the organization pointed out that basically determinacies of work performance is a structural phenomenon of a transaction between an individual and an organization, and it's non- transferable investment result shall increase as time goes on; employees are reluctant to leave the organization.

According to Pinder, individuals have different levels of a need to work. Therefore, working is valued by individual's distinct perception of the requirements to compete a job.

Table 2.2: Work Motivation

WORK MOTIVATION	**4 SA**	**3 A**	**2 D**	**1 SD**	**WM**	**VI**	**R**
monetary bonuses or benefits	33	64	0	0	3.34	strongly agree	4
Opportunities for advancement and promotion	33	57	5	2	3.24	Agree	5.5
opportunities for increased job responsibility	40	51	6	0	3.35	strongly agree	2.5
recognition from managers, colleagues, customers, and family	41	51	5	0	3.37	strongly agree	1
challenging work	37	57	3	0	3.35	strongly agree	2.5
feelings of accomplishment	29	63	5	0	3.24	agree	5.5
development of self-esteem	29	62	5	1	3.22	agree	7
good working conditions	28	64	5	0	3.23	agree	6.5

good work schedules	32	59	4	2	3.24	agree	5.5
job security	26	68	3	0	3.23	agree	6.5
being regarded as a good employee	29	61	6	1	3.21	agree	8

Table 2.2 showed the frequency distribution based on the degree of agreement to work motivation, it implies that respondents strongly agreed to the statement regarding work motivation about recognition from managers, colleagues, customers, and family with 3.37 average weighted mean and rank number 1. On the other hand the lowest weighted mean obtained 3.21 item number 7 which is "being regarded as a good employee".

The result showed that the main determinants of work performance for work motivation are the opportunities for increased job responsibility and recognition from managers, colleagues, customers, and family. It means that the employees are motivated with additional task given by the superior who will enhance their skills and ability.

According to Delizo (2013) it is employees feeling that they are empowered to contribute to the company's company goals through the decision they make in their work and that their efforts are supported and recognized by management. It means employees are happy and satisfied in what they are doing for the company and for themselves.

Table 2.3: Organizational Commitment

Organizational Commitment	**4 SA**	**3 A**	**2 D**	**1 SD**	**WM**	**VI**	**R**
My attendance at work is above the norm.	25	70	1	1	agree	6	agree
I read and keep up with hotel announcements, memos, and so on	42	51	3	1	strongly agree	2	strongly agree
I consider the impact of my actions on co-workers.	38	54	5	0	strongly agree	3	strongly agree
I take time to listen to co-workers' problems and worries.	29	65	2	1	agree	4	agree
I assist supervisors with work when not asked.	31	55	8	3	agree	5	agree
I help others who have been absent/late	36	57	9	1	strongly agree	1	strongly agree
I really feel as if this hotel's problems are my own.	19	63	10	5	agree	7	agree

Table 2.3 showed the frequency distribution based on the Agreement to Organizational Commitment. It implies that respondents strongly agreed to the statement regarding about I help others who have been late/absent with 3.44 average weighted mean and rank number 1, on the other hand the lowest mean obtained 2.98 item number 7 which is "I really feel as if this hotel's problem are my own"

The result showed that hotel respondents in Cabanatuan City showed the determinants of showing hospitality teamwork.

According to Stirling J. 2018 it is important that employees are listened to, valued, and encouraged to provide feedback. By keeping channels of communication open, employers and employees can benefit from mutual trust and respect. The importance that we know and how hospitality teach us to help to our co-workers in order to provide good quality service for the visitors.

V. CONCLUSION

Based on the findings of this research study the following conclusion were drawn :

1. The researchers find out that the most of the hotel personnel in Cabanatuan City had 21-25 and 26-30

years of age, most of them are females, on civil status most of them are single. In average monthly income most of the hotel personnel had a PHP10, 000.00 and most of them are college graduates and most of them has a 6-9 hours of number of work and housekeeping.

2. Recognition from the superior, managers, colleagues, customers, and family is the main determinants to work motivation of hotel employees.
3. Recognition from managers, colleagues, supervisors, and co- workers are the main determinants of work performance which may lead to commitment of hotel employees from the organization.
4. Perception and support from managers, colleagues, supervisors, co- workers, customers and family are the main determinants of work performance that leads to job satisfaction

RECOMMENDATION

1. Based on the result of the study that the main work determinants in order to motivate the employees, it is necessary that supervisors and managers should provide programs for their employees in order to further recognize their work performance.
2. Enhancing support services from hotel to further motivate their employees such as benefits and incentives.

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Sustainable Development and Management Strategies of Groundwater in Arid-Lands

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Abstract— *Sustainable groundwater development efficiently manages existing groundwater resources and addresses the risks associated with aquifer physical qualities, storage capacity, and recovery ability for future generating requirements. Response to future scenario development is essential for sustainable groundwater management in arid lands. This article discusses various development scenarios associated with better management of groundwater. This is to formulate effective and sustainable management strategies and their impact on sustainable groundwater management. The paper also seeks to provide a brief overview of common ideas of sustainability and their application to groundwater resource usage and development. Eventually, sustainable development can be accompanied by policies that stimulate groundwater use and prioritize profit over conservation require being considered. Policies include the establishment and formation of a social identity for collective aquifer storage and recovery, the creation of a legal framework for sustainable groundwater governance, the establishment of social adoption of groundwater pumping technology, and the formation of groundwater cultures at the point of abstraction.*

Keywords*— Arid lands, Sustainable Groundwater, Circular economy, Technology, Policies.*

I. INTRODUCTION

Globally, groundwater is the most abundant freshwater available (NASA 2003) and accounts for 98% of all freshwater on the earth (Velis et al. 2017). It is also the most extracted raw material (Jarvis 2012; Margat and Gun 2013). About 38% of irrigated lands are irrigated by groundwater (Siebert et al. 2010). Agriculture is the most groundwater-consuming sector with 70% of groundwater withdrawn worldwide (NGWA 2023). It is also an important source for humans, where nearly half of all drinking water worldwide is provided by groundwater (Kløve et al. 2011; Smith et al. 2016). The importance of groundwater extends beyond drinking and agriculture but also sustains the ecosystem, by providing nutrients (Dubrovsky & Hamilton 2010; Mullins 2014), buffering temperature (Kaandorp 2019), and supporting biodiversity (UNWWDR 2022).

Global demand for groundwater is rising due to population growth, irrigated agriculture expansion, and economic development. Human activities affect the sustainability of groundwater, many regions pump groundwater above the required without controlling the sustainability levels (WWF 2023), consequently, groundwater has been depleted (Das et al. 2020; Roy & Zahid 2021; Brückner et al. 2021; Negm & Elkhouly 2021). Further, climate variability and change impact groundwater systems, both directly through recharge and indirectly through changes in groundwater use (Taylor et al. 2012). Natural processes like climate change and increasing global air temperature cause a lowering of the piezometric levels of the adjacent aquifer (Sayed et al. 2020; Jannis et al. 2021; Gona et al. 2022). Agroecosystems and land use exert a stronger influence on groundwater, especially the expansion of rain-fed and irrigated agriculture; For example, during multi-decadal droughts in the West African Sahel, groundwater recharge and storage increased rather than declined as farmland replaced savannah, increasing surface runoff through soil crusting and focused recharge in ponds (Leblanc et al. 2008).

Climate trends, hydrogeologic conditions, groundwater withdrawal rates, land use, and management practices in the twenty-first century have all contributed to widespread, rapid, and accelerated groundwater level decreases (Jasechko et al. 2023). Agricultural intensification is also one of the main factors driving groundwater levels to their limit; as a result, groundwater levels have decreased to potentially hazardous levels (Qureshi et al. 2010; Yin et al. 2011). Nonetheless, there are numerous situations where declines in groundwater levels have slowed, stopped, or reversed after intervention, such as adopting regulatory measures (Buapeng and Foster 2008). The global challenge linked with groundwater requires an effective way to offer economic and social advantages while attaining long-term sustainable development (Shah 2005; Filimonau & Barth 2016). Therefore, this study represents the most extensive approaches to saving groundwater levels in many regions. In addition, it establishes a model for the future adoption of sustainable groundwater development practices.

Global and Local Groundwater Characteristics

This section shows global annual freshwater withdrawals as a percentage of internal resources, as shown in Fig. 1, as well as, shows an example of groundwater depletion in Egypt, as shown in Table 1. Total water withdrawals, not counting evaporation losses from storage basins. Withdrawals also include water from desalination plants in countries where they are a significant source. Withdrawals include extraction from nonrenewable aquifers and desalination plants for agriculture (irrigation and livestock production and for direct industrial use) and for domestic uses (drinking water, municipal use or supply, and use for public services, commercial establishments, and homes). The annual freshwater withdrawal is increasing which implies the necessity to better manage water resources, in particular groundwater.

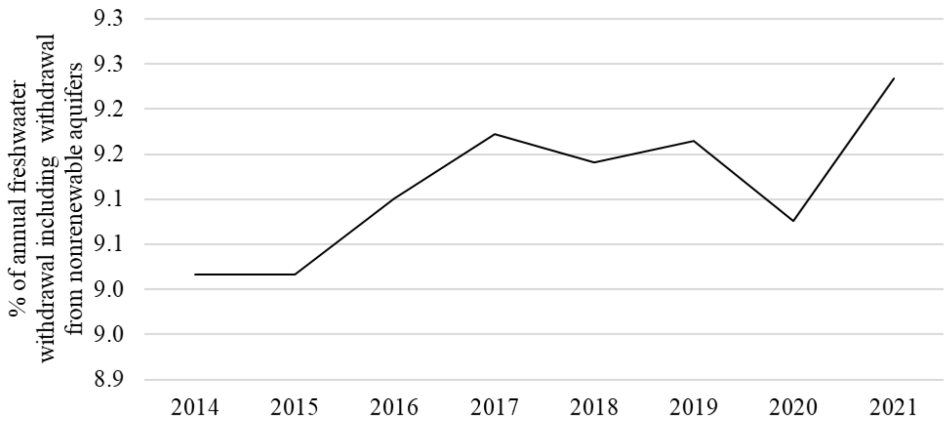

Fig 1. Annual freshwater withdrawals, total (% of internal resources) (Source: FAO-AQUASTAT)

Table 1. An example of inventory data of some wells tapping Wadi Araba in Egypt (Source: Authors, Freeg et al. 2023).

Location		Total depth (m)	Well yield $m^3\ hr^{-1}$	Static water depth m	Dynamic water depth m	Transmissivity $m^2\ day^{-1}$
Upstream	BNS-B	1200	200.0	111.4	155.5	400
	BNS-D	450	197.0	109.7	137.6	340
Midstream	BNS-C	1448	100.0	78.0	173.6	49
	ED-2	858	45.0	68.4	206.2	10
	Araba-2	300	97.0	35.2	150.8	50
Downstream	Araba-1	300	45.0	81.8	156.0	20

In Egypt, where freshwater resources are limited, the country relies on groundwater in some parts, like the Wadi Araba region. Table 1 shows an example of inventory data of the drilled wells in the aquifer subject to groundwater characteristics. The transmissivity of upstream wells BNS-B and BNS-D implies the higher extraction potentiality of groundwater from the aquifer upstream, which is classified as moderate potentiality. Regarding midstream and downstream wells, the transmissivity implies weak extraction potentiality of groundwater from the aquifer at midstream and downstream. For more information see *Appraisal of multilayer aquifer system for sustainable groundwater management in Wadi Araba, Eastern desert, Egypt.* Therefore, the global and local challenges of groundwater resources require the formation and creation of sustainable groundwater management strategies. Policies that encourage groundwater use and promote profit over conservation must be considered while pursuing sustainable development.

Sustainable Development and Management Strategies

Groundwater and Circular Economy

The circular economy aims to save resources through closed-loop usage. The circular economy can be applied to water through water footprint which counts water in both quantity and quality and both direct and indirect water usage that must consider circularity (Sauvé et al. 2021). The virtual water and water footprint concepts emphasize the importance of considering the entire water supply chain when consuming (Aldaya et al. 2011). To evaluate the sustainability of water consumption, analyzing the water footprint is significant by further subdividing water allocation into three groups: blue, green, and grey (Hoekstra and Mekonnen 2012). This demonstrates how the same product or consumer good can have a drastically varied water footprint and level of sustainability or circularity depending on where it came from and what source of water was used in its manufacturing. Further, establishing an intensive production system, such as poultry, seasonal crops, animals, and trees, is critical for transitioning farmers from agriculture to agro-industries based on agricultural raw material processing (IFAD 2014; FAO 2014; Freeg et al. 2023). This allows groundwater-based communities to transition from agriculture to agro-industries based on agricultural raw material processing activities, hence conserving water supplies.

Adoption of Groundwater Pumping Technology

The adoption of groundwater pumping technology is important for long-term sustainable development. For example, the negative influence of submersible pumps on groundwater levels and quality has led to legislation in many countries to control abstraction (Jones 2012). Groundwater pumping technology also includes the mobilization of solar and wind turbines. Solar and wind turbines were introduced in the late 1970s (Ward and Dunford 1984), and since then, many countries have set ambitious plans and initiatives to use solar and wind turbines widely. India's first solar-powered water pumping systems were launched in 1993-1994 as part of the government's non-conventional energy sources promotion program, to install 50,000 units within five years (Purohit and Michaelowa 2005). In the United States, a study examined hybrid wind and solar-powered center-pivot groundwater irrigation. It demonstrates that it might be economically viable on the High Plains of Northern Texas if used to irrigate two crops yearly (Vick 2010). However, applying solar-based groundwater pumping technology for irrigation showed positive impacts on saving groundwater resources from depletion, as well as, offering a cost-effective and sustainable energy solution (Closas 2017; Mostafaeipour et al. 2021). Technology can be expanded to combine the pumping system and the irrigation method in the field, such as modern irrigation systems of sprinklers, subsurface, and drip irrigations. The replacement of traditional surface irrigation methods with modern irrigation systems, including horizontal sprinklers, central pivots, surface drip, and subsurface drip, sustains groundwater resources. A study conducted in the Nile Delta of Egypt showed when those techniques were applied, the drawdown of groundwater reached 2.60 m, 4.20 m, and 6.50 m, respectively (Abd El-Aty et al. 2023).

II. POLICIES AND GROUNDWATER

The aim of the groundwater vulnerability assessment is determined by several elements, including the organization's groundwater policy goal, technical concerns, and institutional issues (Pandian et al. 2023). The scope, forms, and settings for governance at the point of groundwater abstraction must be addressed from the perspective of the primary stakeholders—regulators, users, and suppliers (Jones 2012). This necessitated the importance of jointly sharing the groundwater source between all beneficiaries, otherwise, in the long run, groundwater markets may prove socially unstable and divisive unless a new governance paradigm is devised (Jarvis 2011). Policies require a good grasp of the key links between groundwater systems and surface water, land use, and other sectors (Foster and Chilton 2017). However, some policies have recently emerged, such as I) Integrated approaches to land and water resource management (including surface water, aquifers, and recharge zones), II) Pricing water use, land tenure reform, and water allocation systems based on consumptive use (Duda 2017), III) Encourage and sustain stakeholder engagement in groundwater governance (Valizadeh et al. 2022), IV) Establish economic mechanisms, behavior, and incentives for groundwater management (Koundouri et al. 2017), and V) Establish a legal framework for sustainable groundwater governance (Mechlem 2016). Eventually, multiple frameworks and transdisciplinary skill-building circumstances must be included to improve groundwater and aquifer collaboration.

III. CONCLUSIONS

This article discusses various development scenarios associated with better management of groundwater. This is to formulate effective and sustainable management strategies and their impact on sustainable groundwater management. This study highlighted a wealth of opportunities for the combination of integrated approaches in groundwater management. It is simultaneously recognized that community mobilization and stakeholder organization around a common vision of resource sustainability are necessary prerequisites for developing and implementing groundwater management plans. They must be based on a comprehensive understanding of the important connections between groundwater systems and surface water, land use, and other sectors. Eventually, integrated groundwater policy creation and management planning are essential components of effective governance in managing the 'required transformation process'.

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Japanese Language Centers (JLCS) in the Philippines: An Insightful Look at their Profiles and Emerging Opportunities

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***Abstract*— This study, Japanese Language Centers (JLCs) in the Philippines: An Insightful Look at Their Profiles and Emerging Opportunities, explores the current state of Japanese Language Centers (JLCs) in the Philippines, particularly in the National Capital Region, focusing on their profiles and business operations. Additionally, the research investigates the marketing, technical, financial, and management opportunities faced by these centers. Through a descriptive-correlational design, data were collected from 30 JLCs in Quezon City and Makati, analyzing variables such as years of operation, number of employees, income, and types of services provided. The results indicate a vibrant landscape of JLCs that balances relatively young and established businesses, primarily catering to entry-level Japanese courses while recognizing significant growth potential through refined marketing strategies and the integration of technology in teaching. Additionally, stable funding sources are deemed essential for financial management and operational success, while effective management practices are viewed as crucial for fostering a positive work culture. Overall, these insights underscore the importance of adaptability and innovation in ensuring the sustainability and growth of JLCs within an evolving educational landscape.*

***Keywords*— Emerging opportunities, financial, Japanese Language Centers, marketing, profile, technical management**

I. INTRODUCTION

The increasing interest among Filipinos in learning Japanese, commonly referred to as Nihongo, reflects a broader trend of cultural and economic interconnectivity between the Philippines and Japan. This burgeoning interest is underpinned by both strategic motivations and educational challenges, as evidenced by the significant body of research and discourse on the subject. For instance, Rocamora (2023) highlighted that Filipino university students predominantly pursue Japanese language studies due to the perceived utility in enhancing career prospects and securing employment opportunities. This utilitarian motivation is further reinforced by the increasing number of Filipinos taking Japanese language proficiency tests, such as the JLPT and NAT-TEST, a trend that has seen a remarkable upsurge in participation over the years, indicative of the growing importance placed on Japanese language proficiency for work and migration opportunities in Japan (Galve, 2022).

Moreover, the encouragement from diplomatic channels, as evidenced by Ambassador Kazuhiko Koshikawa's exhortations, emphasizes Nihongo proficiency's role in providing a competitive edge for Filipino youth in scholarship and job applications in Japan (Rocamora, 2023). This perspective is complemented by the academic findings of Quintos (2022), who identified specific linguistic challenges faced by Filipino learners, such as vocabulary limitations and the lack of cultural context, which hamper the mastery of the Japanese language. These educational hurdles underscore the need for innovative teaching strategies and learning resources that cater to the unique needs of Filipino students.

The strategic partnerships and agreements between the Philippines and Japan, aiming to elevate bilateral relations to new heights, further contextualize the importance of

Nihongo education within the framework of broader socio-economic and defense cooperation (Dominguez, 2023). This multifaceted relationship, bolstered by shared interests and collaborative ventures, underpins the rationale for examining the challenges and opportunities inherent in the Japanese Language Center model in the Philippines.

The synthesis of these insights presents a compelling case for the proposed study, underscoring the relevance of Japanese language education in the Philippines as a linguistic endeavor and a strategic component of the Philippines' broader engagement with Japan. Thus, this research aims to bridge the gap in the literature by delving into the operational dynamics of Japanese Language Centers in the Philippines, focusing on identifying pathways for enhancing the effectiveness and accessibility of Japanese language education and its emerging opportunities.

II. METHODOLOGY

This study utilized the descriptive research design. This quantitative approach was used to systematically examine and quantify the profile and emerging opportunities of Japanese Language Centers (JLCs) in the Philippines particularly in the National Capital Region (NCR).

Quantitative research approaches emphasize objective measurements, such as analysis of statistics or numerical data collection. The survey included purposively chosen (Suba, 2018), thirty (30) Japanese language centers. Data are acquired from the respondents using several techniques, including surveys and questionnaires (Creswell, 2009). Quantitative studies can also involve interpreting previously collected statistical data using various methodologies. This method is based on obtaining statistical data to extrapolate it across a population of individuals and provide information on a certain occurrence (Barbie, 2010). Data collection was conducted using a structured survey method, which allows for a broad and efficient gathering of data across the targeted geographic area. The collected data was analyzed using appropriate statistical tools.

III. RESULTS AND DISCUSSION

1. Demographic Profile of the Japanese Language Centers (JLCs)

Table 1 shows the socio-demographic profiles of the respondent JLCs.

Table 1. Demographic Profile of the Respondents

1. Years of Existence	Frequency	Percent
1 to 2 years	10	33.3
3 to 4 years	11	36.7
5 years and above	9	30.0
Total	30	100.0
2. Number of Employees	Frequency	Percent
1 to 10	17	56.7
11 to 20	13	43.3
Total	30	100.0
3. Annual Gross Income	Frequency	Percent
50,000 to 100,000php	10	33.3
101,000 to 200,000php	6	20.0
201,000php and above	14	46.7
Total	30	100.0
4. Starting Capital	Frequency	Percent
101,000 to 200,000php	15	50.0
201,000php and above	15	50.0
Total	30	100.0
5. Types of Services Provided	Frequency	Percent
N5-N4 Level Japanese Course	24	80.0

Prometric Review	0	.0
Japanese Language Proficiency Test Review	6	20.0
Japanese Language Tutorial	0	.0
Total	30	100.0

Data in Table 1 revealed that most JLCs have existed for 3 to 4 years, representing 36.7% of the total respondents. This indicates that a significant portion of the respondents are relatively young but established businesses. A slightly smaller group (33.3%) are even newer, having been in operation for just 1 to 2 years, showing a trend of emerging businesses. Meanwhile, 30% of the organizations have existed for over 5 years, indicating a balance between new and more experienced businesses.

A majority (56.7%) of businesses operate with a small workforce of 1 to 10 employees, suggesting that these are likely small enterprises, possibly with a limited operational scope or budget. The remaining 43.3% of businesses employ between 11 and 20 people, which may reflect medium-sized operations with slightly larger capacities or service offerings.

