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An Assessment of Portfolio Managers' Awareness of Big Data Analytics (BDA) Role in Achieving Portfolio Management (PFM) Success: A Qualitative Study

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Abstract
As big data analytics become the most valuable resource held by all administrations, every huge organization will be investing in initiatives of big data in a succession of Portfolio Management at the next level (Grover et al., 2018). This research aims to study the extent to which portfolio managers are aware of the role of big data in the efficiency of portfolio management.This study includes a qualitative research method to assess portfolio managers' awareness of the role of big data analytics (BDA) in portfolio management success. The researcher followed a theoretical, descriptive approach. The researcher applied the onion analysis methods. The researcher surveyed many portfolio managers in several companies in the Kingdom of Saudi Arabia. Only portfolio managers were chosen because they are more concerned with achieving strategic goals than program and project managers. The researcher conducted a qualitative study by interviewing 38 company portfolio managers.The concept of BDA in this study contains four components (Volume – Veracity- velocity- variety). In this research, five main questions have been extracted to link big data analytics with portfolio management methodology as per PMI standard guidelines for managing business portfolios. The central themes and sub-themes have been extracted for conducting the interview.The results indicated that the portfolio managers' awareness of the (PMI) Portfolio Management (PFM) methodology is very high and compatible with the directions of the Kingdom of Saudi Arabia 2030. The researcher recommends future research to apply another quantitative study for a specific sector to investigate clear awareness regarding the value of using BDA in managing several portfolios.
Keywords: Big Data Analytics (BDA)- Portfolio Management (PFM)- Portfolio Decision Support (PDS).
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1. Introduction

A good way to start all current projects of the organizations is to gather all information about project inventory. Business ability is the skill of adapting and altering all of their internal and external changes rapidly and effortlessly (Mandal, 2018). As none of the organizations have the resources for meeting all the requirements of the business, they need to view all the resources through Portfolio Management and they can prioritize where they can apply these limited properties is the main aspect of big data analytics. The organization with the skill to perceive all these resources among the project standing and other assigned resources for confirming the accurate projects have been completed earlier. In the analytics of big data, all data has been arranged and processed later. After the collection of the data, they are stored by the data professionals for use in various analytical inquiries. Big data analytics mainly helps all associations to connect all of their data and use them in the future for identifying better opportunities. It leads all organizations to do all operations more efficiently, for cooler business moves, to gain greater profits, and to make their consumers happy and satisfied. Businesses that are using big data with progressive analytics will be able to gain more value in various ways such as in the area of Portfolio Management Success. To become fruitful in Portfolio Management Success, users need to select and recruit their projects based on all abilities of the organization and their future goals. For becoming successful in the management of a portfolio, one needs to know the decision procedure and other systematic mythologies. Predictive analytics in big data helps in building various models for forecasting the behavior of clients and other future activities, trends, and scenarios working by the management of a portfolio. The use of big data analytics is prevalent in 24% of companies. Only 24% of organizations describe themselves as data-driven, even though 97.2% say they're investing in big data and artificial intelligence projects. (Expert, 2022). This motivated the researcher to examine portfolio managers' awareness of big data analysis and its impact on proper portfolio management in the Kingdom of Saudi Arabia.

2. Problem Statement

The main research problem is that some portfolio managers do not know the role of big data in managing their business portfolios efficiently and effectively. Portfolio managers have always been aware of what assets to buy and sell, but big data has made it possible to use algorithms that can help them manage different assets more

effectively. By analyzing vast amounts of data using algorithms, it is possible to make predictions about which assets are likely to perform better in the future and which are likely to perform worse. With this knowledge, the portfolio manager can then make changes to his or her portfolio to increase the profits of their business. On the other hand, some of the managers believe that big data has no real impact on their business and does not help improve the management of their portfolios. Results of a study on managers' views on big data revealed significant differences between those with and without experience.(Ylijoki & Porras, 2018). This motivated the researcher to study portfolio managers' knowledge of big data analysis and its effects on portfolio management in Saudi Arabia.

3. Research Questions

This research aims to understand how Big Data can help portfolio managers effectively manage project portfolios within its five domains. The following key question and sub-questions are being explored:

Key Question: How can Big Data help portfolio managers manage project portfolios with its five domains?

Sub-Questions

1. How the portfolio managers utilize the BDA in order to develop Portfolio Strategic Management?
2. How the portfolio managers utilize the BDA in order to develop Portfolio Governance Management?
3. How the portfolio managers utilize the BDA in order to develop Portfolio Performance Management?
4. How the portfolio managers utilize the BDA in order to develop the Portfolio Communication Management?
5. How the portfolio managers utilize the BDA in order to develop the Portfolio Risk Management?

4. Research Aims and Objectives

To become successful in the area of portfolio Management Success, users need to have applications, standard procedures, training for the active sharing of relevant data of portfolio analysis, and also for setting the goal, decision making, prioritization of the project, status of the project in big data analytics (Korherr & Kanbach, 2021). But do portfolio managers have a real awareness and understanding of the importance of analyzing and benefiting from big data in managing the whole portfolio? This research aims to study the extent to which portfolio managers are aware of the role of big data in the efficiency of portfolio management.

5. Theoretical frame work

After reviewing the previous literature review related to the subject of the study on the assessment of portfolio managers' awareness of the role of big data analytics (BDA) in portfolio management success, and reviewed the problems and challenges in many of the aforementioned studies. The researcher will use a thematic analysis method. There are various themes designed and bring a fruitful explanation of it. These themes are presented based on the interview questions. Different questions offer distinct themes that help conduct the study effectively and gain a fruitful and beneficial outcome. The interview questions are designed to cover the study objectives to assess portfolio managers' points of view on How can big data assist them in managing project portfolios across its five domains. The interview questions are designed in (5) thematic to cover the study purposes. The interview questions are reliable because they the five main domains for managing project portfolios approved by the Project Management Institute as below. (Popovič et al., 2018).

Table (1): (*Portfolio Management (PfMP) Certification| PMI*, n.d.)

Knowledge Areas	Process Groups		
	Defining Process Group	Aligning Process Group	Authorizing and Controlling Process Group
Portfolio Strategic Management	4.1 Develop Portfolio Strategic Plan 4.2 Develop Portfolio Charter 4.3 Define Portfolio Roadmap	4.4 Manage Strategic Change	
Portfolio Governance Management	5.1 Develop Portfolio Management Plan 5.2 Define Portfolio	5.3 Optimize Portfolio	5.4 Authorize Portfolio 5.5 Provide Portfolio Oversight
Portfolio Performance Management	6.1 Develop Portfolio Performance Management Plan	6.2 Manage Supply and Demand 6.3 Manage Portfolio Value	
Portfolio Communication Management	7.1 Develop Portfolio Communication Management Plan	7.2 Manage Portfolio Information	
Portfolio Risk Management	8.1 Develop Portfolio Risk Management Plan	8.2 Manage Portfolio Risks	

The matrix below is the matrix that links the study questions with the interview themes to assess portfolio managers' awareness of the role of Big Data Analytics (BDA) in Portfolio Management (PFM) success.