The annual gross income varies widely among respondents. The largest proportion (46.7%) reports earning more than 201,000php annually, indicating a considerable income for nearly half of the businesses. On the other hand, 33.3% of businesses earn between 50,000 and 100,000php, and 20% earn between 101,000 and 200,000php. This shows income disparity, with a notable number of businesses generating higher revenue while some operate with a modest income.

There is an equal distribution of starting capital among businesses, with 50% having begun with a capital between 101,000 and 200,000php and the other 50% starting with more than 201,000php. This suggests that businesses in this sector require substantial initial investments, with no significant difference in capital needed to start operations, regardless of their success or longevity.

A vast majority of businesses (80%) offer N5-N4 level Japanese courses, highlighting a strong focus on entry-level Japanese language education. Only 20% offer Japanese Language Proficiency Test (JLPT) reviews, which are more specialized services. Interestingly, none of the businesses provide Prometric reviews or general Japanese language tutorials, suggesting a niche focus on specific Japanese language certification preparation rather than broad tutorial or technical review services.

In other words, this demographic profile data shows that most businesses in this group are fairly new and small, with only a few employees. Their income varies, with some earning quite a bit and others making less, but they all seem to need a decent amount of money to get started. According to Lawrence's (2015) study, a "combination of priorities is necessary with technology adopted to improve the use of labor and materials" for owners/managers of small businesses. Most of these businesses focus on teaching beginner-level Japanese language courses, and only a few offer other types of services like test reviews or more advanced language support.

2. Emerging Opportunities for the Japanese Language Center (JLC) in terms of the Business Aspects

Table 2.1 Marketing

Marketing	WM	Verbal Description
1. Our marketing strategies create great opportunities for attracting new students.	3.43	Very Good Opportunity
2. Our marketing approach effectively reaches potential students.	3.35	Very Good Opportunity
3. There are many growing opportunities in the demand for learning Japanese.	3.48	Very Good Opportunity
4. Our marketing efforts effectively engage with the right target groups.	3.59	Very Good Opportunity
5. We regularly evaluate our marketing campaigns to identify areas for improvement.	3.65	Very Good Opportunity
6. Exploring new marketing tools and platforms is beneficial for us.	3.60	Very Good Opportunity

7. Recent market research has uncovered new growth opportunities.	3.83	Very Good Opportunity
Overall Weighted Mean	**3.56**	**Very Good Opportunity**

Table 2.1 presents the identified opportunities of the JLCs in terms of marketing. The overall weighted mean (WM = 3.56) indicates that these marketing efforts are viewed as a very good opportunity for JLCs because they serve as a conduit for Japanese language centers to show off their unique strengths, academic accomplishments, and additional offerings and their compelled marketing strategy attracts potential pupils and their parents, establishing a positive first impression and fostering a long-term connection with the school.

Item 7, "Recent market research has uncovered new growth opportunities." got the highest weighted mean of 3.83 and was interpreted as "Very Good Opportunity." In contrast, item 2, "Our marketing approach effectively reaches potential students." got the lowest weighted mean of 3.35, also interpreted as "Very Good Opportunity."

The findings suggest that the JLC has identified promising growth opportunities through recent market research, which can be leveraged for strategic expansion. However, the effectiveness of the marketing approach highlights the need for a more targeted strategy to capitalize on these new opportunities and effectively engage potential students (Yan & Liu, 2020).

Another significant opportunity for JLCs is the effectiveness in reaching their potential students (WM = 3.35), which can be attributed to their marketing efforts to effectively engage with the right target groups (IWM = 3.59). According to a study by Tyagita (2016), educational institutions' marketing strategies must separate themselves from their rivals by delivering higher-quality services, superior commodities, and superior teacher performance, among other things.

Finally, JLCs is open to using new marketing methods and platforms. As a result, they must consider embracing the newest trends in digital marketing, as it has become a crucial tool for educational institutions seeking to interact with learners, parents, and stakeholders. To remain competitive and efficiently reach their target audience, educational institutions must keep up with the most recent digital marketing trends (Ganesan & Gopalsamy, 2022).

Table 2.2 Technical

Technical	WM	Verbal Description
1. Our technical resources provide excellent opportunities for enhancing operations.	3.68	Very Good Opportunity
2. We do not face major technical challenges that hinder our progress.	3.57	Very Good Opportunity
3. We are well-trained to use our technical systems, improving our operational efficiency.	3.64	Very Good Opportunity
4. Advances in technology greatly benefit our teaching methods.	3.72	Very Good Opportunity
5. Our technical support for students and staff is robust and helpful.	3.59	Very Good Opportunity
6. Plans to upgrade our technical infrastructure offer promising opportunities.	3.53	Very Good Opportunity
7. Embracing new technologies enhances our technical capabilities.	3.73	Very Good Opportunity
Overall Weighted Mean	**3.64**	**Very Good Opportunity**

Table 2.2 shows the identified opportunities of the JLCs regarding the technical aspect. The overall weighted mean (WM = 3.64) indicates that these technical efforts are viewed as a very good opportunity for JLCs, as incorporating technology into education has proven to be a transformative force, transforming traditional classrooms

into dynamic centers of learning and innovation. As JLCs traverse the twenty-first century, it has become clear that technology is more than simply a supplemental tool; it is a crucial enabler with the ability to transform education and raise student accomplishment by implementing proven teaching methodologies.

Item 7, "Embracing new technologies enhances our technical capabilities." got the highest weighted mean of 3.73 and was interpreted as "Very Good Opportunity." At the same time, item 6, "Plans to upgrade our technical infrastructure offer promising opportunities." got the lowest weighted mean of 3.53, also interpreted as "Very Good Opportunity."

Results showed that JLCs integrate technology in their operations to enhance their services, greatly benefiting their teaching methods. This implies that JLCs embraced the importance of using technology in their teaching-learning process.

According to the most recent research into how modern students prefer to use technology and how it affects their learning, it has been discovered that using modern equipment, technology, and tools increases students' learning and interactivity (Raja and Nagasubramani, 2018). They also find that when technology is used, it makes it much more dynamic and entertaining. Technology has four roles in education: it is incorporated into the curriculum, it serves as an educational delivery method, it aids instruction, and it serves as a tool to improve the overall learning process.

Table 2.3 Financial

Financial	WM	Verbal Description
1. Our stable funding sources provide a solid foundation for growth opportunities.	3.70	Very Good Opportunity
2. Financial stability creates a positive environment for expanding our programs.	3.68	Very Good Opportunity
3. Effective budgeting and financial planning enhance our operational opportunities.	3.55	Very Good Opportunity
4. Financial considerations are well-integrated into our strategic decisions.	3.68	Very Good Opportunity
5. Our cost and revenue management practices support continued growth.	3.58	Very Good Opportunity
6. We manage financial risks effectively, ensuring stability.	3.59	Very Good Opportunity
7. Positive financial trends support our strategic development and expansion.	3.61	Very Good Opportunity
Overall Weighted Mean	**3.63**	**Very Good Opportunity**

Table 2.3 displays the identified opportunities of the JLCs in terms of the financial aspect. The overall weighted mean (WM = 3.63) suggests that these financial efforts are considered a very good opportunity for JLCs' strategic management of their finances. Financial decision-making is an important part of corporate management. It entails deciding amongst various options to attain financial objectives. Every action, from budgeting to investing, influences financial stability and development. Financial decision-making includes analyzing possibilities, making decisions, and acting on financial matters. It entails evaluating risks, utilizing existing resources, and integrating decisions with long-term goals. Effective decision-making is vital for financial success, either managing personal money or directing a firm toward success (Martinez, 2024).

Item 1, "Our stable funding sources provide a solid foundation for growth opportunities." got the highest weighted mean of 3.70 and was interpreted as "Very Good Opportunity," while item 3, "Effective budgeting and financial planning enhance our operational opportunities." got the lowest weighted mean of 3.55 also interpreted as "Very Good Opportunity."

Results showed that JLCs' stable funding sources provide a solid foundation for growth opportunities, which gives them effective budgeting and financial planning to enhance their operational opportunities. It only implies that the sources of funding affect their program's stability.

Financial assets are the most powerful instruments for improving both a school's human and physical resources. Aside from curriculum changes and capacity development initiatives, the Department of Education (DepEd) keeps providing additional cash to public schools to assist them in fulfilling their ultimate mission of educating students to grow into better citizens of this nation (DepEd Order No. 13, s. 2016).

Private schools, on the other hand, require working capital to cover routine operating expenses such as instructor and administrator salaries and benefits, academic and sports programs, utilities, repairs and maintenance, printing, copying, and office supplies, IT supplies, services and software, student transportation, and so on. Tuition, supplemental fees and income, and investment income are often used sources of operating capital. When private schools require a big new building, repairs to an existing facility, or other major expenditures on capital, some, but not all, can fund such costs through cash reserves, endowment funds, or contemporaneous contributions. More commonly, instead of postponing the project, institutions turn to loan funding (Gabay, 2022).

Table 2.4 Management

Management	WM	Verbal Description
1. Our management structure provides clear opportunities for efficient operations.	3.56	Very Good Opportunity
2. Effective management practices contribute to smooth operations and growth.	3.45	Very Good Opportunity
3. Our leadership is supportive and promotes a productive work environment.	3.73	Very Good Opportunity
4. Innovative management practices enhance our organizational effectiveness.	3.58	Very Good Opportunity
5. Regular staff training and development programs are beneficial for us.	3.55	Very Good Opportunity
6. Our conflict resolution policies improve workplace harmony.	3.45	Very Good Opportunity
7. Continuous assessment and improvement of our operations support our organizational success.	3.59	Very Good Opportunity
Overall Weighted Mean	**3.56**	**Very Good Opportunity**

Table 2.4 displays the identified opportunities of the JLCs in terms of management. The overall weighted mean (WM = 3.56) suggests that these management efforts are considered a good opportunity for JLC management toward a positive work culture.

Item 3, "Our leadership is supportive and promotes a productive work environment." got the highest weighted mean of 3.73 and was interpreted as "Very Good Opportunity." In contrast, items 2, "Effective management practices contribute to smooth operations and growth." and 6, "Our conflict resolution policies improve workplace harmony." got the lowest weighted mean of 3.45, also interpreted as "Very Good Opportunity."

The findings revealed that JLCs' leadership supports a healthy school culture that encourages student and staff growth. Finally, effective leadership is critical in creating a pleasant work atmosphere. Leaders may foster a healthy workplace by using strategies that stress active listening, offering context, guaranteeing justice, supporting psychological safety, utilizing strengths, exhibiting empathy, and recognizing contributions while encouraging excitement. Such an atmosphere improves the team's well-being and promotes long-term productivity and success. Leaders who perceive themselves as gardeners and nurture their workers with care and attention will witness their organizations grow and improve (Govil, 2020).

Moreover, JLCs' management structure provides clear opportunities for efficient operations, which guides in the effective management practices that contribute to smooth operations and growth of JLCs such as using innovative management practices that enhance their organizational effectiveness.

The findings indicated that maintaining a healthy workplace culture has become a major concern for JLCs in today's fast-paced and competitive work environment. This increases staff engagement, efficiency, and well-being. As a result, JLCs promote cooperation, innovation, and creativity while making employees feel appreciated, respected, and supported.

Alkeaid (2023) stated good leadership is essential for building a positive and productive workplace atmosphere. As a result, leaders play an important role in defining an organization's culture, and their behaviors and mindsets substantially influence their teams' well-being. As a result, their abilities as managers and leaders provide a chance to encourage and enable school-wide teaching competence to accomplish a high rate of advancement for all students.

IV. CONCLUSION

The following conclusions are made based on the findings of this study:

1. A vibrant landscape of Japanese language centers, with a mix of relatively young and more established businesses, primarily operating with small to medium-sized workforces. While there is a notable income disparity among these enterprises, the majority focus on entry-level Japanese courses, reflecting a niche specialization in language education rather than a broader range of services.

2. The Japanese language centers have recognized substantial growth opportunities through recent market research, emphasizing the importance of refining their marketing strategies to effectively engage potential students and remain competitive in a rapidly evolving digital landscape.

3. The Japanese language centers recognize the transformative potential of technology in education, viewing it as a vital opportunity to enhance their teaching methods and improve student outcomes.

4. The Japanese language centers view stable funding sources as a crucial foundation for growth, underscoring the importance of effective financial decision-making and planning in enhancing their operational opportunities.

5. The Japanese language centers perceive their management practices as a valuable opportunity to foster a positive work culture, highlighting the significance of supportive leadership and effective management in promoting productivity and harmony within the workplace.

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The Application of Corpus Data-driven Learning Model in College English Language Teaching in China

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Abstract— *In recent decades, corpus linguistics has developed rapidly, and corpus data-driven learning has provided new ideas for English language teaching research and practice. The concept of data-driven learning highlights the advantages of corpus in assisting language teaching and cultivating students' autonomous learning ability, research ability, and ability to use modern information technology. China's college language English teaching is still confined to the traditional teaching model, and corpora are rarely used for teaching innovation. Starting from the concept of corpus and data-driven learning and the actual teaching needs, this paper briefly introduces the necessity of implementing this learning concept in college English language teaching of vocabulary, grammar, translation and writing, in order to promote corpus-assisted English language learning in college English classrooms and improve the advanced and innovative nature of Chinese college English language teaching.*

Keywords— ***data-driven learning; corpus; college English language teaching; China***

I. INTRODUCTION

Corpus linguistics is the use of computer technology to systematically describe and explore a large amount of real language or language variants, including its linguistic features, contextual meaning, pragmatic functions, etc. With the help of computer retrieval advantages, intuitive observation interface and huge amount of language information, corpus linguistics has become one of the main means of language research and teaching (Chen & He, 2017). Data Driven Learning is a language learning concept proposed by Tim Johns, which is based on the research results of the Collins COBUILD research project led by John Sinclair, the founder of corpus linguistics at the University of Birmingham in the UK. The core of the concept is to use information technology and a large amount of corpus data to allow students to observe and summarize language usage phenomena (Xu & Zhang, 2019).

The concept of data-driven learning highlights the advantages of corpora in assisting language teaching and cultivating students' autonomous learning ability, research ability and ability to use modern information technology. In language teaching, there are two main purposes for using this learning method: first, corpus linguistics emphasizes that meaning and function exist in context. Therefore, from the perspective of learning content, through index lines, students can more intuitively explore and discover the form, meaning and function of language through context (Lin & He, 2019); second, from the perspective of learning and teaching methods, this learning method emphasizes student-centeredness and challenges the traditional foreign language teaching concept centered on teachers and textbooks. In other words, data-driven learning requires teachers not to directly and explicitly convey information and knowledge to students, but to act as guides and collaborators, control the teaching process, and cooperate with students' knowledge input and output in a research and exploration manner. This language learning method is in line with the student-centered and teacher-led education policy, which is conducive to training students' ability to discover problems and think independently. When the concept of data-driven learning was first proposed, it was not widely recognized. However, with the application and popularization of computer technology and corpus technology in foreign language teaching, the importance of data-driven learning has become increasingly apparent (Talai & Fotovatnia, 2012).

II. CORPUS DATA-DRIVEN LEARNING CONCEPT AND ITS CHARACTERISTICS

The characteristic of corpus linguistics is to observe language features from a huge amount of real texts through frequency, collocation and index lines. Constructivist learning theory believes that the acquisition of language knowledge is not a simple process from teachers to students, but a process of discovery and exploration by students themselves (Zhou, 2009). Teachers need to build connections between new and old knowledge, and guide students to make positive transfers based on existing knowledge, experience and cognitive structure, so as to promote the formation of students' independent exploration motivation and master new knowledge. The data-driven learning concept based on corpus has the above characteristics. First, this learning concept uses real corpus as language input through corpus index lines. Secondly, the data-driven learning concept requires learners to be centered and autonomous learning to be the main focus. Students should self-manage, self-monitor and self-evaluate in the learning process. Finally, this is a bottom-up inductive learning method. Students need to find rules from a large amount of language data. This process can not only deepen their understanding of language knowledge, but also train their ability to explore the essence from the phenomenon (Sinclair, 2004).

The lexical grammar theory proposed by Sinclair (2004) includes five elements: node words, collocation, colligation, semantic tendency, and semantic prosody, which are the basic components of corpus linguistics research. Therefore, the implementation method of data-driven learning also corresponds to these five hierarchical systems. Specifically, it mainly includes the following methods and steps.

2.1 Searching for node words and observing concordance

This method mainly involves importing the target corpus file into the corpus analysis software, searching for node words, and presenting an index line on the interface. Students can intuitively observe the frequency of occurrence and context of the node words through the search results, and deduce their contextual meaning and function.

2.2 Analysis of collocation and colligation

The study of collocation is mainly based on the phrase concept of corpus linguistics, and the co-occurrence characteristics of language are understood through the analysis of frequency and contextual meaning. Sinclair (1991) defined collocation as "the co-occurrence of two or more words within a short distance in a text", that is, the words that co-occur at the same time have contextual meaning; the collocation concept proposed by Wei (2002) emphasizes the frequency feature, "a sequence of words that realize certain non-idiomatic meanings in the text and are used in a certain grammatical form in a certain way, and the words that constitute the sequence are mutually expected and co-occur with a probability greater than chance", that is, collocation in the statistical sense. As an important concept of word collocation in corpus linguistics, colligation refers to the combination of language between lexical and grammatical categories, that is, the co-selection relationship between words and grammar. Corpus linguistics research uses colligation to describe the grammatical structure at the horizontal combination level. "Class connection is not an abstraction parallel to word collocation, but a higher level of abstraction" (Wei, 2002; Zhen & Li, 2017). For example, "turn a blind eye to" reflects the lexical grammatical structure of "turn + a + ADJ + NOUN + to", that is, the colligation. The corpus gives the vocabulary collocation suitable for the real context according to the frequency, presenting its contextual meaning. This learning method can enable students to learn more authentic language expressions.

2.3 Understanding semantic preference and semantic prosody

Sinclair (2004) proposed that a meaning unit is composed of a main word and a class of words that often co-occur with this word, and has relatively stable semantic characteristics, which forms semantic tendency and semantic prosody. The speaker's point of view and attitude can be expressed through semantic rhyme. Therefore, recognizing and learning semantic tendency and semantic prosody can help us master accurate and appropriate language forms for communication while avoiding making up collocations according to grammatical rules (Gao & Wei, 2020).

The above series of operations based on data-driven learning allow students to see a large number of real language samples while being immersed in the situation. Classroom teaching and language learning planned in this way reflect the information and high-tech nature of modern education. In theory, it will improve students' ability to explore, summarize and learn independently. However, applying them to the practice of foreign language teaching has both gains and difficulties.

III. CORPUS DATA-DRIVEN LEANING AND ENGLISH VOCABULARY TEACHING

Since the concept of corpus was created in the 1960s, linguists have been exploring the use of electronic corpora to analyze language and gradually applying them to classroom teaching. Johns (1991) coined the term data-driven learning (DDL), and advocated corpus-based inductive "data-driven learning", which can help teachers guide students to use the index line function in the corpus to conduct independent research, thereby enriching students' vocabulary. By searching for synonyms of keywords that students use a lot, teachers can present vocabulary in the same semantic field to help students master the diversity of the vocabulary based on specific contexts. In addition, teachers use corpus-based data-driven learning methods to compare the definitions and collocations of easily confused vocabulary, deepen students' understanding of the meaning and usage of the vocabulary in multiple contexts, and thus help them distinguish and understand the meaning of words.

Later, many scholars use corpora to analyze vocabulary association and collocation, and explore their application in vocabulary teaching (Cobb, 1997; McEnery & Wilson, 1997; Nesselhauf, 2006; Barfield & Gyllstad, 2009). Cobb (1997) explores whether corpus-based classroom vocabulary teaching can produce obvious learning effects. This study first proposed the vocabulary learning hypothesis, which is to use corpus vocabulary indexes to learn vocabulary usage presented in different contexts. Studies have shown that when learners use vocabulary indexes, they will improve the accuracy of their vocabulary usage, which verifies that applying corpora to vocabulary teaching will produce positive learning effects. Nesselhauf (2006) mainly studies the vocabulary collocation in the English corpus of second language learners, explores the mistakes that learners are prone to make when using vocabulary collocation, and analyzes which factors affect the mastery of vocabulary collocation and ultimately affect language learning. In addition, related studies use corpora to strengthen vocabulary learning, explore the learning strategies and effects of vocabulary collocation and association, and provide practical suggestions based on this (Chen, 2013; Ground, 2019; Ghalebie et al., 2020). Reka & Eniko (2022) focused on the application of specific-purpose corpora in the research of English major vocabulary teaching. The study found that specific-purpose corpora can provide vocabulary learning support for learners and teachers.

Research shows that Chinese English learners have far more misused parts of speech than foreign learners, both in terms of the total number of misused parts of speech and the types of misused parts of speech involved. In college English language classes, how to help students explore and summarize language usage rules from real language data is a major challenge faced by Chinese college English teachers in their teaching. Traditional auxiliary English vocabulary teaching tools, such as textbooks, dictionaries, reference books, and English teachers' sense of language are all lacking in helping students fully understand and correctly apply English vocabulary. The examples in textbooks and dictionaries are relatively limited, so they can only provide limited meanings, usages, and grammatical collocations of target vocabulary. The comprehensiveness of the corpus with its huge amount of data and the convenience of using technology can help solve this problem.

In order to enable students to express their ideas better, teachers can use the DDL teaching model in teaching, find specific collocations from the BNC corpus, and help students understand and master more skills in using the language. The word "problem" is an important part of "solve the problem". When the information of "problem" is extracted from the BNC corpus, 568 index lines are extracted after screening. Among them, the most common verb collocations of "problem" are: tackle, unlock, remove and conquer. After careful comparison and study, students find that the words on the index line are used in daily life, and they also realize that there are some shortcomings when using these daily words. The collocation mentioned in the above example is a language technique that can help students better understand the words in the text and combine them in a more effective way. This technique makes the relationship between words that is not accidental become closer. To master this language technique, we must start with the formal characteristics of word collocation, such as the similarity between phrases, mutual expectations and attraction, and the similarity of collocation components, because these are important aspects of word collocation research. The corpus can be used to more effectively guide students to use common phrases for learning. For example, teachers can guide students to study the collocation of "absolutely" with other common adjectives in the BNC corpus and find out the common points between them: indicating the characteristics of a certain thing to a certain extent, such as "sure" and "certain"; referring to the judgment of the characteristics of a thing, and other terms that help describe people, things, and objects.

The collocation function in the corpus is usually displayed in the form of spans. The target vocabulary is used as a node word (or central word), and the number of words around the central word is set. The sum of the number of words on the left and right is the span. The words that appear at each position in the span belong to the collocation words of the target vocabulary. By observing the frequency of the target vocabulary and these collocation words, we can grasp the collocation rules, collocation patterns or habitual collocation usage of the target vocabulary, so as to understand the semantic characteristics (i.e. semantic prosody) or semantic tendency of the vocabulary. The submodule “collocation” in the multilingual database comprehensive platform can realize this function and can be directly applied to the collocation teaching of college English classroom.

Taking the central word “rule” as an example, in the British National Corpus (hereinafter referred to as BNC), the language is selected as English, the number of words in the left and right intervals of “rule” is set to 5, that is, the span is 10, and punctuation is enabled as stop words to reduce interference with the results. According to the query results, the maximum frequency value of the words in each span position is sorted out, and the following results are obtained: the central word “rule” appears 336 times in the platform database, and the top three collocations with it are right 1 “of” (305 times), right 2 “law” (288 times), left 1 “the” (223 times). From this observation, it can be identified that “rule of law” is a fixed collocation usage, meaning “法制 (fǎ zhì)”. Teachers can also show students specific examples of this collocation and its usage in different contexts through the KWIC (Key Word in Context) or index line function. In addition, the system can automatically generate cloud maps for vocabulary collocation, presenting the vocabulary collocation to users in a visual form. The closer the vocabulary is to the central word, the closer the relationship between the vocabulary and the central word is, and the higher the frequency of collocation in specific applications.

The above discussion shows that when teachers apply real examples in the database in college English language classes, it not only provides a scientific basis for teachers’ teaching, but also allows students to learn more authentic and customary expressions based on examples and context, ultimately improving teaching and learning efficiency.

IV. CORPUS DATA-DRIVEN LEARNING AND ENGLISH GRAMMAR TEACHING

When people learn a second language, they can significantly improve the effect of language learning by mastering certain grammatical rules. Therefore, grammar teaching is very important in English language teaching. According to relevant surveys and studies, although most Chinese college students have a certain concept of English grammar, less than one-fifth of students have a clear concept of English grammar, and some students even have no concept of grammar at all. In the process of learning a language, they rely entirely on their sense of language or reading Chinese translations. At the same time, the main purpose of most students learning English grammar is to take exams, and only about one-fifth of students learn grammar to improve their English literacy. At present, most students say that they have great difficulties in learning grammar, but they all want to improve their grammar level. The main way for students to improve their grammar level is still to rely on teachers' teaching and reading grammar books, or a large number of grammar exercises. The learning effect of this kind is often not good. Students' grammar learning is prone to fall into the misunderstanding of taking exams, and it is difficult to achieve positive transfer for the use of language in real scenarios. Therefore, in order to improve the effect of English grammar teaching, improve the accuracy of language learning, and realize the combination of language form, meaning and pragmatics, it is necessary to introduce corpus into English grammar teaching.

When teaching sentence patterns, Chinese college English language teachers are accustomed to conducting a large number of sentence pattern conversion exercises of affirmative sentences, negative sentences and interrogative sentences in the teaching process to strengthen students' proficiency in a certain sentence pattern. For example, when students learn the *there be* sentence pattern, they will do a lot of negative sentences *there be not* exercises according to the teacher's requirements. However, after searching various types of existential sentences (*there be* sentence patterns) on BNC, it was found that among the 186,030 examples of existential sentences (*there be* sentence patterns) retrieved, negative sentences only accounted for about 1.1% of the total. It can be seen that native English speakers generally use the *there be* structure in affirmative sentences and interrogative sentences in actual applications, and rarely use its negative form. In addition, the frequency of *there be* sentence patterns in academic English is extremely low. Language teaching separated from the corpus is inevitably lacking in accuracy and may mislead students to a certain extent. Kennedy (2000) believes that the frequency of a language phenomenon in the corpus should be the only criterion that can affect language teaching. In addition, according to the description of traditional English grammar, some is used in affirmative sentences, and any is used in negative sentences or interrogative sentences. Tognini-Bonelli used the Birmingham English Corpus to search and count, and extracted 35 of the 21,636 index lines of *any*, and found that a total of 19 *any* were used in negative and interrogative sentences, and the remaining 16 *any* were used in affirmative sentences, accounting for 46% of the total (Tognini-Bonelli, 2001: 15-17). It can be seen that the description of the use of *any* in traditional grammar is not accurate or complete. The use of *any* in affirmative sentences is an objective grammatical phenomenon, and English learners can use it boldly without hesitation because of concerns about the grammatical rules taught by teachers in class.

For another example, there is a rule in traditional grammar: in a clause introduced by the conjunction *that*, if the clause introduced by *that* is a direct object or complement, *that* is often omitted in informal usage. However, it is difficult for learners to grasp what frequency "often" refers to and how *that* is omitted in formal language based on the above general description. Corpora can provide learners with comprehensive and reliable statistics. The Longman Corpus mainly includes several domains such as conversation, news and academic articles. The search results of *that* clauses in the Longman Corpus show that in conversation, the proportion of that omitted in *that* clauses is about 85%; in news reports, *that* is omitted in about 25%; and in academic articles, it is very rare to omit *that*. In addition, regarding the omission of relative words, traditional textbooks often give a general rule explanation, that is, relative words are often omitted in informal styles such as spoken language. However, neither teachers nor scholars can give a clear explanation of what frequency "often" refers to. The search results of the Longman Corpus show that in conversations, about 25% of relative clauses omit relative words; in academic articles, only about 10% of restrictive relative clauses omit relative words. Of course, there are also omissions in the four domains of conversation, novels, news, and academic articles. When the subject of the relative clause is a pronoun, 60% to 70% of the relative clauses omit relative words; when the subject of the relative clause is a noun phrase, 80% to 95% of the relative clauses retain relative pronouns. After understanding the specific distribution and frequency of these grammatical rules in different domains, learners may have a more comprehensive, accurate, and in-depth grasp of the usage of that clauses and relative word omission.

It can be seen that compared with traditional grammar teaching, corpus-based grammar research observes the language actually used by native English speakers in different registers, and the units of description are grammatical meaning units including vocabulary and structure, which provides a more accurate and intuitive basis for language learners.

V. CORPUS DATA-DRIVEN LEARNING AND TRANSLATION TEACHING

With the popularization of machine translation, the statistical suggestions provided by corpora have begun to be valued. Parallel corpora used in translation can provide detailed language examples for translation teaching and improve the accuracy of translation (Liu & Li, 2020). Mona Baker (1995) was the first to combine corpora with translation teaching. Subsequently, foreign scholars such as Olohan (2004) and Gallego-Hernández (2016) discussed the index line resources, co-existing examples and their significance provided by corpora. Chinese scholars have also put forward improvement suggestions from the aspects of translation teaching design and teacher-student interaction mode, and have given an implementation plan for corpus-assisted translation teaching (Xiao, 2005; Qin & Wang, 2007). As a scientific and technological product in the era of information intelligence, corpus translation technology is an efficient translation tool that helps improve translation efficiency and empower cross-cultural communication. There is a broad space for exploring the integration of corpus translation technology into translation teaching. In the process of translation classroom teaching, by introducing professional field corpora, students can better master the correct expression of professional terms and effectively improve their professional translation ability and cross-cultural communication ability.

In traditional translation teaching, it is difficult for students to fully understand the original text, especially the original text with very new content, only relying on textbooks, dictionaries or translators' intuition. The powerful search function of monolingual corpora provides a good solution to this problem.

After being elected as the mayor of Boston, Chinese American Wu Mi said in her speech: We're ready to be a Boston where all can afford to stay and to thrive. And yes, Boston is ready to become a *Green New Deal* city.

Many students cannot understand *Green New Deal* in the above example. Through Baidu Encyclopedia, we can find that its corresponding Chinese expression is "绿色新政（lǜ sè xīn zhèng)", but the original English background information of the system is difficult to obtain, and students still have a vague understanding of the connotation of this concept. If we use the search function of the corpus, this problem will be solved. Take the Corpus of Contemporary American English (hereinafter referred to as COCA) as an example. Enter *Green New Deal* in the search box on the homepage of the corpus, and soon get 246 search results arranged in reverse chronological order (2019-2008). The relevant materials come from speeches, blogs, magazines, news, etc. The first three search results appeared in 2008, two of which came from *The Washington Post* and the other from the *Christian Science Monitor* (CS Monitor). The former is the most influential daily newspaper in the United States, and the latter is an internationally renowned news organization. After these two media reported information related to the *Green New Deal*, other magazines, blogs, and speeches also appeared with related content. Using the context function of COCA, translators can click on each search result as needed to view the complete relevant news reports and obtain the original English information about the *Green New Deal* to have a more comprehensive understanding of this concept. Taking the 246th collection result with the earliest publication time as an example, the context function of COCA shows that the concept of *Green New Deal* was first published in the article "World wants green action, despite costs" on page 25 of the Christian Science Monitor on November 20, 2008. The article focused on the importance of energy conservation and renewable energy to revitalizing the economy and emphasized the inevitable connection between green development and national sustainable development.

It can be seen that by analyzing the data in the corpus, we can obtain information about the frequency of use, collocation rules and context of various words, phrases and sentences, find common expressions under specific topics, and learn from the words and sentence patterns of native speakers, which can better help translators understand the usage and habits of the target language, so as to choose the most appropriate expression and improve the accuracy and fluency of translation. At the same time, compared with the traditional teaching model, the corpus-assisted translation teaching model can allow students to have a more intuitive feeling and deeper thinking about the correct selection and use of corpus, and improve their independent learning ability, collaborative communication ability and inquiry learning ability in the process of continuous discovery and exploration.

VI. CORPUS DARA-DRIVEN LEARNING AND ENGLISH WRITING TEACHING

There are a large number of empirical studies on the application of data-driven learning methods to improve the writing ability of second language learners abroad. The research is relatively in-depth, the specific content of the research is more detailed, and there are relatively more quantitative analyses of experimental results. Vyatkina (2016) studied the effect of data-driven learning of collocation on the expressiveness, proficiency and perception of second language learners' writing, combined a variety of outcome measurement methods, and measured delayed learning outcomes. Walker (2017) proved through empirical research that students' direct exposure to the corpus MICUSP (Michigan Corpus of Upper-Level Student Papers) can help reduce errors in the use of English conjunctions. Mao et al. (2018) let students directly contact corpora such as BNC, COCA and English-Chinese Parallel Corpus in writing classes to examine the validity of data-driven learning methods in college English writing classes, and used questionnaires to understand students' attitudes towards this new learning method. Li (2017) explored the impact of direct use of corpora on learners' collocation ability in academic writing. In recent years, although there have been some studies on the application of data-driven learning methods in English writing teaching in China, the overall number is small and the influence is relatively small.

Many Chinese universities still use traditional methods to teach writing, such as lecturing on theories, analyzing model essays, centralized review, and teacher face-to-face review. In such traditional writing teaching, the interaction between teachers and students is not smooth, the student participation is not high, the classroom atmosphere is not good, and it is difficult to stimulate students' interest in writing. The introduction of corpus can greatly improve the effect of writing teaching. In the corpus, learners can retrieve specific words, phrases, sentences and other real language examples to understand their language rules and expression patterns, and enhance language acquisition. The corpus breaks the rigid pattern of traditional writing teaching, and encourages students to find language examples in the corpus, verify their language expression methods, and drive students to write independently.

In English writing, students can learn, draw lessons from and apply verbal expressions with the help of corpora. For example, for the sentence "As time went by, my confidence increased slowly", when we cannot confirm whether the expression is authentic, we implant it into the COCA free English corpus for verification. Enter "my confidence increased" in the result query area and the result is "zero". This means that there is no similar verbal expression example in the entire corpus, that is, the expression is unacceptable. We can enter different words or phrases in the query area, click on the index bar information respectively, and the related examples will be displayed. Different example results can help us correct the above hypothetical statement: "As time went by, my confidence grew slowly".

The extensive content and feature-rich search tools of corpora such as BNC provide valuable resources and support for professional English writing teaching. First, corpora such as BNC contain samples from a variety of text types, and students can find collocations of target vocabulary in different contexts and themes. This helps students to understand the usage of words in a comprehensive way, rather than just being limited to a specific field or theme. Second, the keyword search function of BNC enables students to easily find collocations of target vocabulary. This greatly improves their writing efficiency because they can quickly find the information they need without flipping through a large amount of text or relying on traditional paper dictionaries. This real-time, customized collocation search tool can meet the specific needs of students in the writing process. Third, corpora such as BNC provide examples of whole sentences using the target vocabulary collocation. By viewing the complete sentences, students can better understand the grammar and context of the collocation. This helps students to organically integrate these collocations into their own writing to ensure that the sentences are smooth and grammatically correct. In addition, word frequency information in corpora such as BNC provides students with insights into the frequency of using a certain collocation, which can help students determine which collocations are most common in their writing, so that their articles are more natural and in line with the actual usage of English. This data-driven approach helps students avoid using overly stiff or uncommon word combinations and improves the quality of their writing. Finally, actual grammatical examples from corpora such as BNC can help students better understand the grammatical rules and context of word collocation. This enables them to more confidently choose appropriate vocabulary collocations and incorporate them into their own writing. By learning from actual examples, students can improve their language skills in practice, which is essential for professional English writing.

In short, using corpus to teach English writing is a relatively novel and effective teaching method. This model can solve some of the problems that plague English writing teaching to a certain extent. For teachers, using corpus to teach writing can well make up for the defects in language textbooks and achieve flexible use of language; for students, corpus writing can improve writing enthusiasm, and through self-searching, they can also better master the use of target vocabulary.

VII. CORPUS DARA-DRIVEN LEARNING AND ORAL ENGLISH TEACHING

The use of online multimedia corpus indexing system in oral English teaching is to use online graphics, animation, sound and video and other information integration methods to form document materials to assist teaching and improve the efficiency of students' oral learning. This feature is not available in traditional pure text corpora. Online corpus materials are vivid, rich and full of content. Teachers and students can more easily obtain targeted corpus to assist teaching in the process of teaching and learning, making what is taught and learned more effective, and fundamentally promoting the improvement of students' oral ability.

Phonetic problems are a major problem in oral teaching. In teaching practice, many students do not have enough recognition of phonetic symbols and have no awareness of connected reading and meaning groups. They ignore the intonation problem in oral expression and tend to say words one by one and stiffly, while skipping the meaning groups and connected reading parts composed of words. This not only makes the expresser lose confidence and gradually no longer want to speak English, but also makes the audience lose patience, directly or indirectly causing various misunderstandings in communication. To address this problem, teachers can use the convenience of the online system to insert various videos or audio clips that are suitable for students' levels and that they like into oral teaching for students to learn and imitate. For individual difficult sentences, the stressed and connected parts should be marked so that students can practice repeatedly with key points. This can not only improve students' pronunciation and intonation, but also enhance their understanding of English culture and improve students' oral literacy as a whole.

To achieve effective communication, the accumulation of vocabulary and the correct use of grammar are indispensable elements. In oral communication, students often realize that their vocabulary is extremely limited. Even if they have their own opinions on certain topics, they cannot communicate fluently due to limited vocabulary. Insufficient vocabulary and outdated vocabulary greatly hinder students' enthusiasm and initiative in free communication. Frequent grammatical errors are also a major difficulty in students' oral learning, which seriously affects the communication effect. In teaching, teachers should obtain daily high-frequency words and grammatical points that are suitable for students' acceptance ability through the online corpus retrieval system, and insert relevant videos, animations and other courseware in multimedia corpora into teaching in a targeted manner to present knowledge in a multimodal manner. In this way, key knowledge is more intuitive and visual, which promotes students' comprehensible input, and further guides and encourages students to fully and diversely apply daily high-frequency vocabulary and oral sentence patterns in actual oral communication, and constantly achieve internalization and appropriate use.

Flexible and diverse use of discourse markers can ensure the natural fluency of language. However, most Chinese English learners use such language markers too much or too little, and even use them indiscriminately, such as you know, well, so, I think, etc., which affects the meaning of the text to a certain extent. In daily oral learning and training, students do not pay attention to the acquisition of pragmatic knowledge of markers, and their awareness of the use of marker language blocks is not strong enough, and their output is insufficient, resulting in stiff language expression, inappropriate communication, and inappropriate consequences. In this regard, teachers should strengthen the training of college students in the use of markers, collect the language phenomena of various online markers and the markers that appear in the text of student conversation recordings, and form a teaching corpus of oral markers. In daily oral teaching, teachers can use typical examples to explain the pragmatic functions of markers to students, gradually cultivate students' awareness of marker use and strengthen students' ability to use markers correctly and appropriately in discourse communication.

Traditional English teaching overemphasizes exams and does not pay enough attention to oral practice, resulting in the fact that most Chinese students have the ability to "talk on paper". Once they actually use English to communicate with others, they will be timid. Sometimes they are so nervous that their minds go blank and they can't speak. Even if some students with strong psychological qualities can communicate with others orally, their English oral practice is too written, and they pay too much attention to details such as whether the structure is rigorous, whether the language is accurate, and whether the use is standardized, resulting in insufficient timeliness in English speaking. Once the other party's words exceed the scope of their own knowledge, it is difficult to continue the communication. The key to oral communication in English is fluency, not fancy words. When teaching oral English, teachers should pay attention to the accumulation of students' daily language, not just the accumulation of written language, to avoid students developing a mode of thinking of using written language for dialogue. By increasing "interesting knowledge" through online multimedia corpus, various topics of oral knowledge can be pushed to students in a regular manner in the form of small modules, which can accumulate little by little and continuously enhance students' awareness of the use of oral words and sentences. Online indexing of various types of oral learning resources can create a personalized learning atmosphere for students, experience authentic foreign languages, stimulate interest in oral learning, master common language blocks, and lay a solid foundation for good communication.

Obviously, network technology can not only be applied to teachers' classroom teaching, but also help students to study independently after class. As far as college English oral teaching is concerned, the multimedia corpus indexing system provides college students with equal opportunities to listen to classes to a certain extent, making teachers' teaching more flexible and the quality of teaching higher. Therefore, teachers should make full use of information technology, develop educational and teaching resources, help students expand learning channels, improve learning methods, and improve learning efficiency.

VIII. CONCLUSION

In summary, scholars and educators in China and abroad have conducted in-depth and extensive explorations on the concept and practice of data-driven learning, and on this basis have drawn similar conclusions and teaching inspirations. For example, by comparing the differences in language use between students and native speakers, searching for high-frequency collocations, and helping teachers and students master authentic word collocation behaviors; at the same time, in vocabulary teaching, we should not ignore the contextual meaning of vocabulary due to excessive attention to the size of students' vocabulary, but actively use the corpus to search for conventional word blocks, and learn to memorize words efficiently in context . The reasonable use of data-driven learning methods can fully mobilize students' enthusiasm, give full play to their initiative, give students enough space for thinking and expression, cultivate divergent thinking, improve students' ability to use their hands and brains, and achieve the established teaching goals.

In language teaching, any method must overcome some obstacles when applied in practice, and data-driven learning is no exception. Many teaching research practices have found that the acceptance of corpus technology by students at different stages will affect its role in the learning process. The higher the language ability and level of students, the better the mastery of data-driven learning methods, while learners with lower language levels do not accept this method well. In response to this problem, Sinclair (2003) suggested bringing texts retrieved and screened from the corpus to the classroom for discussion with students, and gradually operating them in person, so that students can more easily master data-driven learning methods, become familiar with the principles and functions of corpora, and accelerate their learning progress. Therefore, in the classroom of data-driven learning, teachers should not only have basic knowledge of corpus linguistics theory and the use of corpus tools, but also guide students to reasonably arrange the use of corpora for independent exploration when using data-driven learning teaching methods, and explain the functional rationales behind different language examples in a simple and easy-to-understand way, so that students can be familiar with this learning method, improve their interest in learning and their ability to use language comprehensively. This is undoubtedly a challenge for the teachers' prior knowledge reserves, lesson preparation, and classroom control and coordination abilities.

Driven by science and technology, corpus linguistics research has been developing rapidly, and foreign language teaching research and practice based on corpus linguistics have also been widely valued and applied. In the era of rapid development of information technology, data-driven learning methods are expected to become mainstream. For students, the use of corpus tools can solve many uncertain vocabulary usage, sentence expression and other problems. For teachers, the teaching model based on data-driven learning helps to achieve advanced, innovative and challenging teaching goals. It should be pointed out that although data-driven learning is a teaching method advocated by many experts and scholars, it is still in the exploration and trial stage. It still requires teachers and students to boldly try, make full use of all corpus resources, and conduct in-depth data-driven learning and teaching research to broaden the road for English language teaching.

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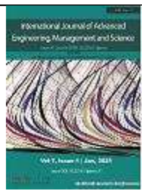

Analysis of Telecom Projects using Agile Framework

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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.