Table (2): Matching between Study objectives & Questionnaire interview

Study Questions	Theme	Sub-themes
Theme 1: How the portfolio managers utilize the big data in order to develop Portfolio Strategic Management?	Big data analysis helps create a strategic plan for a portfolio, as well as an initial structure, portfolio charter, and roadmap tailored to the portfolio.	Contribute May be Contribute No contribution
Theme 2: How the portfolio managers utilize the big data in order to develop Portfolio Governance Management?	Big data analysis helps create a Portfolio Governance Management system. This includes figuring out the right elements for the portfolio and analyzing them to create the ideal balance for reaching strategic alignment.	For sure May be Not Guarantee
Theme 3: How the portfolio managers utilize the big data in order to develop Portfolio Performance Management?	Big data analysis can help in building a Portfolio Performance Management system to decide how portfolio value is defined, which components are allocated resources, and how the benefits of all components are realized.	Contribute May be Contribute No contribution
Theme 4: How the portfolio managers utilize the big data in order to develop the Portfolio Communication Management?	Big data analysis assists in constructing a Portfolio communication Management and communication requirement matrix between all concerned stakeholders.	Ensure success May be Not Guarantee
Theme 5: How the portfolio managers utilize the big data in order to develop the Portfolio Risk Management?	Analyzing big data can help in managing portfolio risks and capitalize on opportunities, while minimizing negative effects.	Sure, handling Risk May be Not necessary

The interview questions are reliable because they cover the five main domains for managing project portfolios approved by the Project Management Institute.(*Portfolio Management (PfMP) Certification| PMI*, n.d.).

6.1 Portfolio Management as per PMI methodology

A portfolio is a group of projects, programs, and other operations managed to accomplish strategic purposes. A portfolio management strategy concentrates on aligning all organization's projects, programs, and operations properly. Portfolio management is the selection, prioritization, and control of an association's programs and projects to align them with its strategic purposes and performance capabilities. The purpose is to balance implementing change initiatives and maintaining business as usual while optimizing return on investment. (Portfolio Management (PfMP) Certification| PMI, n.d.). A good portfolio management process should maintain sufficient control and oversight while encouraging a high level of innovation. It is often referred to as program and project management or Portfolio Decision Support ("PDS"). The approaches affected in portfolio structure, prioritization, management, and control are collectively known as portfolio management. There are five primary activities within the portfolio activity: project selection, project planning, budget forecasting, project execution, and project closure. Each project is assigned one or more resources from the organization to execute the work. Organizations vary in their approaches to portfolio management; some organizations perform these activities centrally, while others may delegate those tasks to business units and individual project managers. Organizational-level portfolio management involves defining an organization's overall strategy and selecting programs to support that strategy. Program-level portfolio management involves translating the strategy into a set of projects and determining the resources and responsibilities needed to manage those projects.(Kopmann et al., 2017)

As per PMI institute, Portfolio management will include the below active domains of management:

Domain 1: Strategic alignment of portfolio
Domain 2: Governance of portfolio
Domain 3: Portfolio Performance Management
Domain 4: Portfolio Risk Management
Domain 5: Portfolio Communication

Domain 1: Strategic alignment of portfolio

The strategic alignment of a portfolio refers to aligning the organization's long-term business goals with the projects, programs, and initiatives in the portfolio. As part of portfolio strategic alignment, a recommendation for portfolio scenarios and related components is made to create an initial high-level roadmap for the portfolio. The strategic alignment also mandates determining existing and possible portfolio elements by examining documentation, such as business plans/proposals, to construct portfolio scenarios. Form portfolio scenarios (what-if analysis) by matching components against prioritization measures and utilizing analysis approaches (e.g. Risk, examination, SWOT analysis, financial calculation) to evaluate and decide feasible choices.(KenFaulkenberry, 2019).

Domain 2: Governance of portfolio

Governance activities include the establishment of governance models. This includes defining the structure and authority of governing bodies, identifying risks and opportunities, developing policies and procedures to govern operations, managing conflicts of interest, and measuring and evaluating the effectiveness of governance practices. Tasks in the Governance domain ensure that portfolio components are authorized, and processes are in place to monitor and report progress and ensure compliance.(Portfolio, 2016)

Domain 3: Portfolio Performance Management

As defined by the governance model, the Portfolio Performance domain includes the activities required to manage the portfolio. The goal of portfolio management is to guarantee that the risks and rewards associated with a particular investment are appropriately aligned to reach the best probable value on the financed capital. The process of identifying investment opportunities, selecting investments, and managing those investments is referred to as portfolio management. This process involves monitoring the investment performance of the portfolio and making adjustments as necessary in order to ensure that it is meeting its objective.(Jensen et al., 2019).

Domain 4: Portfolio Risk Management

As part of Portfolio Risk Management, businesses balance and manage their portfolio risks in accordance with their risk appetite and facilitate the decision-making process. The size and structure of the business will determine the level of complexity involved in the portfolio decision-making process.(KenFaulkenberry, 2019).The primary objective of portfolio risk management is to ensure that assets are exposed to an appropriate level of risk at all times and that they are managed in a way that optimizes performance and returns while minimizing risk. This involves identifying and understanding the nature of a business's risks and quantifying them in terms of their potential impact on the business's financial performance. Once these risks have been identified, strategies can then be developed to manage or mitigate them.(*Portfolio Management (PfMP) Certification| PMI*, n.d.)

Domain 5: Portfolio Communication

As part of the Communications Management domain, stakeholders must be kept informed about their needs and expectations; they must be communicated with continuously; and developing, implementing, and monitoring communication plans. Communication plans are designed with goals and carefully aligned with business objectives. They may include a range of strategies, including formal announcements, social media postings, and marketing messages.

A vital component of an effective communications plan is identifying the proper communication methods to reach target audiences. Different audiences require different communication methods and channels. For example, employees may need more formal communication through emails and memos than customers. Appropriate communication channels also depend on the size of the audience and the channel's reach. (Kopmann et al., 2017).