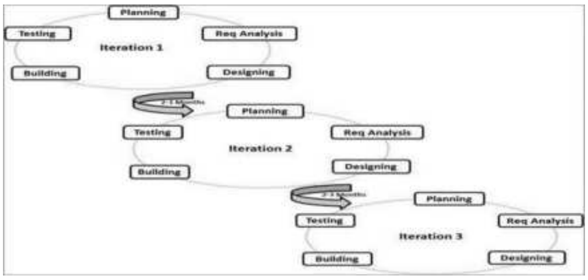


Fig 1.1: Agile Development Model

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.

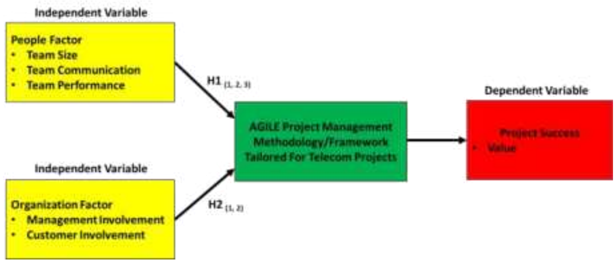


Fig 3.1: Conceptualized Model

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						Total
		Less than or equal to 30	31 - 35	36 – 40	41 – 45	46 - 50	Above 50	
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

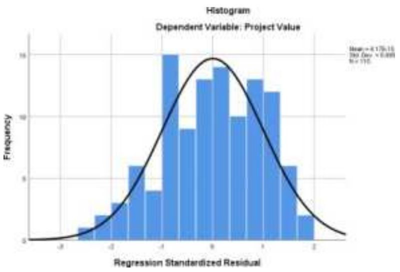
		Project Value	Customer Involvement
Project Value	PC	1	.323**
	Sig. (2-tailed)		.001
	N	110	110
Customer Involvement	PC	.323**	1
	Sig. (2-tailed)	.001	
	N	110	110

**. 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	.253ᵃ	.058	.049	.47733	.058	7.498	1

Tab 4.21: Team Size & Project Value

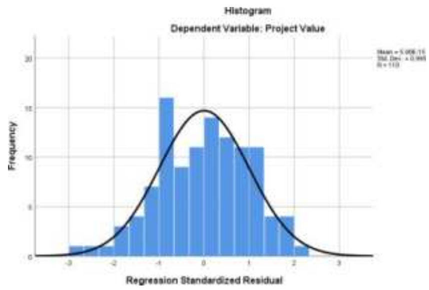


Fig 4.1: Histogram Team Size

	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	.383ᵃ	.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	.529ᵃ	.288	.278	.43444	.288	44.045	1

Tab 4.25: Team Performance & Project Value

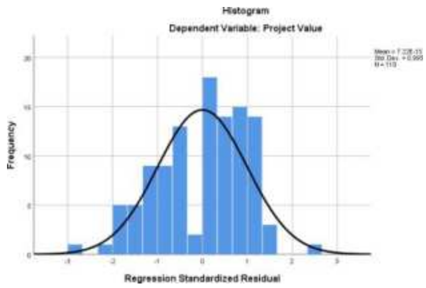


Fig 4.3: Histogram Team Performance

	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	.473ª	.244	.234	.43899	.245	32.689	1

Tab 4.27: Management Involvement and Project Value

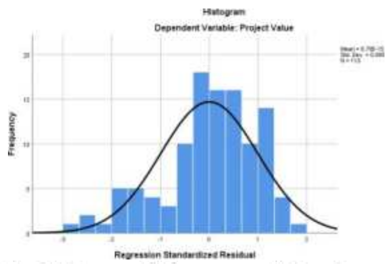


Fig 4.4: Histogram Management Involvement

	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	.323ª	.089	.091	.47045	.097	11.701	1

Tab 4.29: Customer Involvement & Project Value

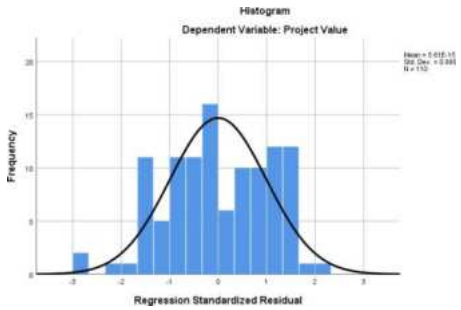


Fig 4.5: Histogram Customer Involvement

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.

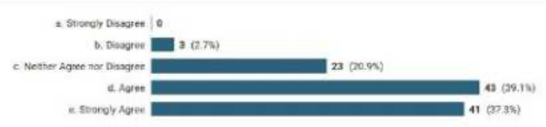


Fig 5.1: APM - Agile Project Management will be Successful in DS Compared to the Traditional Approach?

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.

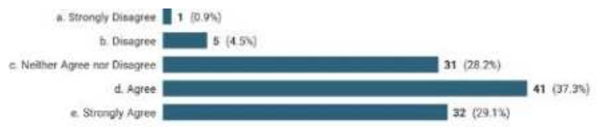


Fig 5.2: APM will be Successful in Managed Services if Applied?

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.

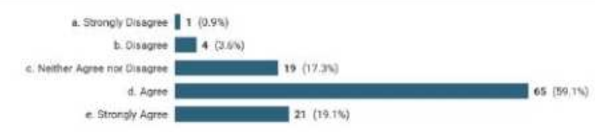


Fig 5.4: Do you Agree that Project Achieves Project Value when Moderated by APM Method rather than Traditional Method?

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?

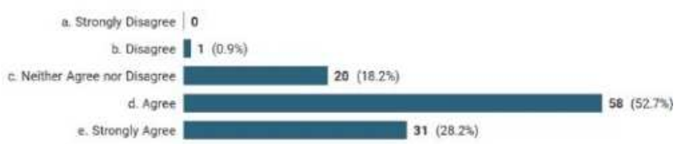


Fig 5.6: Providing Training to Team

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:

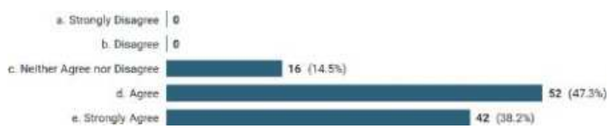


Fig 5.7: Complete Methodology Implementation Strategy Will Significantly Impact Implementing that APM Methodology & Achieving the Project Value.

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:

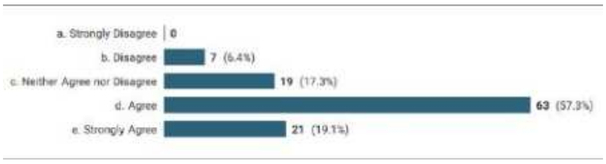


Fig 5.8: Management Involvement Using APM Method Achieves Project Value rather than Traditional one?

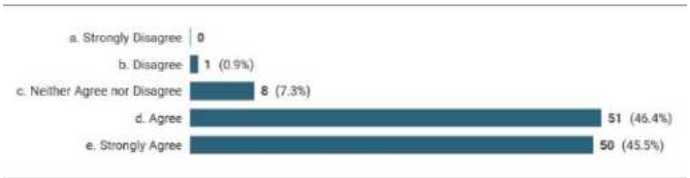


Fig 5.9: Active Management Involvement & Support

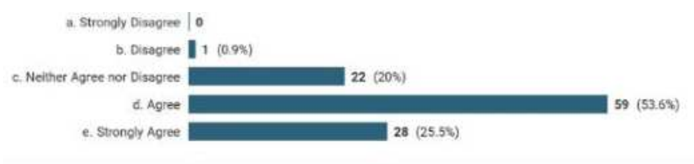


Fig 5.10: Management Involvement has Significant Impact on the Application of APM Methodology

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:

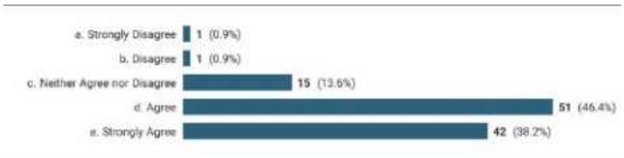


Fig 5.11: Customer Involvement has Significant Impact on Application of Agile Methodology

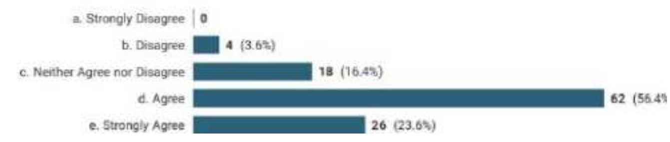


Fig 5.12: Customer Involvement Achieves Project Value When Moderated by APM Methodology

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.

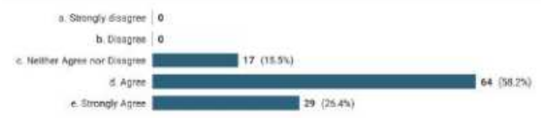


Fig 5.13: Success if used in Testing Phases

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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Agile Development Methodology: Impact on Project Cost and Time

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Abstract— *The study investigates the impact of cost and time based on chosen development methodology specifically agile software development. Agile software development is being used widely in maximum IT companies. The sole purpose of this research is to study the impact of cost and time on software projects which were developed using agile frameworks. The concept of the study uses quantitative descriptive approach in which all respondents were given a survey of closed-ended questions to determine the impact of cost and time on software projects using agile software development. The gathered information was statistically analyzed using Statistical Package for the Social Sciences (SPSS) tool. Validity test was verified by panel of experts, and reliability was checked by Cronbach's alpha of internal consistency. A number of analyses were performed on the data including normality testing, correlations and regression analysis.*

Keywords*— *Agile Software Development, Impact of Cost, Time impact, Software development cost and time impact.

I. INTRODUCTION

Agile software development has played an important role in almost every business area since the internet dawn. As the consumer's desire for immediacy and convenience grows, companies are increasingly being asked to integrate and develop their web-based services into their products. As a result, more resources are devoted to developing profitable software that meets consumer demands. Businesses want to maximize profits, so they need efficient resource allocation to keep costs down. This is achieved by adopting a process model that maximizes the conversion of resources into quality goods. Agile software development is a new paradigm aimed at reducing risk and cost of production. It is based on iterative development and constant feedback from all stakeholders throughout the development cycle. Moving from a typical waterfall process model to an agile process model reduces lead times and increases team morale and productivity, reducing the risks associated with large software programmer development. My research shows that companies across a wide range of industries can benefit from incorporating some degree of agility into their development processes. In recent years, the size and functionality of software have increased significantly. Cost and time are the major factors in software development cycle, cost estimation must be completed before the development cycle begins and deadlines or estimated completion time must be defined before the development starts. Both factors help you correctly estimate each project and get the right price and delivery time. The vibrant and dynamic nature of ASD makes starting product development using agile methodologies a daunting task. Therefore, such a development model requires accurate cost estimates to match deadlines and estimates while maintaining the highest software quality. This report provides a systematic impact of ASD's on project cost and time and helps an agile user to understand the impact of these factors while choosing ASD for his project.

II. BACKGROUND

A process model is required to set the timeline for software project deliverables and to ensure that all members of the development team, from managers to engineers to end users, understand workflow expectations. Organizations are beginning to realize the inherent limitations of the long-used waterfall approach. A linear schedule for developing requirements, implementing all features, and testing does not adapt well to changing customer requirements, putting the project at significant risk. My research examines the impact of agile approaches on these risks and costs. Agile uses an iterative development methodology, where features are developed in 2–4-week increments. As a result, all three major components of software development are repeated during the development cycle. Small features are generated every few weeks and can be easily modified, allowing for changing user requirements. The result is lower risk than the waterfall approach and lower capital costs for software projects in agile frameworks. Because this method is highly adaptable and responsive to continuous input, the product almost perfectly matches consumer expectations, resulting in greater satisfaction and demand, as well as higher profitability. However, only good implementation of agile approaches, or a good degree of agility, can lead to such low software development costs. My research examines the pros and cons of using agile models to assess cost and time impacts on software projects. We begin by examining the broad expert consensus on the limitations of both traditional and agile methodologies and the benefits of agile process models. Then, we explore the main areas of cost, quality and customer satisfaction that are impacted when moving from a traditional method to an agile one.

The term agile methodology refers to processes that are developed and tested throughout the software development lifecycle of a project. In contrast to the waterfall approach, the agile style of software testing runs both the development and testing processes simultaneously. Agile refers to a software development methodology that emphasizes customer satisfaction, team productivity, continuous planning, and incremental deliverables, rather than aiming to deliver everything at once at the end.

Agile focuses on keeping processes lean and delivering a minimum viable product (MVP) that goes through multiple iterations before being finalized. Feedback is continuously captured and incorporated, resulting in a more dynamic process where everyone is working towards a common goal.

PURPOSE

Determining how long and how much it will take to deliver a new software product is one of the most difficult tasks in software development. Should it be that challenging? The answer is a little more complex and difficult.

Estimating software expenses is tough by nature, and humans are notoriously terrible at forecasting absolute outcomes. There are no two projects alike; each has its own set of goals and a unique set of parameters that define its existence. What appears to be a simple problem on the surface is sometimes considerably more difficult or technically difficult to accomplish in practice. And, without a doubt, there will be 'unknowns' with the project that will only be discovered when they occur. Furthermore, whether you're a consumer, a developer, or a user, no two people are same. We arrive with our own set of information, experiences, values, expectations, risk aversion, and adaptability. Senior engineers are accustomed to writing high-quality software; but, building amazing software solutions may be a much more challenging task for all parties involved.

This study aims to examine the impact of the cost and time on project delivery using agile process model.

PROBLEM STATEMENT

Agile methodology is being used extensively in various organizations, but most of them face problem that how long and how much cost it will take to deliver the project, this study was aimed to explore the critical factors that impact project time and cost using the agile methodology.

SCOPE OF WORK

In order to find out the factors that impact project time and cost using agile methodology. The study is limited to software projects and in terms of methodology it is limited to agile software development. We picked 30 samples from IT industry of Islamabad and hence this study is covering only companies working in Islamabad. Companies selected for research also work for international clients and have more than 100 employees.

SIGNIFICANCE OF THE STUDY

The critical factors identified in this research would be helpful for the other companies working on agile methodology to keep them in mind while checking the impact of cost and time using agile methodology for any project. They will likely face less issues in execution of project if they take care of the identified factors and conclusions drawn in this study.

RESEARCH OBJECTIVES

Following are the main objectives this research:

- Evaluate if team capability has impact on cost and time of project.
- To evaluate customer feedback and requirements gathering as a major impact on project cost and time.
- To measure the impact of agile methodology on cost.
- To measure the impact of agile methodology on time.

RESEARCH QUESTIONS

RQ1 Does team capability impact on cost and time of project?

RQ2 Are the customer feedback and requirements gathering as a major impact on project cost and time?

RQ3 Project deliverables with equal and defined deadlines is more valuable to accomplish the project on time and at defined cost?

RQ4 Execution of agile methodology has a direct impact on project cost and time?

CLASSIFICATION

Purpose of Research	Descriptive
Research Paradigm	Ontology => Objective, and Epistemology => Positivist
Research Method & Techniques/Data Gathering	Quantitative and Survey research (closed-end Questionnaires)
Study Population	Telecommunication Industry
Sampling Frame	Executive, Project Manager, Project coordinator, Member of the project team and users
Minimum Sample Size	30 individuals are selected from the population of 3 IT companies.
Sampling Technique	Simple Random sampling
Data Analysis Approaches	Deductive =>Exploring Relationships, and Comparing groups => ANOVA

Table 1.1: Classification of Research

DATA COLLECTION

A few of the effective methods to gather data from a large number of population and then apply different random sampling techniques upon it to extract out the desired results. To test the research hypothesis and the research model, data is gathered through 3 IT companies of Islamabad and 30 individuals participated in data collection. Product owners, project managers, scrum master, team leads and mangers with project costing knowledge and those who are responsible for project timelines have been consulted and their views has been gathered through the questionnaires. This survey was conducted on a voluntary basis with no undue pressure. All the target respondents were given a standardized questionnaire as shown below:

Sr. No	AGILE SOFTWARE DEVELOPMENT: IMPACT ON PROJECT COST AND TIME	Level of Significance				
		1	2	3	4	5
1.1	**Team Productivity**					
1.1.1	customer realized the delivered value in each iteration and release					
1.1.2	Projects are motivating the team to do task with whole heartedly.					
1.1.3	Each member of team has domain knowledge of product					
1.1.4	Work place is suitable for creative work, e.g., windows, natural light, size of room and desk?					
1.2	**Customer Satisfaction**					
1.2.1	Was the project planning complete from beginning to end?					
1.2.2	Did the project manager understand how much time the project required?					
1.2.3	The project completed under budget?					
1.2.4	Customers actively participate in sprint planning?					
1.2.5	Customer gives positive feedback on iterations and release?					
1.3	**On time Delivery**					
1.3.1	Did the project finish in the stated timeframe?					
1.3.2	Customer relationship in agile process effect delivering on time					
1.3.3	Teamwork in organizational dimension effect delivering on time.					
1.4	**Management Style**					
1.4.1	Scrum master/Project manager actively calls for daily/scrum meetings.					
1.4.2	Line manager is cooperative in terms of task understanding and communication.					
1.4.3	Project scope is clear from the beginning of the project.					
1.4.4	Management commitments in agile process effect total estimated cost and time					
1.5	**Project Cost and Time**					
1.5.1	Agile software development is directly impacting the projects to be under budget and on time.					
1.5.2	Budgets are controlled in Agile software development.					
1.5.3	Project deadlines are mostly met in agile software development.					
1.5.4	Agile software development is helpful to mitigate the risks that cause delays in software projects.					
1.5.5	Agile Software development is helpful to mitigate the risks that cause extra cost on project.					

DATA ANALYSIS

Most data were received back from the respondents via online questionnaires as most IT staff prefer to use their screens and keep in the comfort of their work environment so researcher also preferred this way to get the actual and real results. Analytical study on collected data were performed using the Statistical Package for the Social Scientists (SPSS). A quantitative approach enables an investigator to investigate the relationship between variables. As there were a number of variables, both dependent and independent, in this study.

STEPS IN QUESTIONNAIRE DESIGN

According to Dr. R. Venkitachalam's "" and Linda Del Greco, Walop W.Richard H McCarthy.

The steps in questionnaire design are as below:

Step 1**: Background;**

(a) Purpose and goal/objectives in Research questions, hypothesis;

(b)Target audience / population sample.

Step 2: **Conceptualization;**

(a) Generate statements/ questions items i.e. variables; Independent Variables (IV), Dependent Variables (DV);

(b) Knowledge, attitude, perception, opinion, facts, behavior

Step 3: **Format & Data Analysis;**

(a) Appropriate scales of measurement.

(b) Data Analysis

(c) Questionnaire format.

Step 4: **Validity;**

(a) ***Panel of experts***

(b) Readability tests

(c) IRB (Institutional Review Board)

(d) Field Test

(e) Revisions Readability Test.

Step 5: **Reliability;**

(a) Pilot Test reliability.

(b) Run Alpha, revisions, Re-Run Alpha.

(c) Instrument ready for mailing.

LIMITATIONS OF THE STUDY

The study has also some limitations which are important to mention at this stage. First, the study focuses only on IT market of Islamabad. Second, the study only emphasizes on industry of Pakistan. Therefore, the dynamics of Agile impact in global organizations are not the part of this study.

THEORETICAL FRAMEWORK

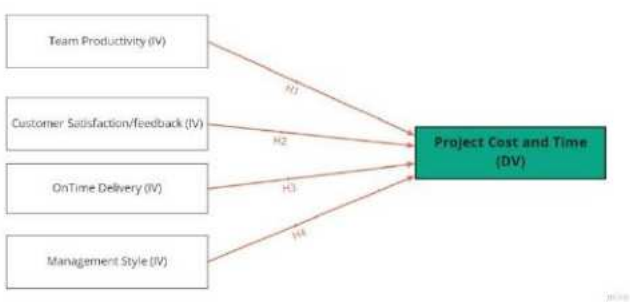


Figure 1.1: Diagrammatic Depiction of Independent and dependent Variables

III. LITERATURE REVIEW

The purpose of this section is to examine the potential impacts that Agile software development can have on time and cost, with a specific focus on major contributions that are discussed in the available literature.

1.1. LITERATURE REVIEW

- **AGILE SOFTWARE DEVELOPMENT**

Agile refers to software development methodologies that emphasis incremental delivery, team communication, continuous planning, and continuous learning rather than attempting to provide everything at once towards the end. Agile promotes keeping processes lean and developing minimal viable products (MVPs) that go through several iterations before being complete. Feedback is continuously collected and incorporated, resulting in a much more dynamic process in which everyone is working towards a common objective.

- **SHORT HISTORY OF AGILE**

Agile software development is a methodology that was first proposed in the early 1990s. It was created as an alternative to the traditional waterfall model of software development. In agile, software 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 software development.

- **AGILE IS MINDSET**

Therefore, Agile is a mentality based on the ideals and principles of the Agile Manifesto. These beliefs and principles show how to produce and adapt to change, as well as how to deal with uncertainty. The Agile Manifesto's opening phrase encompasses the whole concept: "By doing it and helping others do it, we are finding new ways of building software." When faced with ambiguity, try something you believe could work, obtain feedback, and make adjustments as needed. When you're doing this, keep the values and principles in mind. Allow your context to inform the frameworks, methods, and approaches you apply to engage with your team and provide value to your customers.

- **AGILE SOFTWARE DEVELOPMENT MODEL**

Every project should be handled differently, according to the Agile model, and current techniques should be adapted to best meet the project objectives. To provide particular features for a release, tasks are split into time boxes (short time spans) in Agile.

The process is iterative, with each iteration delivering a functional software build. In terms of features, each build is incremental; the final version contains all of the features required by the customer.

Here illustration of the Agile Process Model:

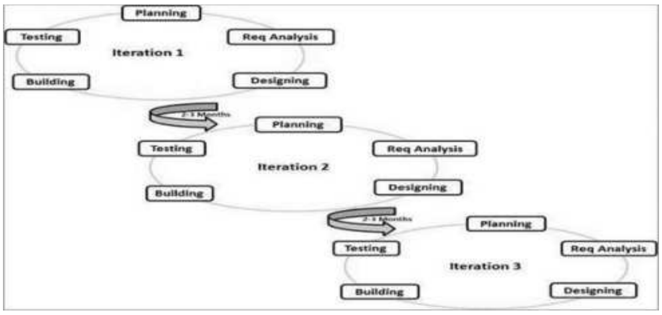


Figure 2.1: Agile Software Development Model

Because of its flexibility and adaptability, the Agile thinking process began early in software development and grew in popularity over time. Rational Unified Process (1994), Scrum (1995), Crystal Clear, Extreme Programming (1996), Adaptive Software Development, Feature Driven Development, and Dynamic Systems Development Method (DSDM) are some of the most prominent agile techniques (1995). Following the publication of the Agile Manifesto in 2001, these are now referred to as Agile Methodologies.

- **AGILE SOFTWARE DEVELOPMENT PROCESS USE**

There are several common software 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 software development. An important aspect of the Agile software 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 software 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:

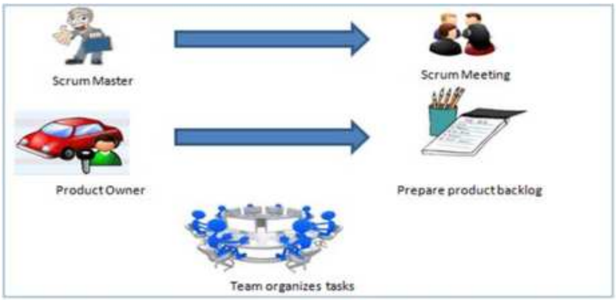


Figure 2.2: Scrum Method

a) Scrum Master: The Scrum Master is in charge of organizing the team, sprint meetings, and removing roadblocks to progress.

b) Product Owner: The Product Owner is in charge of delivering functionality at each iteration and building 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 artifact 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.

- **PROCESS FLOW OF SCRUM**

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 are 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 software 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 software. 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 software 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.

IV. RESEARCH METHODOLOGY

- INTRODUCTION

In this section, we will be discussing the methodology that we will be using to conduct our research. The variables and their operational description/definitions, research tool applied to examine those variables, hypothetical relationship and its graphical portrayal are also briefly illustrated in the section. Moreover, the method for data collection and the software utilized for the analysis of the collected data are also briefly explained.

- RESEARCH METHODOLOGY PROCESS FLOW

The research work has been carried out in different phases to make it systematic and in a sequence such that desired results could be achieved.

PHASE 1: DEFINE GOAL AND CONDUCT LITERATURE REVIEW

Section one i.e. Introduction amplifies upon defining goal for the research conducted in this research. Section two i.e. Literature Review explains in detail the main theme of the research and research idea giving detail background information. The cardinal purpose of the research is to study the impact of agile software development on project cost and time. This research carryout detailed analysis of factors impacting cost and time using agile software development approach.

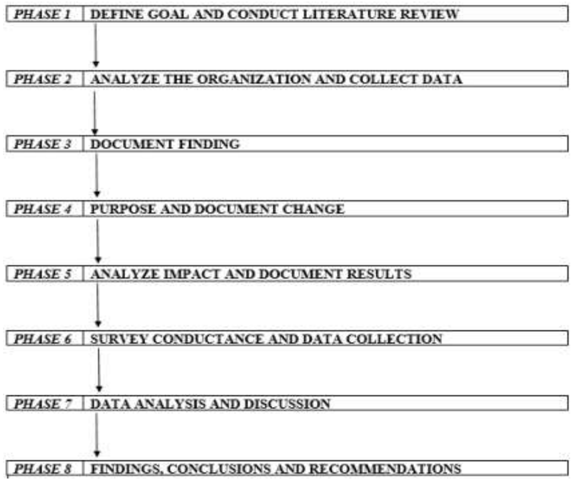


Figure 3.1: Work flow diagram of how the research work was proceeded.

PHASE 2: ANALYZE THE ORGANIZATION AND COLLECT DATA

Depending on the research that has been made during the initial phase, to investigate the impact of software cost and time using agile software development, a research topic was devised in consultation with supervisor and teachers. The finalized research topic is "Agile software development: impact on project cost and time".

PHASE 3: DOCUMENT FINDING

On the basis of finalized research topic " Agile software development: impact on project cost and time ", Firstly the main hub of the knowledge, similar research papers selected for literature review, Secondly, internet resources were searched which came up with relevant articles and the key words of "Agile software development cost and time", "Agile software development", "research methodology", "data analysis" etc. were retrieved and read thoroughly. Section number 2 includes review of almost all relevant literature.

PHASE 4: PURPOSE AND DOCUMENT CHANGE

Problem statement that is highlighted in the Introduction section at section 1.3 was planned, reviewed and finalized with the help of supervisor and IT sector Executives.

- PHASE 5: ANALYZE IMPACT AND DOCUMENT RESULTS

On the basis of the project's research area, targeted entities and the problem statement a questionnaire is developed in context of impact of cost and time using agile methodology in development of software.

- **PHASE 6: SURVEY CONDUCTANCE AND DATA COLLECTION.**

Source of Primary Data

The population of this study includes employees of Information Sector employees specially mangers, team leads, product owners, technical executives and supervisors and those mangers from whom tome management shares and give opinion of project cost and time. The sample size was found out to be 30 numbers from the Information Technology sector of Islamabad. The respondents were selected through simple random sampling method in which every element has the same probability for being selected for the sample (Kothari, 1990). Thirty questionnaires were distributed in above mentioned respondents.

In total 35 plus survey forms were sent by using sample size techniques and 30 forms were received considered for study. The Survey forms received were recorded and data retrieved was analyzed and discussed according to standard procedures.

- **PHASE 7: DATA ANALYSIS AND DISCUSSION**

This phase incorporates the data collected through survey questionnaire and the results which are the outcome of this survey to yield the inference from test and further hypothesis validation. Different types of analysis such as descriptive analysis, data normality testing, correlations analysis and regression analyses is used to produce the findings. The entire analysis was done using the software SPSS.

- **PHASE 8: FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

After data analysis and discussions, findings, conclusions of the research and recommendations regarding future research work were drawn and incorporated in section five of this research.

Following hypotheses were formulated for this research study:

Hypothesis 1

H_1: Team capability is an important factor for a successful agile software development project. It can have a positive or negative effect on time and cost.

Hypothesis 2

H_1: Feedback and requirements are the critical factor that impact on agile software development in terms of project time

Hypothesis 3

H_1: Equal frequency of sprint/iterations deliveries impact agile software development in terms of project completion on time.

Hypothesis 4

H_1: Execution of agile development methodology by management has major impact on project cost and time.

V. RESEARCH APPROACH

Basic classification of Research approach has been categorized into two groups: Quantitative and Qualitative. The research approach used in this study is quantitative. This method is used to establish and employ statistical models, hypotheses and theory relating to phenomena. This method basically analyzes cause and effect, test hypotheses and make inference. The data comprises of numerals and statistics which is collected using validated and structured data-collection tool/instruments. These results of quantitative research can be generalized in a way that they are made, applicable to other scenarios and context through statistical and mathematical modeling. Data was collected from respondents through a structured questionnaire.

- **RESEARCH TYPE**

Research type depends upon the goals of the study. The study of grace used for this study is Descriptive research as describe the significance of a situation, state, or existence of a specific phenomenon. Relational Research Problem -- suggests a relationship of some sort between two or more variables to be investigated. Moreover, this is also co-relational type of research as the researcher only measures the variables and their relationship.

- **RESEARCH TOOL**

Questionnaire has been used as a research tool/instrument to conduct this research. The questionnaire has been developed after extensive literature review of research work related to impact of time and cost for software development using agile techniques and informal interviews / interactions with relevant personnel. The researcher has developed the questionnaire himself and the questionnaire has been tested for validity and reliability tests.

- **STEPS IN QUESTIONNAIRE DESIGN:**

The Questionnaire has been developed following the steps described in Section number 2 and finally passed through stages of validity and reliability by pilot project study based on 25 Nos. of sample questionnaires.

- **VALIDITY OF QUESTIONNAIRE DEVELOPED**

The validity and relevance of questionnaire developed has been verified by experts with vast experience from IT sector including regulatory bodies.

- **RELIABILITY**

The reliability of the research questionnaire has been verified through pilot study based on the sample size of 25 Nos. respondents from sample population. The Cronbach's alpha test has been performed on each variable.

VI. ANALYSIS AND DISCUSSION

- **INTRODUCTION**

To achieve the research aims data is gathered directly from primary source so it does not contain much missing values or outliers as data is gathered from respondents directly and all information regarding to questionnaire are given to them. The analysis has been performed using statistical package of social sciences (SPSS). The data is measured on five point Likert scale while relationship among them is studied using correlation and linearity is discussed by regression analysis.

- **DESIGN SELECTED**

In this study, design selected is questionnaire-based survey research. The data set is gathered on five point Likert scale from strongly disagree to strongly agree. Data reliability and validity is checked using Cronbach alpha.

- **POPULATION**

To examine the results, the population of Islamabad and Rawalpindi is considered as target population so sample is fetched from that particular regions of Pakistan. The population of this study includes team leads, project managers, technical officers and scrum masters of Information Technology organization.

- **SAMPLING DESIGN AND SIZE**

It is difficult to analyze complete population and fetch information from each and every unit of population so a representative sample would be required. Thus, a representative sample of 81 respondents is obtained using simple random sampling technique.

DATA COLLECTION METHOD

The list of respondents compiled from professional circles and LinkedIn members with relevant roles. The questionnaire was circulated through web links by researcher.

- **NORMALITY TESTING**

Usually Normality tests are carried out in order to analyze whether the data is normally distributed or otherwise. There are two normality tests which have been used for this research. These are skewness and kurtosis.

a. Skewness

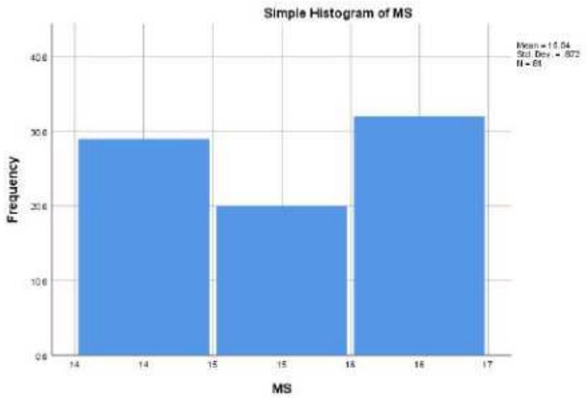
Skewness defines whether the data is skewed towards right or left. Skewness range is usually considered between -1 and +1. It can be seen from table 4-2 that all the variables used in the research have value of skewness falling within the range which shows that the distribution of our data is approximately symmetric.

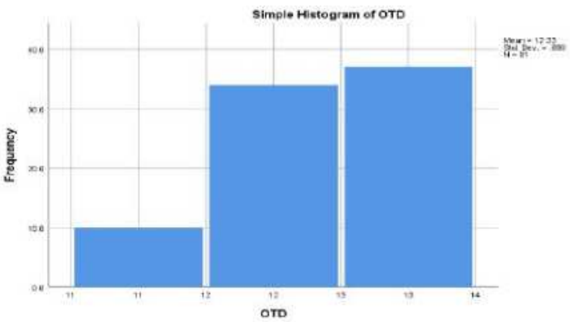
b. Kurtosis

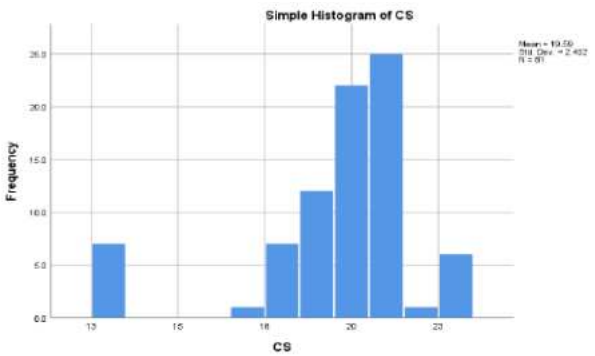
Kurtosis explains the relative sharpness and the height of the distribution as compared to a normal distribution curve. It is usually considered that the range of kurtosis should remain between -3 and +3. It is quite clear from table 4-2 that the value of kurtosis for all the variables used in this research falls within the range which shows that the data is normally distributed.

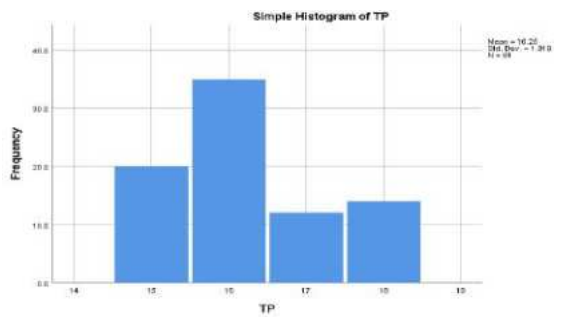
c. Histograms

The Histograms of these variables are attached as shown below.









CRONBACH'S ALPHA VALUE

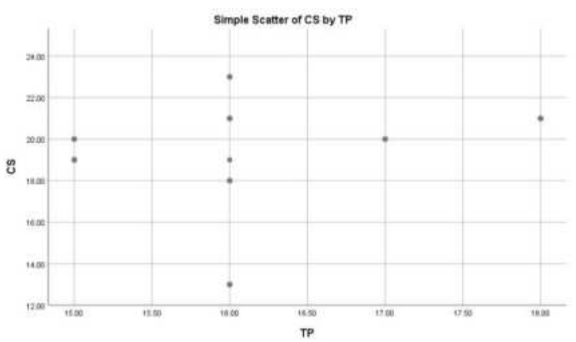
Table 4.1: Cronbach's Alpha Value

Sr. No	Variables	Cronbach value
1	Team Productivity (TP)	0.835
2	Customer Support (CP)	0.779
3	On Time Delivery (OTD)	0.783
4	Management Style (MS)	0.794
5	Project cost and time (PCnT)	0.824

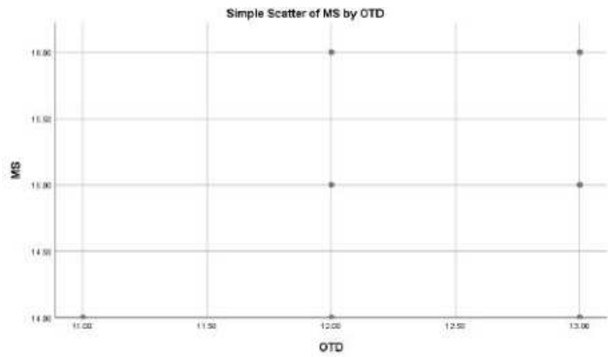
The data is examined for reliability using Cronbach alpha for all the variables separately and for all of them combined as well. Thus, data appeared reliable.

SCATTER PLOTS

Now, we would apply exploratory data analysis techniques and examine the relationship among variables. So, the simplest technique for examining relationship is scatter plot.



The scatter plot indicates not specifically linear relationship among TP and CS although we would examine further linear relationship exists among other variables as well or not.



The scatter plot among OTD and MS also indicated no specific linear relationship among them. Although there appeared only block of four values which presents only that specific values.

CORRELATION ANALYSIS

The scatter plot indicated not specifically linear relationship among two pairs of variables now we would discuss relationship among all four pairs and examine the relationship is significant or not. The significance of relationship is discussed using p values for each pair of pearson relationship.

Table 4.2: Correlations Matrix (Pearson)

Correlations

		TP	CS	OTD	MS	PCnT
TP	Pearson Correlation	1	.233*	.593**	-.460**	.233*
	Sig. (2-tailed)		.037	.000	.000	.037
	N	81	81	81	81	81
CS	Pearson Correlation	.233*	1	.760**	.459**	1.000**
	Sig. (2-tailed)	.037		.000	.000	.000
	N	81	81	81	81	81
OTD	Pearson Correlation	.593**	.760**	1	.166	.760**
	Sig. (2-tailed)	.000	.000		.138	.000
	N	81	81	81	81	81
MS	Pearson Correlation	-.460**	.459**	.166	1	.459**
	Sig. (2-tailed)	.000	.000	.138		.000
	N	81	81	81	81	81
PCnT	Pearson Correlation	.233*	1.000**	.760**	.459**	1
	Sig. (2-tailed)	.037	.000	.000	.000	
	N	81	81	81	81	81

*. Correlation is significant at the 0.05 level (2-tailed).

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

The relationship among all variables is almost positive except Team Productivity and Management style as their relationship is negative. Although we observe p-values for all relationships is small so it seems significant relationship among all pairs of variables that is also observed from astaric * signs above all values in SPSS output. Further, we observe the relationships are almost moderate as they are nearly equal to 0.5 and the value of relationship considered nearly equal to .5 is moderate relationship. While relationship among customer satisfaction and on time delivery is 0.76 which is largest among all relationships and its strongest. Further, all variables have significant relationship with dependent variable as well.

REGRESSION ANALYSIS

As, we observe significant relationship among all pairs of variables using correlation analysis so further linear relationship is discussed using regression analysis and explored how much increase in one variable causes increase or decrease in predictor variable. Here, project cost and time is considered as dependent variable and remaining variables act as independent variables.

Table 4.3: Model Summary

Model	R	R Square	Adjusted R Square	Std Error of Estimate
1	0.233	0.054	0.042	2.623
2	0.853	0.728	0.721	1.335
3	0.854	0.730	0.719	1.340
4	0.855	0.731	0.717	1.345

a. Predictors: (Constant), TP
b. Predictors: (Constant), TP, CS
c. Predictors: (Constant), TP, CS, OTD
d. Predictors: (Constant), TP, CS, OTD, MS
e. Dependent: PCnT

Among these regression equations the second model has highest R square. So, we would say that maximum variation is explained by this model so, team productivity and customer satisfaction are explaining maximum variations as compared to all independent variables.

a. Predictors: (Constant), TP
b. Predictors: (Constant), TP, CS
c. Predictors: (Constant), TP, CS, OTD
d. Predictors: (Constant), TP, CS, OTD, MS
e. Dependent: PCnT

The ANOVA table for all models are indicating significance due to smallest p values which seems goodness of fit for all models.

Table 4.4: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	31.117	1	31.117	4.523	0.037**
	Residuals	543.500	79	6.880		
	Total	574.617	80			
2	Regression	372.896	2	186.448	104.547	0.000***
	Residual	139.104	78	1.783		
	Total	512.000	80			
3	Regression	373.741	3	124.528	69.638	0.000***
	Residual	138.259	77	1.796		
	Total	512.000	80			
4	Regression	374.489	4	93.622	51.743	0.000***
	Residual	137.511	76	1.809		
	Total	512.000	80			

Regression Analysis	Unstandardized coefficients		Standardized coefficients	t	Sig.
Model	b	Std. Error	Beta		
1 constant	9.414	4.685		2.009	0.048**

Table 4.5: Model Summary

Regression Analysis		Unstandardized coefficients		Standardized coefficients	t	Sig.
Model		b	Std. Error	Beta		
1	constant	9.414	4.685		2.009	0.048**
	TP	0.612	0.288	0.233	2.127	0.037**
2	constant	3.789	2.445		1.549	0.125
	TP	0.012	0.151	0.005	0.079	0.937
	CS	0.805	0.057	0.852	14.045	0.000***
3	constant	5.077	3.090		1.643	0.104
	TP	0.103	0.201	0.041	0.511	0.611
	CS	0.856	0.095	0.907	9.043	0.000***
	OTD	-0.305	0.445	-0.083	-0.686	0.495
4	Constant	8.137	5.682		1.432	0.158
	TP	-0.002	0.259	-0.001	-0.007	0.994
	CS	0.879	0.101	0.931	8.663	0.000***
	OTD	-0.245	0.456	-0.067	-0.538	0.592
	MS	-0.169	0.263	-0.058	-0.643	0.522

a. Dependent: PCnT

As shown in Table 4-5 model summary, the highest R square appeared for second model while ANOVA also indicated its significance of model so it is considered to be the best model while detailed analysis indicated customer satisfaction and team productivity have positive significant impact on project cost and time variable. Further the model equation would be written as;

Regression Equation

PCnT = 3.789 + 0.012 TP +0.805 CS

- **HYPORESEARCH TESTING**

The research requires to analyze which of independent variable is significantly impacting on project time and cost. So, t test is examined for all the coefficients and p values determines their probability of rejection.

Table 4:6: t-values and the equivalent p-values

Hypothesis	Independent Variables	Dependent Variable	t-value	Significance (p-value)	Not Rejected/Rejected
H1	Team Productivity (TP)	Project cost and Time (PCnT)	-5.491	.037**	Not Rejected
H2	Customer satisfaction (CS)		6.471	.000**	Not Rejected
H3	On time delivery (OTD)		-5.648	.000**	Not Rejected
H4	Management Style (MS)		-2.538	.001**	Not Rejected

The table indicated that all variables have significant impact on project time and cost separately due to largest t statistics and smallest p-values.

VII. DISCUSSION OF RESULTS

The analysis indicated that independent variables team productivity (TP), management style (MS), customer satisfaction (CS) and on time delivery (OTD) all are impacting significantly on project cost and time (PCnT). Further, significant relationship exists among all of them due to high correlation. Also, regression analysis is performed to examine the linearity of model and the model including team productivity (TP) and customer satisfaction (CS) are expressing more variations as compared to others. Thus, they have more impact among all independent variables.