6.2 Big Data Analytics Concept

Big Data Analytics play big role in Achieving Portfolio Management Success. There is no denying the importance of data in portfolio management, as it can provide insights that help optimize risk and identify new opportunities in the market. However, it is critical that investment firms use the right analytics technology to effectively capture and utilize data in their decision-making. An analysis of big data involves identifying trends, patterns, and correlations in raw data so that data-driven decisions can be made. The use of big data analytics is seen as a business benefit. This promotes organizations to understand customer behavior better, streamline procedures, and accurately forecast future directions. (Kempa, 2017).

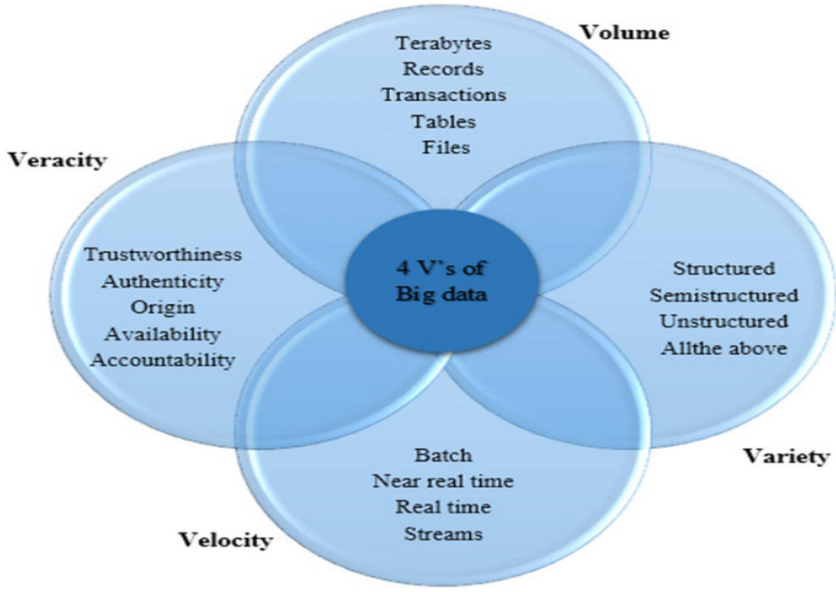

Figure 1: (Saabith, Sundararajan, & Abu Bakar, 2016)

The characteristics of big data are unique and distinguishable. Big data management is based on four dimensions (Vs). This 4Vs consists of (**Volume** – **Veracity- velocity- variety**). The **Volume** refers to how much data is gathered. The analyst must determine for what purpose the data must be collected and how much it should be managed. The **veracity** of data relates to its reliability. For data to be validated and trustworthy, analysts must ensure that it comes from a trusted source. The data collection method and source determine the quality. For reliable results, native data should be collected rather than from third parties. (Yeoman, 2019)

Moreover, test measures should be appropriately designed to ensure that data provides the desired information. The speed at which data are generated, collected, and analyzed is called **velocity** in big data. Using big data can sometimes require immediate action. It is still advantageous to receive up-to-date information about rates and act accordingly in some fields. For other businesses, data trends over time are more critical for making predictions or solving persistent problems. In data collection, **variety** refers to how multiple reference points are used. One data source may give skewed results if all data is collected from that source. The trend of the population will represent a small group of people. (Demchenko, 2022).

7. Research Methodology

Scientific research methodology is the cornerstone of any scientific research. The research methodology is the researcher's roadmap during his research journey. The process of systematizing a precise matter to accomplish beneficial outcomes that contribute to solving the issue; Recommendations and suggestions prepared by the researcher. Practical research methods are many and varied, each with advantages and disadvantages. The comparison is made between these types according to the study's strategic objective and the research framework. This study includes a qualitative research method to assess portfolio managers' awareness of the role of big data analytics (BDA) in portfolio management success The picture will be more transparent at the end of the thematic analysis. To facilitate research construction, the researcher followed a theoretical, descriptive approach. The researcher applied a technique called onion. This methodology is well known among researchers across a wide range of disciplines. Saunders et al. (2007) are the authors of this methodology. Each stage of a study can be entered and exited smoothly. Layers help to give a clearer picture of the research process. As a result of this process, it is possible to develop effective research methodologies. Because it can be adapted to virtually any procedure, this method can be used almost anywhere. During the six stages of the research, we gradually approach the onion core, the ultimate objective of our study. Philosophies, Approaches, Methodological Choices, Strategies, Time Horizons, and Techniques & Procedures are the six stages of the methodology, from the most distant to the nearest. (Saunders et al., 2016).