VIII. FINDINGS, CONCLUSIONS, RECOMMENDATIONS

- **Introduction**

The preceding section deals with introducing evidence and interpreting results in order to address the study's research questions. The emphasis of this section is the review of research-based results, study-derived recommendations, and conclusion. The section further presents the study's weaknesses and strengths. The aim of the analysis was to examine the impact of cost and time on software development using agile methods.

- **Findings and Conclusion**

It is important to mention here that success is measure by the customer's satisfaction, on time delivery, team productivity and management style with the final product and that is possible only in adopting agile software development techniques and these techniques can lead to project cost and time saving, the agile software development creates agility in our software business sector. The study provides insight on how to adopt and retain agile software development in the existing software industry within Pakistan. It also provides ways in which the companies can adopt and sustain healthy use of agile software development.

The main objective of the research was to analyses the impact of agile methodology on project cost and time. In addition to it, the results in section 4 of the case study provide with some useful information. Keeping in view the selected independent variables positively influence as found to have major impact of team productivity (TP), customer satisfaction (CS), on time delivery (OTD) and Management style (MS) on Project cost and time that are major findings by using Agile software development methodologies in software industry. The independent variables designed by summing the information of sample questions are team productivity, customer satisfaction, on time delivery and management style. The average showed maximum worth for customer satisfaction therefore it would say that there are largest percentage of contributors who are satisfied with techniques. The scatter plot indicates not specifically linear relationship among TP and CS and also indicated no specific linear relationship among OTD and MS. The relationship among all variables is almost positive except Team Productivity and Management style as their relationship is negative. Significant relationship among all pairs of variables using correlation analysis. regression analysis is performed to examine the linearity of model and the model including team productivity and customer satisfaction are expressing more variations as compared to others and analysis indicated customer satisfaction and team productivity have positive significant impact on project cost and time variable.

Moreover, the findings of the study can be used to strength and extend the existing models of Agile Software development impact of project cost and time putting into practice in software industry. Academically, the study provides opportunity and avenue for research students who want to conduct research in this field. In this way, the study creates awareness among young researchers about the Agile Software development impact on project cost and time. Agile software development is providing more opportunities for the software industry as it is focusing more on the customer satisfaction / feedback and on time delivery.by focusing features on the needs it will save the project time and cost. Agile software developing is prevailing techniques for the software development, not only providing benefits the team productivity, customer satisfaction/ Feedback, on time delivery and management style but also maximizes the profit of the company by providing good quality of work, delivering the projects on the time and fulfil the customer satisfaction. They can develop new Agile Software development techniques and models for all types of projects.

Limitation and Contribution

As there is no agreed-upon way to measure the cost and time of agile software development. As a result, it is difficult to compare the cost and time of different agile software development approaches. The research is limited by its means of data collection. The data for the study has been gathered only one time so, it has a limited insight. If data might be collected more than one time it can yield much accurate results. Major portion of the data has been gathered from cities of Rawalpindi and Islamabad. The study is limited in ways that only covers the two cities of Pakistan not the overall markets of the country.

In the study, the respondents are all from Pakistan. If a comparative study were to be done, it should be carried out in other countries.

- **Future Work**

The past research statistics and experimental studies are analyzed to fetch out the most relevant conclusions to this study. A systematic experimentation and investigation work was carried out to prove the results of the previous studies and to form the factual evidence of this research. Some major past experimentation has been consulted to define the over-all idea of the underlying study.

In this study we have chosen 4 independent variables team productivity (TP), customer satisfaction (CS), on time delivery (OTD) and Management style (MS). This research work can be extended by adding mediator variables. Like by adding uncertainty as mediator variable in team productivity can help out to extract more significant results.

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Impact of Agile Project Management on IT Projects

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***Abstract*— *Agile project management has been more popular in a number of industries, most notably information technology (IT), because of its flexible and iterative approach. Through a comparative analysis, this study aimed to investigate the impact of agile project management on IT projects. It explored the fundamental ideas and methods of agile project management and looked into how they affect the results of IT projects. Analyzing the benefits and challenges of using agile methodology in IT projects, the research compares and contrasts these results with more conventional project management approaches. It also assesses the impact of agile project management on important factors like project velocity, quality, customer happiness, and IT projects' overall adaptability. This research amied to provide IT managers with the information they need to make informed decisions about their project management approaches by providing specific examples and analyzing the impact of agile project management on IT projects. The goal of this study was to improve understanding of how agile project management affects IT projects. IT managers wishing to implement or improve agile approaches can gain valuable insights from this analysis of actual data and comparative study. Enhancing the effectiveness, efficiency, and customer satisfaction of IT project outcomes is the ultimate goal of this research. The main purpose of this analysis was to shed light on how different project management approaches affect engineers' productivity, effectiveness, and efficiency in order to improve project outcomes, efficiency, and client satisfaction in IT ventures. This research, which focuses on the IT industry, carefully examines the essential elements for a successful implementation of Agile project management strategies, which have shown advantages in the IT industry. The main goal of the study was to identify the crucial success variables that affect IT project success across functional departments of selected entities, both at the individual and organizational levels. A study using random sampling was carried out, and a questionnaire was given to project managers, consultants, and engineers who had at least five years of experience. The sample consisted of 200 individuals working at IBM. The research also provides opportunities for more research, with a focus on internal organizational policies, contract structures, team communication, and consumer engagement. While new perspectives on contract forms and the use of Agile methodologies in quality assurance were provided, more research is necessary to completely comprehend the influence of organizational and human factors.*

***Keywords*— AGILE, Agile Project Management, IT Projects, Project Management.**

I. INTRODUCTION

In today's corporate environment, it is critical to react to fast changing market needs in the sector of IT 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 IT business (Techie, 2017): (Investopedia, 2019). IT service vendors are businesses which supply services to service providers, which are then delivered to market customers or end-users. In essence, a IT service provider is a licensed operator who is authorized to provide IT services to people in a specific country. The IT 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 IT 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). IT sector (Techie, 2017) includes many domains, one of which is IT (Balashova and Gromova, 2017).

Information Technology (IT) 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. IT 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 noTab since it allows for close closeness to clients and promotes the translation of their needs into deliverable solutions.

The IT 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

IT vendors (Techie, 2017) are looking for the best approach to assure effective project delivery to IT 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.

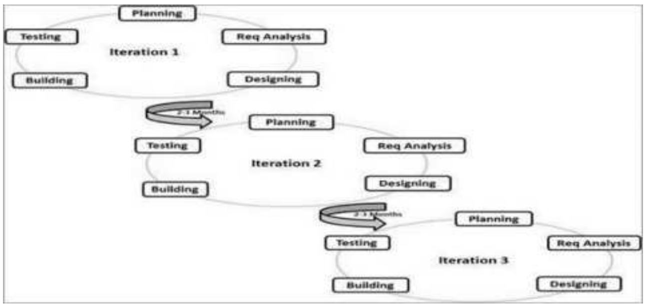

Fig 1.1: Agile Development Model

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:

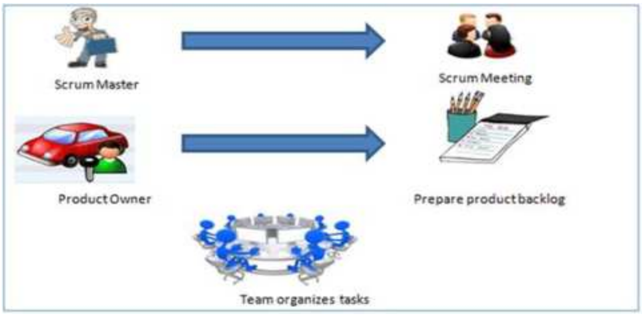

Fig 1.2: Scrum Method

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 practises 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

Services providers in IT sector 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.

While there is a growing body of research exploring the impact of agile project management on different segments of industry, which aims of improve flexibility, collaboration, and customer satisfaction. However, there is a need for a comprehensive and empirical analysis to assess the true impact of Agile project management on IT projects e.g., how team composition interacts with agile project management practices. And then its subsequent impact on IT Projects is an area that requires further investigation. A potential negative consequence an organization may face if they fail to adopt Agile project management timely in IT is delayed and inefficient product/project delivery.

Research Gap

In contextual terms the research papers I've mentioned in previous slide, target specific region and in specific sector. In the light of the literature review I've found the following gaps which were not addressed previously in detail.

- Since many industries are realizing the necessity of agile management and embracing its practices, I would like to see the application of similar working on various other industrial sectors and possibly for other developing nations as well to see how cultural differences may affect its effectiveness.
- A comparative study between Agile and traditional project management to show pros and cons of each.
- Understanding long-term effects of Agile project management and investigating how Agile practices could influence IT Projects over extended periods.

Research Questions

- Does utilization of Agile Project Management (APM) methodologies is advantageous for success of IT (Operations and Services) functional domains?
- Which are the key factors associated with implementation of APM techniques which have the most significant impact on IT projects success?
- Is there a correlation between effective APM and factors like team size & adaptability, team

performance, and learning culture?

- Is it possible to come up with a validated conceptualized model for implementing APM for IT projects?

Objectives

Following objectives are essential to the research:

- To ascertain if the utilization of Agile Project Management (APM) methodologies is advantageous for success of IT (Operations and Services) functional domains?
- To identify the key factors associated with implementation of APM techniques which have the most significant impact on IT projects success?
- Is there a correlation between effective APM and factors like team size & adaptability, team performance, and learning culture?
- To come up with a validated conceptualized model for implementing APM for IT projects.

Research Significance

Agile project management methods have revolutionized the field of IT project management by providing a departure from traditional plan-based approaches. Agile, flexibility, collaboration with customers and iterative development have received a lot of attention and adoption in the IT sector.

II. LITERATURE REVIEW

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

IT department is an essential component that incorporates all IT services, from project management to rollout and delivery. It is crucial to highlight that many IT organizations have moved their focus from a product-oriented to a service-oriented strategy, giving rise to the dominance of the IT Services department (Williams et al., 2008). Apple, Amazon, and eBay are currently key market participants in the IT 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 IT department. 20% yearly growth has been recorded in the market for 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 IT services 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.

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 revolution and the dynamic 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 suiTab 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 IT 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 in agile development such as the use of story cards, refactoring, automated verification and iterative development, 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, graphs, and other visual representations of project progress are created. Additionally, example prototypes may be formed 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 find 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 Project Management 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 IT 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 IT services, however, is scarce. Only a few of the literature review's articles address its applicability to the IT sector. This dearth of research in the IT sector points to a knowledge vacuum. As a result, researchers will gain from the study project's findings that will add significant knowledge to the use of Agile methodology in the IT 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.

Researcher will base the research methodology of analyzing the impact of agile project management on quantitative approach which shall include below steps to validate research questions and achieve its objectives.

Literature Review: Conduct a comprehensive review of existing literature on agile project management, IT management, and the intersection between the two fields. This helps identify gaps in knowledge, theoretical frameworks, and previous research findings.

Tools demonstrations: Use SPSS to analyze and visualize data collected from surveys and questionnaires This will help gather qualitative data on aspects such as productivity, collaboration, communication, satisfaction, and overall performance.

Organizational Surveys: Questionnaire designed to survey shall target project managers, consultants, and engineers with experience of 5 years at minimum within IBM of population size of 200.

Research Questions and Hypotheses: Develop specific research questions or hypotheses that guide the study. These questions are focused on investigating the impact of agile project management on IT projects and align them with research objectives.

- **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. The literature also showed that various combinations of 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.

Conceptualized model is shown below.

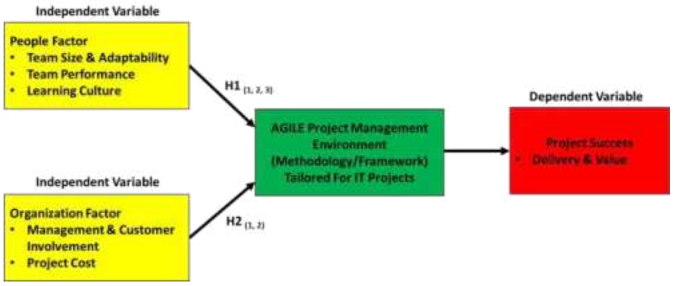

Fig 3.1: Conceptualized Model

Independent Variables

- People Factor (Team Size & Adaptability, Team Performance and Learning Culture)
- Organization Factor (Management & Customer Involvement, Project Cost)

Dependent Variable

- Project Success (Delivery & Value)

- **Hypothesis**

Following hypotheses are formulated for this research study:

Hypothesis 1

H1$_1$: A correlation exists between the size & adaptability of the team and project success (measured in delivery & value) when utilizing an AGILE Project Management Environment (Framework) Tailored for IT Projects.

H1$_2$: An association can be observed between team performance and project delivery when implementing an AGILE Project Management Environment (Framework) Tailored for IT Projects.

H1$_3$: A connection can be identified between learning culture and project delivery when employing an AGILE Project Management Environment (Framework) Tailored for IT Projects.

Hypothesis 2

H2$_1$: A correlation exists between management & customer's involvement and project delivery when implementing an AGILE Project Management Environment (Framework) Tailored for IT Projects.

H2$_2$: A connection can be observed between project cost and project delivery when utilizing an AGILE Project Management Environment (Framework) Tailored for IT 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.

- **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 & adaptability, team performance and learning culture, 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 and Adaptability	Team Performance	Learning Culture
Proper Training	Implement Complete Methodology	Active Management in the learning implementation
Team Access External Resources	Team Colocation	Corporate Size

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 IT department. 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 IT Services Functional Domain	Agile in IT Operations 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

The survey was sent to 200 target project managers, consultants, and engineers with experience of 5 years at minimum within IBM. Responses from 110 respondents were received 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 IT Services department, compared to 68.2% from the department of IT operations. The IT operations department within the chosen organizations (IBM) may be greater in size than the IT 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 IT operations. 1.8% of the employees in the IT Services division were chiefs, and 2.7% were directors. The statistics are shown in the Tab 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	IT Operations	75	67.18	67.18	67.18
	IT 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
	IT Operations Head / IT Services Head	17	14.46	14.46	94.88
	IT Operations Director	3	2.69	2.69	97.42
	IT Services Director	2	1.79	1.79	100
	Total	110	100	100	

Tab 4.10: Position

		IT Operations	IT 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 & Adaptability	0.799
Team Performance	0.563
Learning Culture	0.723
Management & Customer Involvement	0.744
Project Cost	0.754
Delivery & Value	0.748

Tab 4.13: Testing Reliability

- **Correlation**

By formulating hypotheses, you can assess and examine the potential association between dependent and 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 & ADAPTABILITY	PROJECT DELIVERY & VALUE
TEAM SIZE & ADAPTABILITY	Pearson Correlation Coefficient (PCC)	1	.266**
	Sig. (2-tailed)		.007
	N	110	110
Project DELIVERY & 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/Adaptability & Project Delivery/Value

		Project Delivery/ Value	Team Performance
Project Delivery / Value	PCC	1	.383**
	Sig. (2-tailed)		.000
	N	110	110
TEAM PERFORMANCE	PCC	.383**	1
	Sig. (2-tailed)	.000	
	N	110	110

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

Tab 4.15: Team Performance/Project Delivery-Value

		Project Delivery/Value	Learning Culture
Project Delivery/Value	PCC	1	.547**
	Sig. (2-tailed)		.000
	N	110	110
LEARNING CULTURE	PCC	.547**	1
	Sig. (2-tailed)	.000	
	N	110	110

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

Tab 4.16: Learning Culture/Project Delivery-Value

		Project Delivery/Value	Management & Customer's Involvement
Project Delivery/Value	PCC	1	.473**
	Sig. (2-tailed)		.000
	N	110	110
Management & Customer's Participation	PCC	.473**	1
	Sig. (2-tailed)	.000	
	N	110	110

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

Tab 4.17: Management & Customer's Involvement/Project Delivery-Value

		Project Delivery/Value	Project Cost
Project Delivery/Value	PCC	1	.323**
	Sig. (2-tailed)		.001
	N	110	110
Project Cost	PCC	.323**	1
	Sig. (2-tailed)	.001	
	N	110	110

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

Tab 4.18: Project Cost & Project Delivery/Value

Variable	Pearson Correlation
Team Size & Adaptability	0.263
Team Performance	0.375
Learning Culture	0.543
Management & Customer Involvement	0.490
Project Cost	0.325

Tab 4.19: Correlation Analysis Summary

4.5. 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/adaptability and project delivery/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 performance and project delivery/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 delivery/value is 0.29, which corresponds to a low prediction percentage of about 29%. Additionally, the link between management & customer engagement and project delivery/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 Delivery/ Value	4.0643	.51305	110
TEAM SIZE & ADAPTABILITY	4.0898	.57989	110

Tab 4.20: Team Size & Adaptability

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

Tab 4.21: Team Size/Adaptability & Project Delivery/Value

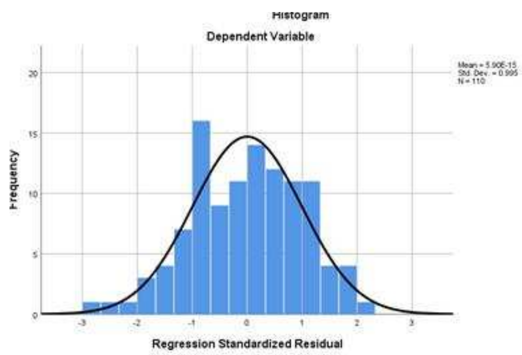

Fig 4.1: Histogram Team Size/Adaptability

	Mean	Std. Deviation	N
Project Delivery/ Value	4.0677	.51045	110
TEAM PERF	4.3967	.43487	110

Tab 4.22: Team Performance

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

Tab 4.23: Team Performance & Project Delivery/Value

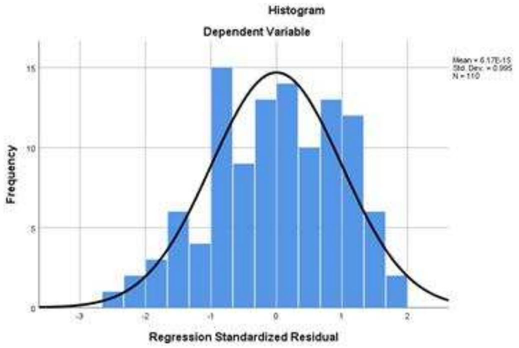

Fig 4.2: Histogram Team Performance

	Mean	Std. Deviation	N
Project Delivery/ Value	4.0693	.51367	110
LEARNING CULTURE	4.3782	.3782	110

Tab 4.24: Learning Culture

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

Tab 4.25: Learning Culture & Project Delivery/Value

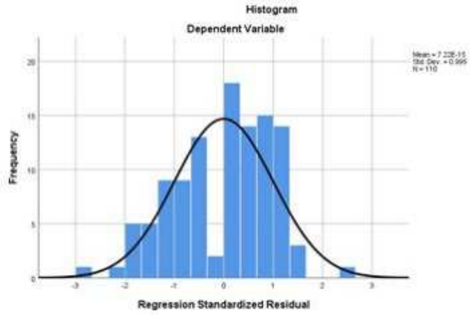

Fig 4.3: Histogram Learning Culture

	Mean	Std. Deviation	N
Project Delivery/Value	4.0810	.50347	110
Management & Customer involvement	4.2434	.45386	110

Tab 4.26: Management & Customer Involvement

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

Tab 4.27: Management & Customer Involvement and Project Delivery/Value

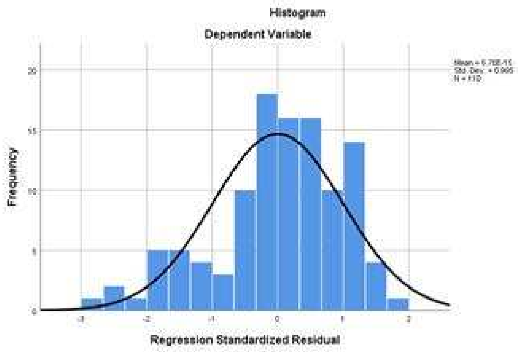

Fig 4.4: Histogram Management & Customer Involvement

	Mean	Std. Deviation	N
Project Delivery/Value	4.0699	.50310	110
Project Cost	4.2428	.50483	110

Tab 4.28: Project Cost - Descriptive Analysis

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

Tab 4.29: Project Cost & Project Delivery/Value

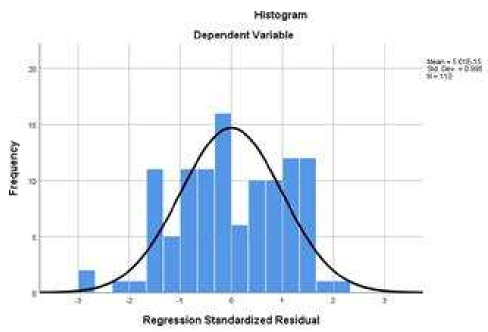

Fig 4.5: Histogram Project Cost

Variable	R Square
Team Size & Adaptability	0.059
Team Performance	0.143
Learning Culture	0.289
Management & Customer Involvement	0.244
Project Cost	0.084

Tab 4.30: Regression Analysis Summary

V. DISCUSSION AND CONCLUSION

- General Discussion

The study used a quantitative approach to its technique. Out of 200 questionnaire's distributed, 110 participants completed the survey, yielding 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 performance, 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.

5.1. Analysis of Research Questions

1st Research Question

Does utilization of Agile Project Management (APM) methodologies is advantageous for success of IT (Operations and Services) 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 IT Operations 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: Is agile project management successful in IT

operations compared to the traditional approach?

In addition to confirming the value and effectiveness of using “agile methodology” in department of IT operations, as previously proposed by Sjödin et al. (2020), the study's findings also help close the research gap in the field of IT Operations. Additionally, the findings provide insight into the application of APM in the IT Services 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 IT Services department. 29.1% of the respondents said they highly agreed with the statement, while 37.3% said they only 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.