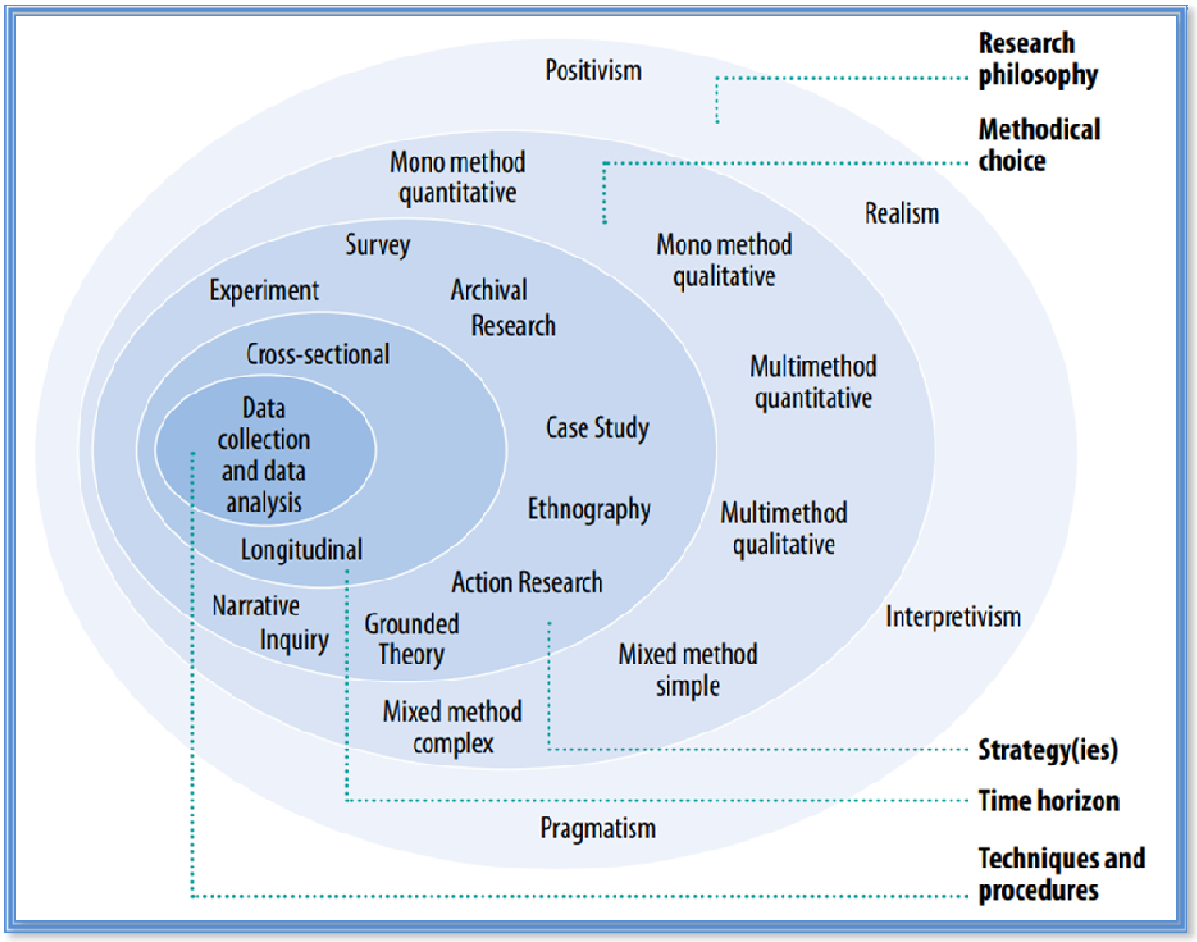

Figure2: Research Onion Methodology & Deduction Stages
(Saunders et al., 2016)

7.1 Philosophy (Interpretivism Philosophy)

Research philosophy refers to the philosophy the researcher acknowledges is related to the research topic. It's the individual thought of the researcher about what proper knowledge is. So, intrinsically, the philosophy of research is the outer layer of the onion of research. Positive studies claim that perception, understanding, and knowledge actually lie beyond what is being examined. In other expressions, what exists can only be done realistically and cannot include individual ideas or beliefs - the researcher does not demonstrate during his research journey. Positivism claims that there is only one truth and that all purposes are agreed upon among the people. After a deep understanding of the onion model, based on the study questions and objectives. The researcher finds that the Interpretivism Philosophy is the most appropriate approach for this qualitative study. Various themes will be designed on the basis of interview questions so that study remain more interesting and valuable. The core essence of the research is to assess portfolio managers' awareness of the role of big data analytics (BDA) in portfolio management success.

7.2 Approach (inductive approach)

This study follows a 'inductive' approach that examines portfolio managers' awareness of the role of big data analytics (BDA) in portfolio management success. Qualitative research often uses this method. The data can then be analyzed for patterns among the respondents after interviews are conducted concerning specific issues.(Jansen, 2021).

7.3 Methodology ('Mono Method Qualitative)

This study will consider the 'Mono-Method Qualitative' methodological choice. Data is an assortment of realities, figures, articles, images, and occasions accumulated from various sources. Associations gather information to settle on better choices. Without information, it would be challenging for associations to settle on suitable choices, thus information is gathered at different moments from various crowds.(*Understanding Research Onion for Research Methodology - The Innovidea*, n.d.).

7.4 Strategy (Survey & Interview)

Regarding the choice of research method, the implemented strategy is based on an "Survey & interview" that presents relevant questions that cover the population of respondents related to this study and can be measured and analyzed by several methods. Data analysis is the most common way of cleaning, changing, and handling crude information, and extricating noteworthy, significant data that assists organizations with settling on informed choices. The system lessens the dangers inborn in direction by giving valuable experiences and measurements, frequently introduced in outlines, pictures, tables, and charts. (Jansen, 2021).

7.5 Time Horizon (Cross-Sectional Time Horizon)

Since research data has been collected in one period of time not in different period of time and considering the fact that this is a mono-Qualitative method of study, the 'Cross-Sectional Time Horizon' is appropriate for this study.

8. Research limitation

This research was limited to a qualitative study to discover the impact of Big Data Analytics (BDA) on the portfolio Management Success (PMS). The researcher conducted a qualitative study by interviewing 38 company portfolio managers. The interview with them took 78 working days. The managers of the companies who had been interviewed invested more than 2.4 pillion million Saudi riyals in several business portfolios. The selection of the target population was limited to portfolio managers because their main priority is achieving strategic goals and aligning with the company's vision and mission.

9. Target population & Data collection

The researcher surveyed a number of portfolio managers in several companies in the Kingdom of Saudi Arabia. Only portfolio managers were chosen because they are more concerned with achieving strategic goals than program and project managers. The researcher conducted a qualitative study by interviewing **38** company portfolio managers. The interview with them took **78** working days. The managers of the companies who had been interviewed invested more than 2.4 pillion Saudi riyals in several business portfolios. To evaluate the awareness of 38 project portfolio managers regarding the role of big data in optimizing project portfolios, a random sample was selected from four different sectors (construction, health, education, and service) within the Kingdom of Saudi Arabia. The aim was to assess their awareness and identify the optimal investment that yields the highest rate of return and benefits for the investing companies. The respondents' answers to the interview questions were analyzed using frequency and percentages.

10. Data Analysis and Findings

The interview questions will be analyzed to determine the extent of portfolio managers' awareness of the role of big data in the success of business portfolios. The five study questions and demographic variables will be analyzed using thematically presenting data as the most common method of analyzing qualitative data. It brings a fruitful explanation to a variety of themes. These themes were derived from the interview questions. This study reveals distinct themes and sub-themes due to the different questions, assisting in effective conduct and gaining beneficial consequences. For each topic in the study, the researcher will explain the frequency of keywords among participants. By doing this, he can see whether this theme is available among the study's key stakeholders. As the researcher scanned the interview results with the respondents, he extracted the words that indicated the themes and sub-themes presented by respondents as below.