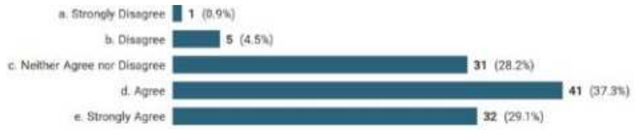

Fig 5.2: APM will be Successful in IT Services if Applied?

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 Research Question

Which are the key elements associated with implementation of APM techniques which have the most significant impact on IT projects 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 Delivery/Value?

Sizable majority of respondents to the survey of 55.5% agreed that using an APM technique can result in the achievement of project delivery/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.

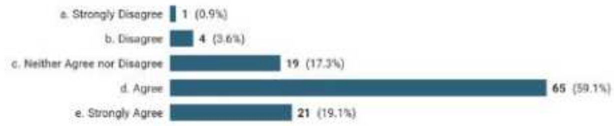

Fig 5.4: Do you agree that the project will achieve project deliverables if it is monitored using the APM method instead of the traditional method?

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 only agreed, and 19.1% said they highly agreed. These results are consistent with the Tab that emphasizes the significance of the Agile Project Management Framework/Environment. According to the survey respondents, training (learning culture) 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: Comprehensive Training on use of Agile will have Significant impact on implementing this methodology by team and Achieve Project Value?

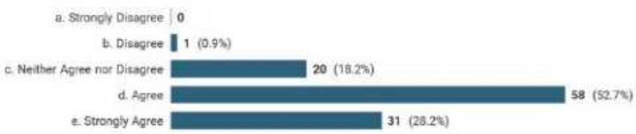

Fig 5.6: Providing Training (learning culture) to Team

When the survey results were statistically analyzed, it was found that 93.7% of the respondents agreed that training (learning culture), 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:

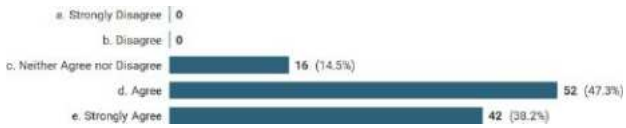

Fig 5.7: Complete Methodology Implementation Plan Will Significantly help Implementing APM Environment Framework Tailored for IT Projects.

The vast majority of survey participants nearly 85.5% agreed that following an Agile Project Management 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 Research Question

Is there a correlation between effective APM and factors like team size & adaptability, team performance, and learning culture?

In order to assess the relationship between the dependent factors and independent variable, correlation analyses were conducted. The results unequivocally demonstrate a positive association between project delivery (dependent variable) and the five independent variables. Notably, learning culture and Management/Customer participation exhibited the strongest relationships, followed by the team performance, Management/Customer participation, and team size and adaptability.

There exists correlation b/w every 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 performance and project delivery/value. The people element, which is acknowledged as one of the crucial aspects alongside organization, process, and technical aspects in the literature, is related to variables including team size and adaptability, team performance, and learning culture.

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 and their adaptability in order to successfully apply APM methodology and achieve project success. Team competence/performance 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 performance 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 IT industry. Learning environment emerges as very important component, closely followed by team performance and team size/adaptability.

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 findings for these variables do not indicate a significant correlation. Learning culture is considered as being essential to success in the agile process, and team performance 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 delivery as the dependent variable and team size/adaptability as well as the moderate correlation with team performance. 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 performance, size/adaptability and learning environment. 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 IT. 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.

Management and customer involvements 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 recognized as 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 management involvement:

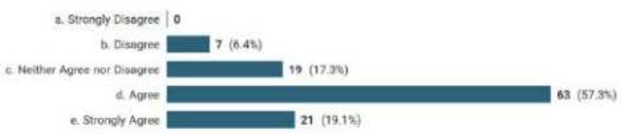

Fig 5.8: Management Involvement Using APM Method Achieves better Project Delivery/Value

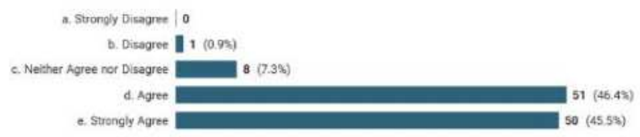

Fig 5.9: Management Involvement & Support

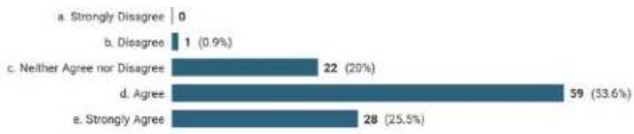

Fig 5.10: Management Involvement shows substantial Impact on the Application of APM Methodology

According to the aforementioned graphs, a sizable majority of survey participants—between 80% and 90%—agree that management interaction is a critical success factor (CSF). The stronger correlation coefficient found for management 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:

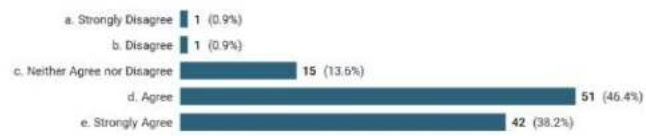

Fig 5.11: Customer Involvement shown promising Impact on Application of Agile Methodology

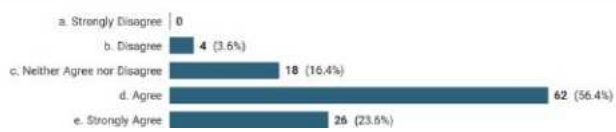

Fig 5.12: Customer Involvement Achieves higher Project Value When Moderated by APM Methodology

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

Gathering primary data was important in order to respond to three research questions and reach the project's goals. The relationship between dependent variables and the independent variable, as described in the conceptual model, 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 on the basis independent factors, the researcher ran extra study to look at the variables' regression. R-squared values, which quantify how well dependent variable can be anticipated from the independent variable, were obtained from the regression analysis for each variable. The regression analysis's findings show that team size and adaptability 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 performance, leaving an additional 84.8% unaccounted for. 29% of the variability is explained by learning environment, 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 method. 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.

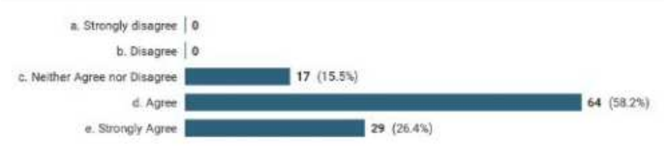

Fig 5.13: Success if used in Testing Phases

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.

5.2. 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 performance 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 IT domains 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 IT industry is the specific emphasis of this research project. The findings of this study show how successful and useful the Agile methodology has been in IT operations and services departments. The research project also broadens the use of Agile methodology in testing and quality assurance, which has not been thoroughly investigated in the IT 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 size/adaptability or performance for the organization. The importance of team performance 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/adaptability for each project, actively involve clients during all project phases, hold daily standup meetings for efficient team performance, and ensure the team's proficiency with Agile project management techniques. It is crucial that management/customer's 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 IT department of IBM are clarified by this research project, which serves as a summary. These CSFs should be carefully considered by project managers, directors, program managers and chief operating officers of IT department. This study is the first of its kind in the world of IT and adds significantly to the body of knowledge in this area.

VI. 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). 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

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 some independent variables, such as the type of contract, which according to respondent comments emerged as a key factor for project success under Agile approach. If given more time, performing extensive research on a bigger project within the IT 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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Consumer Preferences between Branded and Generic Medications: A Comparative Study

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***Abstract*— *Medication selection is pivotal in healthcare, influencing consumers and the broader healthcare system. Making the proper decision can benefit patients by enhancing their quality of life, reducing side effects, and improving treatment outcomes. Informed decisions empower patients, fostering adherence and overall well-being. This study explored the factors of consumer preferences in their medications. L Utilizing a descriptive-comparative design, a total of 50 consumers participated in a survey and filled out a questionnaire. The study revealed that the consumer-respondents were mostly middle-aged single individuals who belonged to average sized-family and mostly spent 500 to 100 pesos on generic and branded medicines; the consumers foremost considered economic factors and cultural factors in their preferences for branded and generic medications; cultural factors of consumer preferences are significantly correlated with age and civil status of the respondents; and no significant difference was established between the type of medicines patronized by the respondents and the consumer preference factors.*

***Keywords*— Branded drugs, Community pharmacy, Consumer preference, Generic drugs, Medications.**

I. INTRODUCTION

The pharmaceutical landscape is marked by a crucial decision consumers face when selecting medications: the choice between branded and generic drugs. As the healthcare industry evolves and consumers become increasingly empowered, understanding the drivers behind medication selection is paramount for healthcare providers, policymakers, and pharmaceutical companies alike. The costs associated with today's medical services are rising, and this includes the price of medications (Barlas, 2019). Furthermore, the use of medications has been found to play a significant role in the rising expense of healthcare services; nevertheless, studies indicate that registered pharmacists worldwide now routinely substitute generic medications for branded ones (Wajid S., et al., 2015). Drug manufacturing conditions determine the distinction between brand-name and generic medications. Branded medicine is the original product that has been developed by a pharmaceutical company. Branded medicines, also known as proprietary or name-brand drugs, play a crucial role in healthcare by offering innovative solutions to various medical conditions. These pharmaceuticals are distinct from their generic counterparts as they are developed and marketed by a specific company, often holding exclusive rights to the drug for a certain period (Pau, 2014). A generic drug is made after the active ingredient of a brand-name drug, whereas a brand-name drug is known by the name given by the producing company. Despite having different brand names, generic medications will nonetheless have the same active components as brand-name drugs.

Nevertheless, in terms of medication efficacy, generic medications include an active ingredient of the same quality as the brand-name medication. The Food and Drug Administration (FDA) in the United States and comparable organizations in other nations enforce rigorous standards and supervision over all pharmaceuticals (Pichholiya M., et al., 2015). Considering the significant role that pharmaceuticals play in healthcare and the fact that public education helps people to take medications in a way that is appropriate and safe, consumers also require knowledge regarding medications and treatments (Chetley et al., 2007). From a healthcare system perspective, optimal medication selection translates to cost-effective care, minimizing adverse events and hospitalizations. Familiarity with consumer preferences and purchasing behavior in the context of generic and branded medications serves as essential for healthcare policy formulation, pharmaceutical marketing strategies, and ensuring access to affordable healthcare given the rapidly expanding pharmaceutical industry and diverse population. Understanding the nuances of consumer perceptions is crucial in unraveling the dynamics that govern medication preferences.

This research explored the economic considerations; and investigated how cost-conscious consumers weigh the financial implications of opting for generic alternatives.

II. METHODOLOGY

This study utilized a descriptive-comparative research design. Descriptive-comparative research design is a quantitative research design that aims to describe the differences between groups in a population without manipulating the independent variable (Mary Ann Cantrell, 2011). In this study, the differences in the preferences in medication of the consumers were determined through their choices of buying branded or generic medicines from a local community pharmacy at Barangay Barrio Militar, Palayan City. The specific factors explored that influenced the preferences of the consumers were in terms of cultural, social, economic, and psychological.

The distribution of respondents is divided equally into male and female categories with several considerations such as the willingness and voluntary participation in the survey; and the capability to answer and understand the survey questionnaire. The main data-gathering instrument of this research was a survey questionnaire that was designed by the researcher. The survey questionnaire consisted of two parts; profile characteristics of the respondents and a Likert-type item statement regarding cultural, social, economic, and psychological factors of consumer medication preferences.

III. RESULTS AND DISCUSSIONS

1. Profile of the Respondents

Table 1. Distribution of the Respondents

Age	**Frequency**	**Percent**
10 to 24	12	24
25 to 39	23	46
40 to 54	4	8
55 to 69	5	10
70 and above	6	12
Total	**50**	**100**
Sex	**Frequency**	**Percent**
Female	25	50.0
Male	25	50.0
Total	50	100.0
Civil Status	**Frequency**	**Percent**
Married	21	42.0
Single	29	58.0
Total	**50**	**100.0**
Number of Family Members in their Household	**Frequency**	**Percent**
1-3	8	16.0
4-6	19	38.0
7-10	16	32.0

More than 10	7	14.0
Total	**50**	**100.0**
Type of Medicine Purchased	**Frequency**	**Percent**
Branded	24	48.0
Generic	26	52.0
Total	**50**	**100.0**
Most Common Medicine Purchased	**Frequency**	**Percent**
Antibiotics	5	10.0
Maintenance (Blood pressure, Blood Sugar, etc.)	15	30.0
Others	12	24.0
Over-the-counter Drug	9	18.0
Vitamins	9	18.0
Total	**50**	**100.0**
Total Amount of Medicine Purchased	**Frequency**	**Percent**
1001-1500 pesos	10	20.0
1501-2000 pesos	5	10.0
501-1000 pesos	13	26.0
Less than 500 pesos	15	30.0
More than 2000 pesos	7	14.0
Total	**50**	**100.0**

Age. The age of the respondents is distributed as follows: there are 12 (24%) respondents who are in the 10 to 24 age brackets; 23 (46%) are in the 25 to 39 age brackets; 4 (8%) belong to the 40 to 54 age bracket; 5 (10%) are 55 to 69 years old; and 6 (12%) respondents belongs to the 70 and above age bracket. The results revealed that the majority of the respondents are 25 to 39 years old.

Sex. The findings in Table 1 revealed that there are 25 (50%) female respondents; and 25 (50%) male respondents. The result showed that male and female respondents were equally distributed.

Civil Status. The result shows that 21 (42%) of the respondents are married, while 29 (58%) are single. It clearly shows that the single respondents dominated the number of respondents.

Number of Family Members in their Household. The result shows that there are 38% of customers composed of 4-6 family members; 32% of consumers composed of 7-10 family members; 16% of customers composed of 1-3 family members; and 14% of consumers composed of more than 10 family members.

Type of Medicine Purchased. The result of the respondents' type of medicine purchased showed that the majority of the respondents preferred generic medicine (52%) over branded medicine (48%).

Most Common Medicine Purchased. The result in Table 1 showed that Maintenance medications are the most commonly bought, comprising 30% of purchases. It suggests a focus on long-term health management. The category "Others" at 24% implies diverse medication needs. Over-the-counter drugs and vitamins at 18% indicate a substantial emphasis on self-care and preventative health measures. The relatively lower percentage of antibiotic purchases at 10% may reflect growing awareness of antibiotic resistance and judicious use.

Total Amount of Medicine Purchased. The findings in the table show that respondents 15 (30%) purchased an amount of less than 500 pesos; 13 (26%) who purchased an amount of 501-1000 pesos; 10 (20%) who purchased an amount of 1001-1500 pesos; 7 (14%) who purchased an amount of more than 2000 pesos; and 5 (10%) who purchased an amount of 1501-2000.

2. Factors Influencing the Consumer Preferences in Choosing Between Branded and Generic Medications

2.1 Comparison of the Cultural Factors of Consumer Preferences in Choosing Medications

Table 2.1 Weighted Mean and Verbal Descriptions of the Respondents' Cultural Factors of Consumer Preferences

Cultural Factors	COMBINED WM	COMBINED Verbal Description	GENERIC WM	GENERIC Verbal Description	BRANDED WM	BRANDED Verbal Description
1. Binibili ko ang gamot na nakasanayan kong bilhin sa matagal na panahon.	3.68	Strongly Agree	3.54	Strongly Agree	3.83	Strongly Agree
2. Sa pagpili ng gamot na aking bibilhin, tinitignan ko kung ito ba ay naging mabisa na sa akin dati.	3.72	Strongly Agree	3.65	Strongly Agree	3.79	Strongly Agree
3. Kapag gamot sa ubo mas pinipili ko ang may mga sangkap na herbal kahit na ito ay Generic.	2.62	Agree	2.77	Agree	2.46	Disagree
4. Kapag subok ko na ang gamot hindi nawawala ang tiwala ko dito.	3.7	Strongly Agree	3.62	Strongly Agree	3.79	Strongly Agree
5. Naniniwala ako na wala sa tatak ng gamot ang bisa nito sa pagpapagaling ng sakit, dahil nakasalalay sa tamang pagsunod ng pag-inom ang paggaling ng maysakit.	3.02	Agree	3.23	Agree	2.79	Agree
Overall Mean	**3.35**	**Strongly Agree**	**3.36**	**Strongly Agree**	**3.33**	**Strongly Agree**

Legend: 1.0 to 1.75 – Strongly Disagree, 1.76 to 2.51 – Disagree, 2.52 to 3.27 -Agree, 3.28 to 4.0-Strongly Agree

Cultural Factors. The result in Table 2.1 shows that generally, the respondents strongly agreed to the following item-statements of cultural factors: "Sa pagpili ng gamot na aking bibilhin, tinitignan ko kung ito ba ay naging mabisa na sa akin dati" (WM=3.72); "Kapag subok ko na ang gamot hindi nawawala ang tiwala ko dito." (WM=3.7); and "Binibili ko ang gamot na nakasanayan kong bilhin sa matagal na panahon" (WM=3.68); on the other hand, they agreed to the following statements: "Naniniwala ako na wala sa tatak ng gamot ang bisa nito sa pagpapagaling ng sakit, dahil nakasalalay sa tamang pagsunod ng pag-inom ang paggaling ng maysakit." (WM=3.02); "Kapag gamot sa ubo mas pinipili ko ang may mga sangkap na herbal kahit na ito ay Generic" (WM=2.62).

In general, the respondents strongly agree on buying a medication that is effective for them. Although, in terms of the item statement "*Kapag gamot sa ubo mas pinipili ko ang may mga sangkap na herbal kahit na ito ay Generic"* the respondents who patronize Generic medicines agreed (WM=2.77); while those who patronizes Branded medicines disagreed (WM=2.46). In the study of Chetley et al., (2007), they emphasized that public education helps people to take medications in a way that is appropriate and safe, consumers also require knowledge regarding medications and treatments.

2.2 Social Factors of Consumer Preferences in Choosing Medications

Table 2.2 Weighted Mean and Verbal Descriptions of the Respondents' Social Factors of Consumer Preferences

Social Factors	COMBINED		GENERIC		BRANDED	
	WM	Verbal Description	WM	Verbal Description	WM	Verbal Description
1. Malaki ang impluwensiya ng mga napapanuod ko sa mga commercials para sa pagpili ko ng bibilhing gamot.	2.94	Agree	3.08	Agree	2.79	Agree
2. Bibilhin ko lang ang gamot ayon sa kung ano ang nireseta ng mga doctor para mas mabilis gumaling.	3.72	Strongly Agree	3.69	Strongly Agree	3.75	Strongly Agree
3. Madali akong makumbinsi na bumili ng gamot kapag ito ay kilala ng maraming tao.	2.56	Agree	2.23	Disagree	2.92	Agree
4. Sa pagpili ng tamang gamot dapat ay nagtatanong-tanong sa mga kakilala kung ano ang madalas nilang binibili at mabisa para sa kanila.	2.32	Disagree	2.19	Disagree	2.46	Disagree
5. Kapag bumibili ako ng gamot tinatanong ko ang pharmacist kung ano ang mabisa.	3.36	Strongly Agree	3.15	Agree	3.58	Strongly Agree
Overall Mean	**2.98**	**Agree**	**2.87**	**Agree**	**3.10**	**Agree**

Legend: 1.0 to 1.75 – Strongly Disagree, 1.76 to 2.51 – Disagree, 2.52 to 3.27 -Agree, 3.28 to 4.0-Strongly Agree

Social Factors. The result in Table 2.2 manifested that the respondents strongly agree in the following social factors of consumer preferences in choosing medications: "Bibilhin ko lang ang gamot ayon sa kung ano ang nireseta ng mga doctor para mas mabilis gumaling" (WM=3.72); "Kapag bumibili ako ng gamot tinatanong ko ang pharmacist kung ano ang mabisa" (WM= 3.36); "Malaki ang impluwensiya ng mga napapanuod ko sa mga commercials para sa pagpili ko ng bibilhing gamot" (WM=2.94); "Madali akong makumbinsi na bumili ng gamot kapag ito ay kilala ng maraming tao" (WM=2.56). The lowest mean of 2.32 was obtained for the statement "Sa pagpili ng tamang gamot dapat ay nagtatanong-tanong sa mga kakilala kung ano ang madalas nilang binibili at mabisa para sa kanila", which means their level of agreement was lowered compared to the other aspects of social factor. In general, the respondents general purchase medicines with proper prescriptions from their attending physicians and not because other individuals suggested it.

In terms of the item-statement "*Madali akong makumbinsi na bumili ng gamot kapag ito ay kilala ng maraming tao",* respondents who purchased Generic medicines disagreed (WM=2.23); while respondents who purchased Branded medicines agreed (WM=2.92).

2.3 Economic Factors of Consumer Preferences in Choosing Medications

Table 2.3 Weighted Mean and Verbal Descriptions of the Respondents' Economic Factors of Consumer Preferences

Economic Factors	COMBINED		GENERIC		BRANDED	
	WM	Verbal Description	WM	Verbal Description	WM	Verbal Description
1. Mas bumibili ako ng mga gamot na pasok sa aking budget.	3.66	Strongly Agree	3.73	Strongly Agree	3.58	Strongly Agree
2. Kung may pera o sapat na budget naman ako mas bibili ako ng branded na gamot kahit mas mahal.	3.52	Strongly Agree	3.19	Agree	3.88	Strongly Agree
3. Bago ako bumili ng gamot tinatanong ko muna ang pagkakaiba ng presyo ng branded at generic na gamot.	3.3	Strongly Agree	3.35	Strongly Agree	3.25	Agree

4. Kapag naubusan ang pharmacy ng gamot na binibili ko tinatanong ko kung meron ibang gamot na pwede kong bilhin para hindi na ako lumipat sa ibang pharmacy	3.18	Agree	3.35	Strongly Agree	3.00	Agree
5. Sa pagbili ng gamot, kung saan malapit na pharmacy ay duon na ako bibili kesa pumunta sa mas malayo.	3.22	Agree	3.19	Agree	3.25	Agree
Overall Mean	**3.38**	**Strongly Agree**	**3.36**	**Strongly Agree**	**3.39**	**Strongly Agree**

Legend: 1.0 to 1.75 – Strongly Disagree, 1.76 to 2.51 – Disagree, 2.52 to 3.27 -Agree, 3.28 to 4.0-Strongly Agree

Economic Factors. The respondents in Table 2.3 presented the economic factor of consumer preferences in choosing medications. The result revealed that the respondents strongly agreed in terms of: "Mas bumibili ako ng mga gamot na pasok sa aking budget" (WM=3.66); "Kung may pera o sapat na budget naman ako mas bibili ako ng branded na gamot kahit mas mahal" (WM=3.52); and "Bago ako bumili ng gamot tinatanong ko muna ang pagkakaiba ng presyo ng branded at generic na gamot" (WM=3.3); while they agree in the following economic factor of consumer preferences in choosing medications "Sa pagbili ng gamot, kung saan malapit na pharmacy ay duon na ako bibili kesa pumunta sa mas malayo" (WM=3.22); and "Kapag naubusan ang pharmacy ng gamot na binibili ko tinatanong ko kung meron ibang gamot na pwede kong bilhin para hindi na ako lumipat sa ibang pharmacy" (WM=3.18). The overall mean of the respondents' response in terms of Economic Factors was 3.38, which means generally, the customers strongly agree that economic factors are considered when purchasing medicines. The respondents usually purchase medicines which are within their budget.

In terms of the item-statements "*Bago ako bumili ng gamot tinatanong ko muna ang pagkakaiba ng presyo ng branded at generic na gamut"* (WM=3.35); and "*Kapag naubusan ang pharmacy ng gamot na binibili ko tinatanong ko kung meron ibang gamot na pwede kong bilhin para hindi na ako lumipat sa ibang pharmacy"* (WM=3.35); respondents who patronized Generic drugs scored higher compared to the respondents who patronized Branded medicines (WM=3.25; WM=3.00). This implies that customers who patronize generic medicines are more likely to ask about the cost or price differences between generic and branded medicines before buying, compared to the customers who purchased Branded medicines. One of the economic factors considered by the respondents when purchasing medicines is to know if the medicine is branded or generic.

2.4 Psychological Factors of Consumer Preferences in Choosing Medications

Table 2.4 Weighted Mean and Verbal Descriptions of the Respondents' Psychological Factors of Consumer Preferences

	COMBINED		GENERIC		BRANDED	
Psychological Factors	**WM**	**Verbal Description**	**WM**	**Verbal Description**	**WM**	**Verbal Description**
1. Naniniwala ako na ang pagpili ng gamot na bibilhin ay hindi nakasalalay sa tatak ng gamot.	2.94	Agree	3.35	Strongly Agree	2.50	Disagree
2. Naniniwala ako na mas mabisa ang mga gamot na branded kaya binibili ko ito.	3.08	Agree	2.35	Disagree	3.88	Strongly Agree
3. Naniniwala ako na parehong mabisa ang mga gamot na branded at generic kaya pareho ko itong binibili.	2.96	Agree	3.46	Strongly Agree	2.42	Disagree
4. Kung wala ang tatak ng gamot na gusto kong bilhin, nag-aalinlangan ako kung bibili ako ng ibang brand o hindi.	3.1	Agree	2.50	Disagree	3.75	Strongly Agree

5. May mga pagkakataon na napatunayan ko na mas mabisa ang Generic na gamot kaysa sa branded.	2.48	Disagree	3.04	Agree	1.88	Disagree
Overall Mean	**2.91**	**Agree**	**2.94**	**Agree**	**2.88**	**Agree**

Legend: 1.0 to 1.75 – Strongly Disagree, 1.76 to 2.51 – Disagree, 2.52 to 3.27 -Agree, 3.28 to 4.0-Strongly Agree

Psychological Factors. In terms of the customers preferences in choosing medications, the respondents agree to the following factors: "Kung wala ang tatak ng gamot na gusto kong bilhin, nag-aalinlangan ako kung bibili ako ng ibang brand o hindi" (WM=3.1); "Naniniwala ako na mas mabisa ang mga gamot na branded kaya binibiling gamot" (WM=3.08); "Naniniwala ako na parehong mabisa ang mga gamot na branded at generic kaya pareho gamot ng binibili" (WM=2.96); and "Naniniwala ako na ang pagpili ng gamot na bibilhin ay hindi nakasalalay sa tatak ng gamot" (WM=2.94). On the other hand, the customers disagree "May mga pagkakataon na napatunayan ko na mas mabisa ang Generic na gamot kaysa sa branded" (WM=2.48). The overall mean of 2.91, manifested that the Psychological factors are considered by the customers when choosing and purchasing their medications.

The result of the comparison between the response of the respondents who patronized Generic and Branded medicines showed variations. Those who patronized Generic medicines strongly agreed in terms of the following item-statements: "*Naniniwala ako na ang pagpili ng gamot na bibilhin ay hindi nakasalalay sa tatak ng gamut"* (WM=3.35); *"Naniniwala ako na parehong mabisa ang mga gamot na branded at generic kaya pareho ko itong binibili"* (WM=3.46); and they agreed to the statement *"May mga pagkakataon na napatunayan ko na mas mabisa ang Generic na gamot kaysa sa branded"* (WM=3.04).

On the other hand, those who patronized Branded medicines disagreed to the same statements, to wit: "*Naniniwala ako na ang pagpili ng gamot na bibilhin ay hindi nakasalalay sa tatak ng gamut"* (WM=2.50); *"Naniniwala ako na parehong mabisa ang mga gamot na branded at generic kaya pareho ko itong binibili"* (WM=2.42); and *"May mga pagkakataon na napatunayan ko na mas mabisa ang Generic na gamot kaysa sa branded"* (WM=1.88).

2.5 Summary of the Consumer Preference Factors

	OVERALL		GENERIC		BRANDED		
Consumer Factors	**AWM**	**Verbal Description**	**AWM**	**Verbal Description**	**AWM**	**Verbal Description**	**Rank**
1. Economic Factors	3.38	Strongly Agree	3.36	Strongly Agree	3.39	Strongly Agree	1
2. Cultural Factors	3.35	Strongly Agree	3.36	Strongly Agree	3.33	Strongly Agree	2
3. Social Factors	2.98	Agree	2.87	Agree	3.10	Agree	3
4. Psychological Factors	2.91	Agree	2.94	Agree	2.88	Agree	4

The result in Table 2.5 revealed that in general, as reflected by the average weighted mean of their responses, both the respondents who patronized Generic and Branded medicines strongly agreed regarding the influence of economic and cultural factors on consumer preferences when buying medicines; while they agreed that social and psychological factors influenced consumer preferences in buying medicines. The ranking of their responses showed that economic factors were the number one consideration of the respondents; and psychological factors were their last considerations when buying medicines.

3. Significant Relationship between the Profile of the Respondents and the Factors that Influence

their Preferences for Branded or Generic Medications

Table 3. Correlation Matrix for the Significant Relationship between Profile Characteristics and Factors of Consumer Preferences

		Cultural Factors	Social Factors	Economic Factors	Psychological Factors
Type of Consumer	Pearson Correlation	-.025	.176	.025	-.049
	Sig. (2-tailed)	.862	.222	.865	.735
	N	50	50	50	50
Most Common Medicine Bought	Pearson Correlation	-.234	.062	-.067	-.170
	Sig. (2-tailed)	.102	.667	.645	.238
	N	50	50	50	50
Amount of money spent on medicines	Pearson Correlation	.077	.247	-.042	-.180
	Sig. (2-tailed)	.595	.084	.771	.212
	N	50	50	50	50
Age	Pearson Correlation	.384**	-.150	.151	.185
	Sig. (2-tailed)	.006	.298	.296	.199
	N	50	50	50	50
Sex	Pearson Correlation	.007	.189	.222	.157
	Sig. (2-tailed)	.961	.188	.121	.276
	N	50	50	50	50
Civil Status	Pearson Correlation	.515**	.088	.192	.264
	Sig. (2-tailed)	.000	.544	.181	.064
	N	50	50	50	50

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

**. Correlation is significant at the 0.05 level (2-tailed).*

The result of the correlation test was presented in Table 4. The result revealed that significant relationships were established between the respondents' age and cultural factors (r=.384**; sig=.006)); and civil status and cultural factors (r=.515**; sig=.000). The hypothesis of no significant relationship between these variables is rejected. The significant relationship between age and cultural factors showed that older respondents are more likely to consider cultural factors in their purchase of medicines. In the same manner, the significant relationship between the respondents' civil status and the cultural factors of consumer preferences explained that married individuals are more likely influenced by cultural factors when choosing their medications compared to single individuals. On the other hand, no significant relationships were established between age, sex, number of family members, type of medicine purchased, amount of money spent on medicine purchase, and the following factors: social, economic, and psychological factors of consumer preferences. Culture plays an important role in the behavior of consumers.

4. **Significant Differences in the Medication Preferences Factors of Customers according to the Type of Medicine they Patronize**

	Levene's Test for Equality of Variances	
	F	**Sig.**
Cultural Factors	1.669	.203
Social Factors	.936	.338
Economic Factors	.173	.679
Psychological Factors	3.727	.059

Level of Significance .05

To test the significant difference between the consumer preferences factors of the respondents who prefer Generic and Branded medicines, their responses were subjected to Levene's T-test. The result in Table 4 showed the following F-values for cultural factors (F=1.669; sig=.203), social factors (F=.936; sig=.338), economic factors (F=.173; sig=.679), and psychological factors (F=3.727; sig=.059). The result manifested no significant differences. It implies that both consumers of Generic and Branded medicines are influenced by cultural, social, economic, and psychological factors when buying medications.

IV. CONCLUSIONS

The following conclusions are derived based on the findings of this study:

1. The consumer respondents were mostly middle-aged single individuals who belonged to the average sized family and mostly spent 500 to 100 pesos on generic and branded medicines.
2. The consumers foremost considered economic factors and cultural factors in their preferences for branded and generic medications.
3. Cultural factors of consumer preferences are significantly correlated with the age and civil status of the respondents.
4. No significant difference was established between the type of medicines patronized by the respondents and the consumer preference factors.

V. RECOMMENDATIONS

The following are offered based on the findings and conclusions of this research:

1. Pharmacy operators and managers should consider the identified economic, cultural, social, and psychological factors in formulating their marketing strategies among consumers of branded0 and generic medicines.
2. Pharmacy operators and managers can enhance their marketing strategies for both branded and generic medicines by integrating sustainable development principles (Balaria, et al., 2017).
3. Similar studies may be conducted in other community pharmacies to have a comparison of the results.
4. Another similar study that explores the integration of local farmers (Fronda, 2024) into community pharmacy initiatives could be done by future researchers.

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Analyzing the Relationship Factors Influencing Philrice-Supplier Partnership: A Basis for Strategic Policy Improvement

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***Abstract*— *This study analyzes the relationship factors influencing PhilRice-Supplier partnerships, focusing on mutual trust, integrity, shared objectives, communication, clarity of understanding, and shared resources. This research also addresses the challenges encountered by the local private suppliers about the procurement projects of the government specifically with PhilRice. A descriptive research design was used to gather data from the 30 local private suppliers of PhilRice within Nueva Ecija, Philippines. The study's findings reveal that the respondents emphasized the importance of effective communication between the two contracting parties, ethical behavior, sharing of resources, and support from the staff that leads to a strong and smooth partnership between the government and its suppliers. Several challenges highlighted by the respondents such as slow response to inquiries, payment delays, and unclear project specifications were identified as significant barriers. The study's insights are valuable and relevant for government agencies, private suppliers, and future researchers to improve and strengthen their partnerships and to make the procurement process more efficient.*

***Keywords*— Challenges, Government-Supplier Partnerships, Nueva Ecija, Philippine Rice Research Institute, Relationship Factors, Strategic Policy Improvement.**

I. INTRODUCTION

Government-supplier partnerships play a crucial role in the successful implementation of public projects and services. These partnerships involve collaboration between government agencies and private suppliers to address the needs of society. Relationship factors refer to the variables that affect the dynamics and interactions between government agencies and suppliers in a partnership. These factors can include communication, trust, cooperation, mutual understanding, and conflict resolution mechanisms. A strong and positive relationship between the government and suppliers is essential for achieving the goals and objectives of the partnership. Conversely, a weak or strained relationship can hinder progress and lead to inefficiencies and conflicts.

The effectiveness of these partnerships is heavily influenced by various relationship factors and the terrain of these collaborations is not without its challenges. According to Pellegrino and Tracey (2012); and Roehrich and Lewis, (2007), misaligned goals, ethical dilemmas, and communication breakdowns can lead to conflict and hinder partnership effectiveness. However, understanding and analyzing these factors is essential for developing strategies that can enhance the performance and outcomes of government-supplier partnerships. Moreover, Xiong et al. (2019), distinguished four main reasons: institutional issues such as a poor social environment; organizational issues such as trust, communication, and transparency; contractual issues such as inadequate risk allocation and distribution mechanisms; and managerial issues such as inefficient partnering capacity.

Apart from considering the said factors, the researcher aimed to describe the challenges encountered in participating in government procurement projects. Thus, by combining these two concepts, the researcher could formulate effective partnership strategies that focus on both government agencies and private suppliers, especially in the government procurement processes and to strengthen or develop their partnerships and achieve better outcomes for society.

II. METHODOLOGY

According to Shuttleworth (2019), descriptive research design is a scientific method that entails observing and describing a subject's behavior without influencing it in any way. The primary objective of this design is to "describe" individuals, situations, issues, behaviors, or phenomena in nature (Siedlecki, 2020). Therefore, in this study, the researchers adopted a descriptive research design.

This study utilized a survey questionnaire strategy to collect data on thoughts and perceptions from the local private suppliers of PhilRice within the province of Nueva Ecija. To do this, the researchers targeted 30 local private suppliers within Nueva Ecija.

For a thorough comprehension of the data, the researcher used the following statistical tools to classify, tabulate, and analyze the data following the objectives of the research study.

1. To describe the profile of the suppliers, the researcher used frequency and percentage;

2. To analyze the relationship factors influencing the government-supplier partnerships, frequency, and percentage were employed;

3. To describe the challenges encountered by the private suppliers in participating in the government procurement projects, weighted mean and Likert scale was utilized:

Scale on Data Interpretation (Tables 2 and 4)

SCALE	VERBAL INTERPRETATION
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

III. RESULTS AND DISCUSSION

Business/Company Profile of Respondents

The largest group of respondents making up 36.7% of the total are from San Jose, Nueva Ecija. Following this, 26.7% are from Munoz, Nueva Ecija while Talavera and Cabanatuan, Nueva Ecija tied with 16.7% each. The smallest group of respondents making up 3.3% are from Sta. Rosa, Nueva Ecija.

As for the product or service category, 26.7% of the respondents are in General Merchandise / Multi-Products followed by Food and Meals, Appliances, Ink, Toner Cartridges, and other Office IT supplies, Agricultural Supplies, Materials, and Equipment with 13.3% each. 10% are in Automotive Supplies while a smaller percentage are in Aircon Service Center and Repairs, Hardware & Construction Supplies and Materials, and Office Supplies and Equipment with 3.3% each. Based on their PhilGEPS Membership, Platinum and Red tied with 50% each.

Duration of Partnership with PhilRice

The respondents' distribution is based on their duration of partnership with PhilRice, where 56.7% or a majority of the respondents are in 1 to 5 years, followed by 6 to 10 years with 30% while less than 1 year and 11 years and above are tied with 6.7% each.

Table 1. Relationship Factors According to Importance

RANK	RELATIONSHIP FACTOR	FREQUENCY	PERCENTAGE
1	Integrity	17	56.7%
2	Mutual Trust	14	46.7%
3	Communications	18	60%
4	Clarity of understanding	30	100%
5	Shared Objectives	20	66.7%
6	Shared Resources	20	66.7%

Table 1 shows the relationship factors according to importance. Integrity dominates the 1st rank with 56.7% or a majority of the respondents believing that Integrity is a very important factor in a government-supplier partnership. Mutual Trust dominates the 2nd rank with 46.7% while Communications dominates the 3rd rank with 60%. The 4th rank was occupied by Clarity of Understanding alone with 100%. Shared Objectives made up at 5th rank with 66.7% and Shared Resources were the 6th and last rank with 33.3%.

Table 2. Private Suppliers Perceived Practices of PhilRice in Terms of Relationship Factor

STATEMENT	WEIGHTED MEAN	VERBAL INTERPRETATION
A. Mutual Trust		
I am confident that PhilRice honors its commitments to suppliers.	4.67	Strongly Agree
B. Integrity		
PhilRice adheres to ethical standards in its dealings with suppliers.	4.73	Strongly Agree
C. Shared Objectives		
PhilRice effectively communicates its long-term objectives to suppliers involved in procurement projects.	3.90	Agree
D. Communication		
Communication between PhilRice and its suppliers is frequent during procurement projects.	4.37	Strongly Agree
E. Clarity of Understanding		
There is a shared understanding of objectives and processes in procurement projects between PhilRice and its suppliers.	4.43	Strongly Agree
F. Shared Resources		
PhilRice is willing to share resources (e.g., information) with its suppliers during procurement projects.	4.07	Agree

Table 2 shows a comprehensive assessment of PhilRice's relationship with its suppliers, emphasizing relationship factors such as mutual trust, integrity, shared objectives, communication, clarity of understanding, and shared resources. The highest ratings are observed in the areas of integrity (4.73) and mutual trust (4.67), both receiving a "Strongly Agree" interpretation, indicating that suppliers have strong confidence in PhilRice's commitment and ethical standards. Communication is also rated highly (4.37), reflecting frequent interactions during procurement projects. Clarity of understanding scores similarly high (4.43), suggesting a well-aligned perception of objectives and processes between PhilRice and its suppliers. However, the shared objectives category, while still positive, has a slightly lower score (3.90), indicating room for improvement in conveying long-term goals to suppliers.

Table 3. Relationship Factors According to Most Problems or Challenges Encountered

RANK	RELATIONSHIP FACTOR	FREQUENCY	PERCENTAGE
1	Communications	20	66.7%
2	Clarity of understanding	18	60%
3	Integrity	15	50%
4	Mutual Trust	16	53.3%
5	Shared Objectives	20	66.7%
6	Shared Resources	20	66.7%

Table 3 shows the ranking of relationship factors according to most problems or challenges encountered. Communication dominates the 1st rank with 66.7% or a majority of the respondents believing that Communication is often the reason why the partnership with PhilRice is sometimes not effective. Clarity of understanding dominates the 2nd rank with 60%. Integrity dominates the 3rd rank with 50%. Mutual Trust dominates the 4th rank with 53.3%. Shared Objectives make up at 5th rank with 66.7% while Shared Resources is the 6th and last rank with 33.3%.

Table 4. Private Suppliers Concerns or Challenges Encountered with PhilRice

STATEMENT	WEIGHTED MEAN	VERBAL INTERPRETATION
A. Mutual Trust There is a lack of confidence in PhilRice's ability to meet the agreed payment terms and schedules.	3.97	Agree
B. Integrity PhilRice often fails to fulfill its contractual obligations.	3.83	Agree
C. Communications PhilRice shows little commitment to achieving common goals with suppliers.	3.77	Agree
D. Communications PhilRice is slow to respond to supplier inquiries and concerns.	3.50	Agree
E. Clarity of Understanding The terms and conditions of procurement agreements are often unclear.	3.67	Agree
F. Shared Resources PhilRice provides insufficient support and guidance throughout the procurement process.	3.53	Agree

Table 4 outlines various concerns or challenges faced by private suppliers in their transactions with PhilRice, as reflected in six relationship factors. Private suppliers express moderate agreement (3.97) with a lack of confidence in PhilRice's ability to meet payment terms and schedules, indicating a significant trust issue. Likewise, there is concern regarding PhilRice's adherence to contractual obligations (3.83). Communication challenges are also evident, with suppliers agreeing that PhilRice shows little commitment to common goals (3.77) and is slow in responding to inquiries (3.50). In addition, terms and conditions in procurement agreements are perceived as unclear (3.67), and there is a consensus that PhilRice provides inadequate support and guidance throughout the procurement process (3.53). Overall, these ratings suggest that while the issues are still manageable, PhilRice must improve its interactions and support for suppliers to make the procurement process more efficient and to strengthen their partnership.

IV. CONCLUSIONS

The following conclusions were made based on the data collected and the findings obtained:

1.Integrity, communication, mutual trust, clarity of understanding, shared objectives, and shared resources were identified as the key factors influencing government-supplier partnerships.

2.Suppliers expressed strong confidence in PhilRice's integrity and adherence to ethical standards. Clarity of objectives and processes was also perceived positively. Communication emerged as the most frequent challenge faced by suppliers. Additionally, suppliers reported concerns regarding PhilRice's ability to meet payment terms, fulfill contractual obligations, and provide adequate support throughout the procurement process.

V. RECOMMENDATIONS

The following are recommended based on the findings of the study:

1. PhilRice has to be more transparent and communicate better. They have to talk about project updates, resolve issues, and promote teamwork. Create and put into place clear routes of contact for questions and comments. These could be hotlines, internet portals, or assigned staff. Finally, PhilRice needs to make their long-term goals and the importance of supplier participation in procurement projects very evident.
2. PhilRice has to make the expectations more clear. To prevent misunderstandings, create uniform procurement agreements with precise, succinct terms and conditions. Pre-bidding conferences are

another way to assure fair competition, address supplier inquiries, and define project requirements.

3. PhilRice needs to help its suppliers more. Simplify procurement procedures to increase their effectiveness and supplier friendliness.

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