10.1 Analysis of the study demographic variables

During the study period, the researcher collected demographic data for analysis as follows:

10.1.1 Demographic variable- Age analysis results

Table (3): Age analysis results

Age	Frequency	Percentage
Less than 25	**3**	**%8**
26-35	**3**	**%8**
36-45	**14**	**%37**
More than 45	**18**	**%47**
Total	**38**	**%100**

Source: "Made by author"

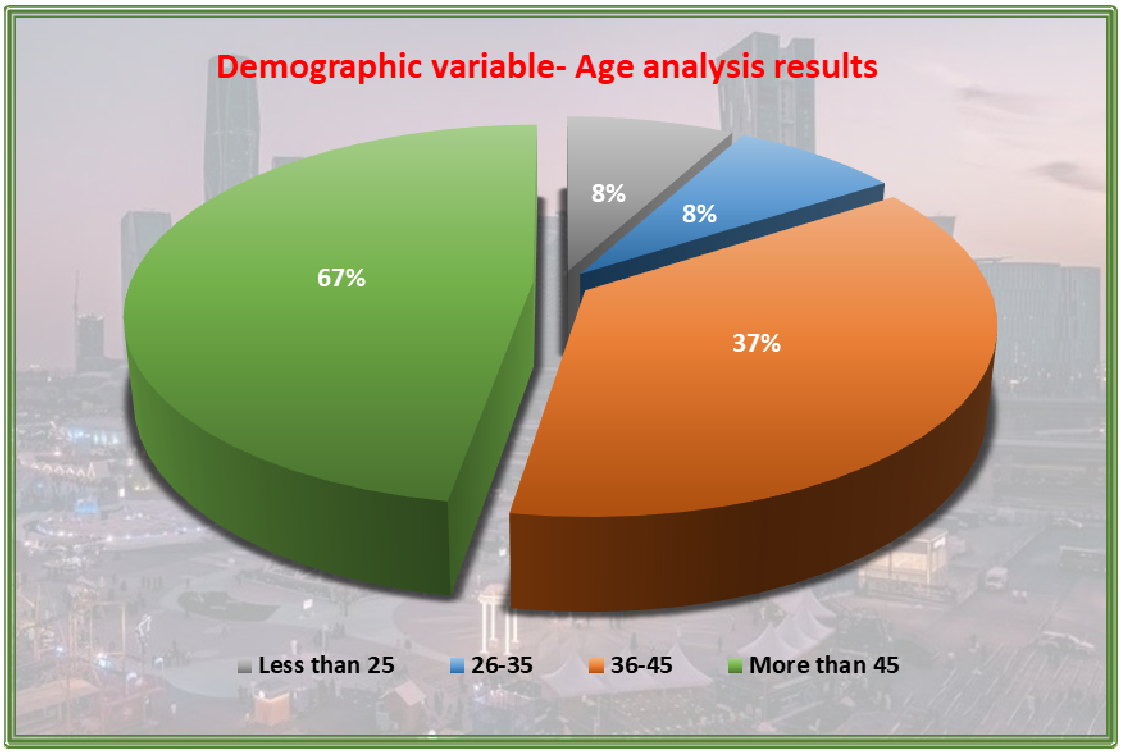

Figure 3: Demographic variable- Age analysis results
Source: "Made by author"

Table No.3 shows that the majority of respondents (47%) are above the age of 45, while 14 participants (37%) are between the ages of 36 and 45. Three additional participants were discovered to be aged 26 to 35 and made (8%). However, three responders (8% of the total) were under 25.

10.1.2 Demographic variable- level of education analysis results

Table (4): level of education analysis results

level of education	Frequency	Percentage
Bachelor	6	%16
Master	17	%45
Doctorate	15	%39
Total	38	%100

Source: "Made by author"

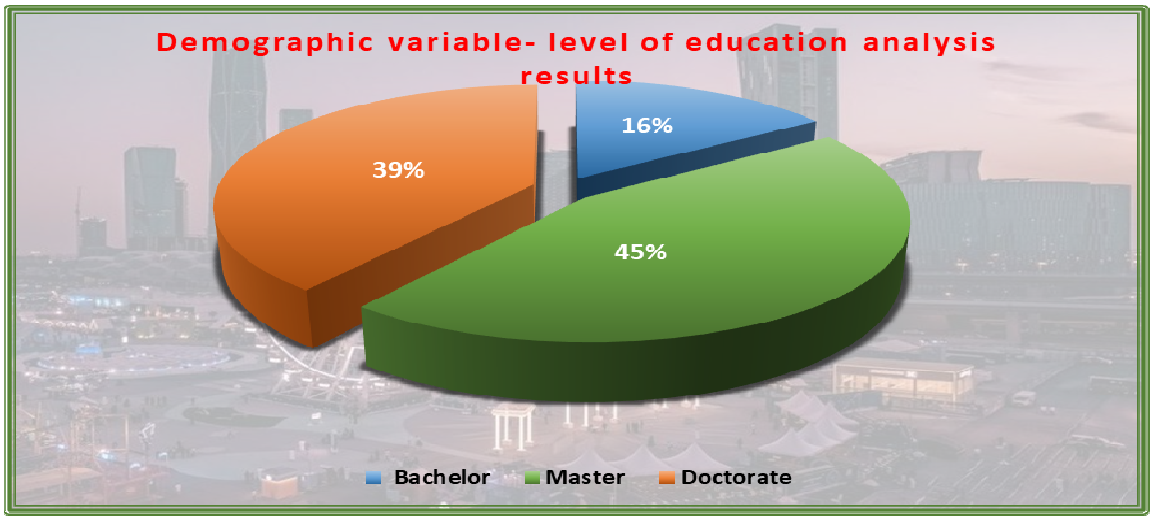

Figure 4: Demographic variable- level of education analysis results
Source: "Made by author"

In order to manage portfolios, portfolio managers must have at least a bachelor's degree. According to table no. (4), 17 participants (45%) have completed a master's degree. Furthermore, 15 respondents ranked a Ph.D. second (39%). In contrast, only six (16%) holders of bachelor's degrees were present.

10.1.3 Demographic variable- Years of managerial experience analysis results

Table (5): Years of managerial experience analysis results

Years of managerial experience	Frequency	Percentage
Less than 5	1	%3
6-10	5	%13
11-15	8	%21
16-20	14	%37
Over 20	10	%26
Total	38	%100

Source: "Made by author"

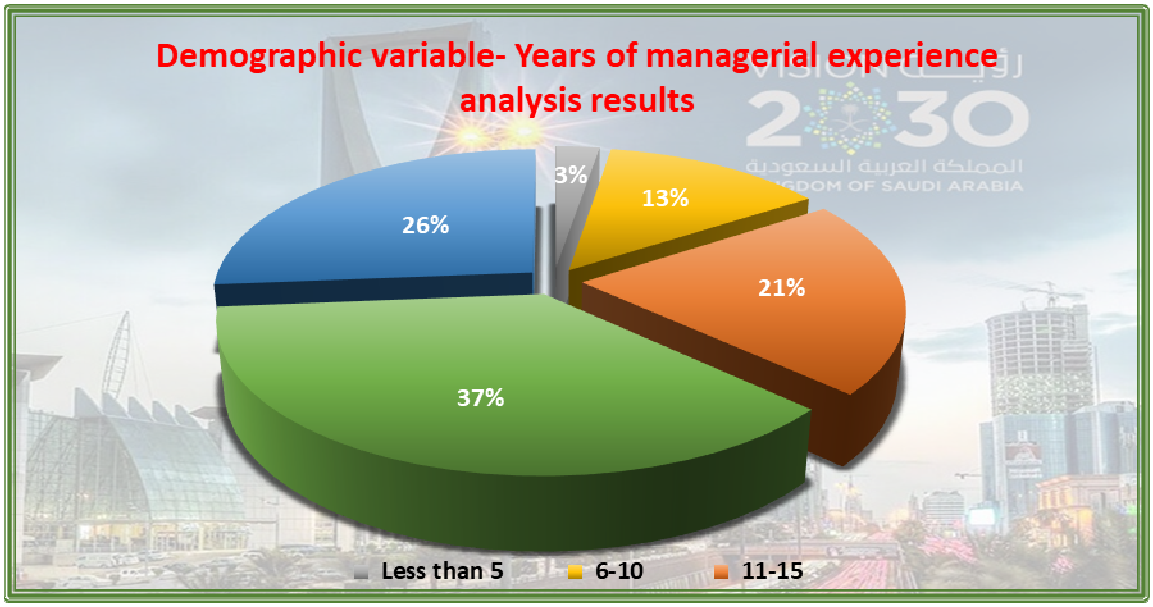

Figure 5: Demographic variable- Years of managerial experience analysis results
Source: "Made by author"

Table no. 5 indicates that most respondents have 16-20 years of managerial experience (37%), while the remaining have 11-15 years of experience (21%). Another 5 participants were found to have between 6-10 years of experience, making a percentage of (13%). In total, one respondent has less than five years of experience (3%); however, ten respondents have more than 20 years of experience, and their percentage is 26%.

10.2 Analysis of the Interview questions

10.2.1 Analysis of theme one (Big data analysis helps create a strategic plan for a portfolio and an initial structure, charter, and roadmap tailored to the portfolio)

Table (6): Analysis of Sub-theme On

Sub-theme One	Frequency	Percentage
Contribute	35	%92
May be Contribute	2	%5
No contribution	1	%3
Total	38	%100

Source: "Made by author"

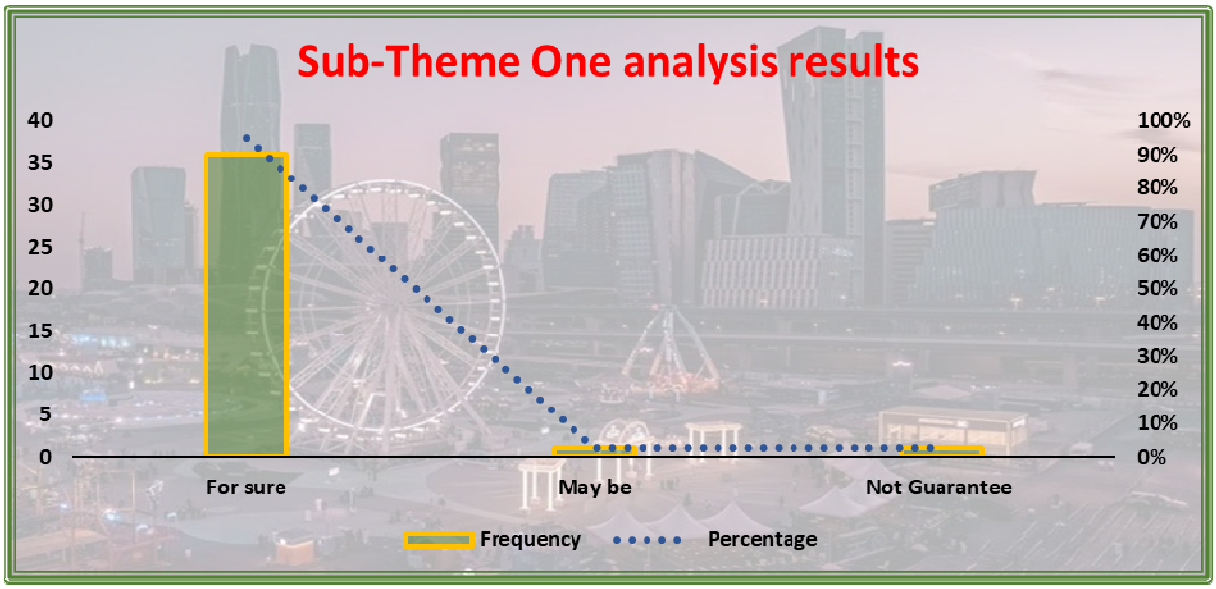

Figure 6: Sub-Theme One analysis results
Source: "Made by author"

According to the methodology of the Project Management Institute, the portfolio manager must collect the necessary data and information to determine the targeted projects and programs that may achieve the highest value and benefits for the company. (Lanka, M. C. 2007).

The portfolio manager must also build priorities for these programs or projects to ensure good investment, establish the portfolio charter, approve the initial structure by the portfolio sponsor and the Governance board, and build the necessary roadmap at a specific time frame. Table 6 reveals that one respondent need further knowledge on the impact of big data analysis in developing a portfolio strategic plan, including a roadmap, structure, and charter (3%). Comparatively, two respondents had some knowledge (5%), while 35 respondents understood the role big data analysis plays in portfolio strategic alignment (92%). The analysis of the first theme reflects that the study sample has a very high awareness of 92% that big data analysis helps create a strategic plan for a portfolio and an initial structure, charter, and roadmap tailored to the portfolio.

10.2.2 Analysis of theme one (Big data analysis helps create a Portfolio Governance Management system. This includes figuring out the right elements for the portfolio and analyzing them to create the ideal balance for reaching strategic alignment)

Table (7): Analysis of Sub-theme Two

Sub-theme Two	Frequency	Percentage
For sure	36	%95
May be	1	%3
Not Guarantee	1	%3
Total	38	%100

Source: "Made by author"

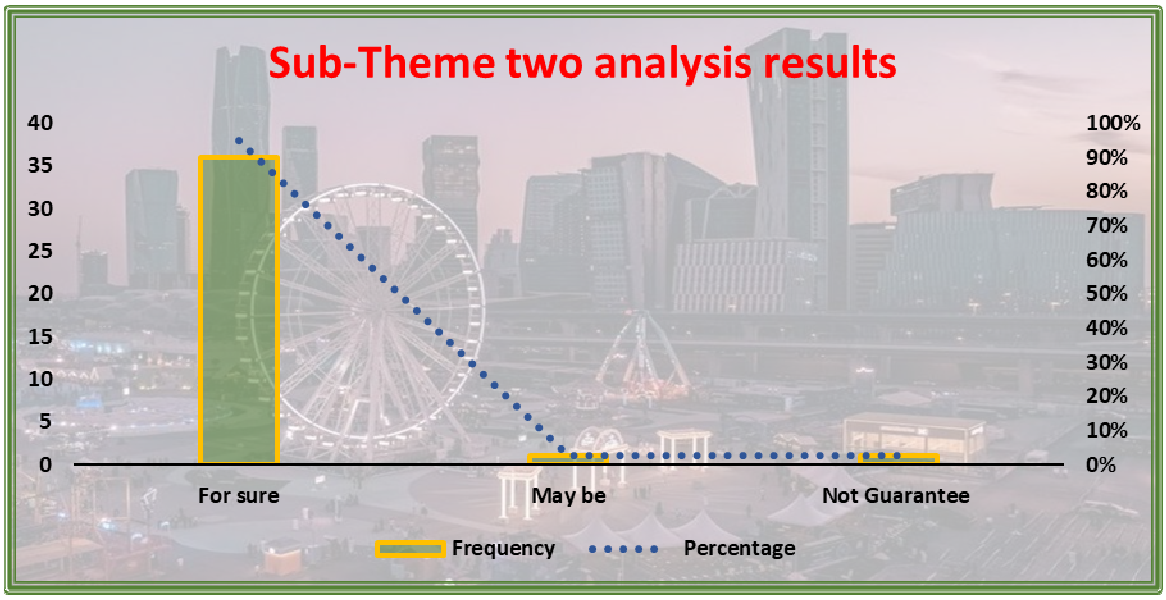

Figure 7: Sub-Theme Two analysis results
Source: "Made by author"

According to the sub-theme results, participants repeated "Not Guarantee " one times at a rate of 3%, indicating that a very small percentage believed that big data analysis helps create a Portfolio Governance Management system. While the word "maybe" was repeated also one times by 3%, showing the relative knowledge of participant about the relationship between big data analysis and Portfolio Governance. In contrast, "For sure" was repeated 36 times at 95%, a significant percentage. Based on the theoretical framework and previous studies, and PMI institute, The Governance domain includes activities related to establishing the governance model for an organization, selecting and appointing directors to manage the entity, monitoring director performance, and fixing disputes. These activities are critical to ensuring that the board of directors fulfills its oversight role and that the organization operates efficiently and effectively. Develop a portfolio management plan based on organizational assets, such as standards, models, and communication procedures. Include governance models, escalation procedures, risk tolerances, governance thresholds, change control, management, key performance indicators, prioritization models, and communication techniques. All mentioned requiring deep data analysis to develop effective Portfolio Governance. The analysis of the second theme reflects that the study sample has a very high awareness of 95% that Big data analysis helps create a Portfolio Governance Management system that reflects the capabilities of portfolio managers in Saudi Arabia.

10.2.3 Analysis of theme one (Big data analysis can help build a Portfolio Performance Management system to decide how portfolio value is defined, which components are allocated resources, and how the benefits of all components are realized)

Table (8): Analysis of Sub-theme Three

Sub-theme Three	Frequency	Percentage
Contribute	38	%100
May be Contribute	0	%0
No contribution	0	%0
Total	38	%100

Source: "Made by author"

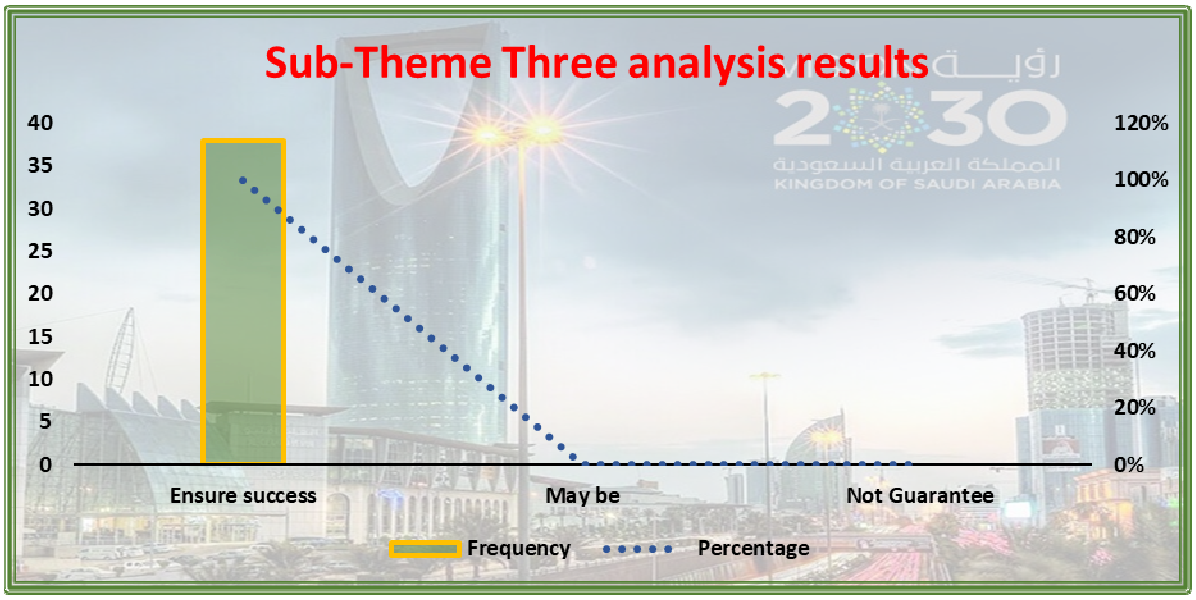

Figure 8: Sub-theme Three analysis results
Source: "Made by author"

The results for sub-theme three reveal that participants repeated "contribution" 38 times with 100%, indicating that the study sample is extremely aware of the significance of Big Data analysis. Using Big Data Analytics, Portfolio Performance Management systems can be built that define portfolio value, assign resources to components, and realize the benefits of those components. The respondents did not repeatedly respond with "may be contributing" and "no contribution," which indicates a complete consensus among the respondents regarding the value of big data in constructing Portfolio Performance Management.

10.2.4 Analysis of theme one (Big data analysis assists in constructing a Portfolio communication Management and communication requirement matrix between all concerned stakeholders)

Table (9): Analysis of Sub-theme Four

Sub-theme Four	Frequency	Percentage
Ensure success	**37**	**%97**
May be	**1**	**%3**
Not Guarantee	**0**	**%0**
Total	**38**	**%100**

Source: "Made by author"

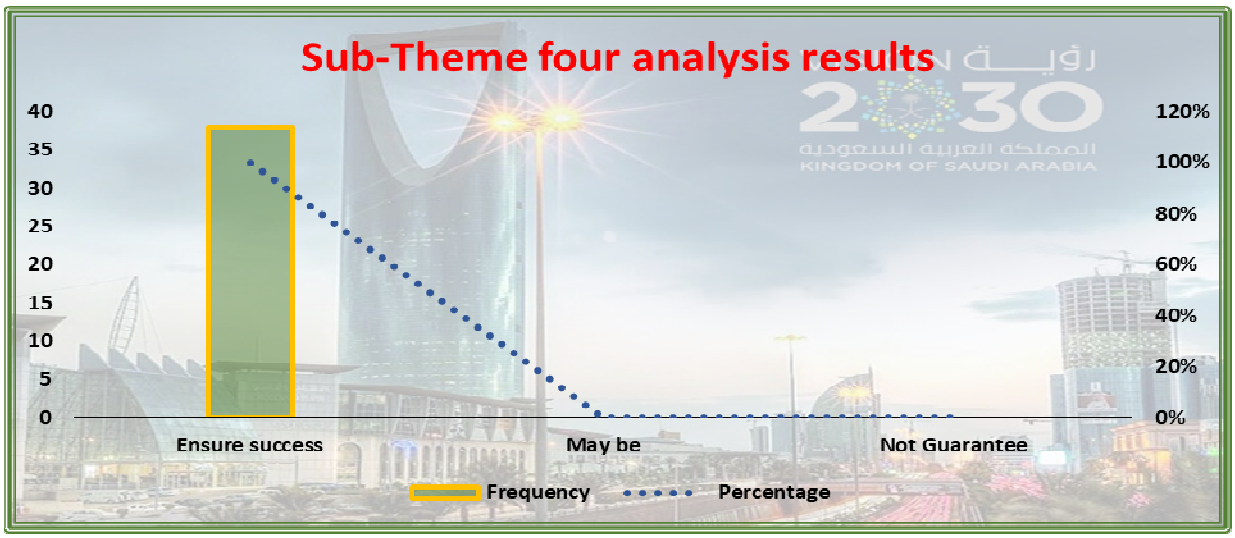

Figure 9: Sub-theme Four analysis results
Source: "Made by author

The results of the fourth sub-theme show that the keyword "No guarantee" was not repeated, indicating that

all participants believe that big data analysis helps create Portfolio communication. While the word "maybe" was repeated one time with 3%, showing the relative knowledge of one participant about big data analysis's role in constructing Portfolio Communication Management. On the contrary, "Ensure success " was repeated 37 times at 97%. This means the majority understand the Big Data analysis role in constructing a Portfolio communication Management and communication requirement matrix.

10.2.5 Analysis of theme one (Analyzing big data can help manage portfolio risks and capitalize on opportunities, while minimizing negative effects)

Table (10): Analysis of Sub-theme Five

Sub-theme Five	Frequency	Percentage
Sure, handling Risk	35	%92
May be	3	%8
Not necessary	0	%0
Total	38	%100

Source: “Made by author

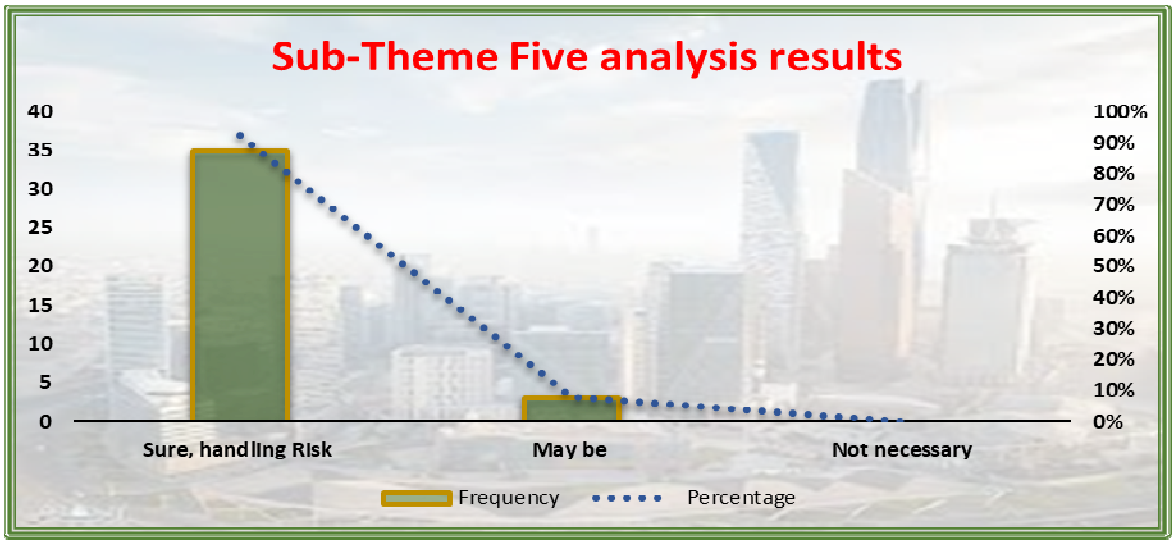

Figure 10: Sub-theme Five analysis results

Source: “Made by author

In the fifth sub- theme results, the word "Not necessary" was not repeated at any time. While the word "maybe" was repeated three times at 8%, showing the relative knowledge of participants about big data analysis's role in constructing Portfolio risk. On the contrary, the word "Sure, handling Risk "was repeated 35 times at 92%. This means the majority have a complete understanding of the big data analysis may assist in managing portfolio risks, seizing opportunities, and minimizing unfavorable outcomes.

11. Conclusion

The results of this study, which were applied to 38 portfolio managers in different sectors in the Kingdom, indicated that portfolio managers' understanding of big data still needs continuous development. Some people thought big data and its various analytics were only related to technology projects. Analyzing data and information very accurately may lead to the success of projects. In conclusion, the five research objectives & questions have already been covered. The results of the thematic analysis of the respondents' answers indicated that there is effective knowledge of the importance of big data. In fact, the portfolio of projects is managed through five main domains previously referred to in the theoretical framework. These domains need accurate data and are treated objectively in order to maximize the expected benefits from project portfolios. Saudi Arabian business portfolio managers deeply understand the Project Management Institute's portfolio management methodology.

12. Recommendations

The researcher recommends conducting quantitative research on specific sectors to determine the extent of portfolio managers' awareness of the importance of big data. This will enable them to maximize the benefits of the portfolio and achieve strategic alignment. The researcher also recommends conducting a comparative study between portfolio managers in different sectors or countries. This will enable them to determine the differences,

make improvements, and train portfolio managers to fully understand and know the portfolio management methodology approved by the Project Management Institute.

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