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ABSTRACT

Title: Proposed Drivers Analysis Framework as an Ex-Ante Control Approach for Conducting Strategic Orientation of Cost Management: With A Case Study

Background: Due to competitive pressures, a lot of changes should be made to cope with rapid developments and requirements of modern environment that should be related to firm strategy to create competitive advantages and achieve its long-term objectives. Therefore, it is necessary for firms to have a strategic orientation in their cost management practices and achieving better Ex-ante control over value-creation and cost throughout the Total Value Chain (TVC), to continually improve performance toward creating the maximum value for the customer at the lowest possible cost. Drivers Analysis can be recognized as a valuable and effective Strategic Cost Management (SCM) technique, it is also considered among the important Ex-ante control approaches, through controlling their drivers. It provides a distinct approach to study the trade-off between value-creation represented by value drivers and cost represented by cost drivers for the purpose of selecting and providing information on best drivers.

Purpose: The research aims to present a proposed Drivers Analysis framework for the purpose of conducting strategic orientation of cost management.

Design/Methodology/approach/method/tools: A Problem-Solving approach was adopted. Accordingly, the Constructive Approach was used to develop the proposed framework that serves the research purpose. A Case Study was caried out as a research method using AHP tool on National Bank of Egypt branches in Gharbia to clarify the applicability of the proposed framework based on a set of proposed criteria for applying Drivers Analysis. In addition, the researchers relied on interviews, observations, documentary analysis and a questionnaire to collect the necessary data for the case.

Findings: Some recommendations have been suggested to improve the utilization of the NBE's resources in a way that maximizes the value of its clients at a lower cost and to guide and

improve the strategic performance in NBE toward achieving sustainable competitive advantages and enhancing its competitive position.

Originality/Value: This research provides substantial insights into the importance of drivers` analysis and how to apply it in a new and better way by dealing with the area of value-creation to achieve competitive advantages and conducting the strategic orientation of cost management. In addition to Cost Drivers Analysis, the research considered the value drivers analysis based on the Critical Success Factors (CSFs) to select best value drivers and best cost drivers using AHP.

Key Words: Strategic Cost Management (SCM); Ex-ante Control; Drivers` Analysis; Total Value Chain (TVC); Critical Success Factors (CSFs); Value Drivers Analysis; Cost Drivers Analysis, Analytical Hierarchy Process (AHP).

1. Introduction

During the past two decades, firms have been faced with dramatic changes in the business environment. resulting in competition in an increasingly fierce market and tends to be more severe and harsh (Berisha, 2017). That's why all firms must cope with this new business environment and struggle against the competitive market pressures to keep their existence by continually improving their performance to create sustainable competitive advantages and maintain a good competitive position and constantly supporting it.

Hansen et al, (2021) argued that competitive advantage is creating superior customer value for the same or lower cost than offered by rivals or creating equivalent or better value for lower cost than offered by rivals. Therefore, cost and customer value-creation have always been one of the major components of the entire businesses, and are undoubtedly one of the most important factors on which the firm's management depends in making decisions and managing performance (Berisha, 2017). And as they represent the two important aspects of cost management (CM), CM became a critical competitive survival skill.

In the end, the absence of strategic awareness can expose firms to many risks that harm their competitive position and their inability to create sustainable competitive advantages. So that, it is not sufficient to simply reduce costs; instead, cost and value must be managed and controlled strategically. Subsequently, firms should switch from unfocused CM to SCM. SCM is how to manage cost and how to use SCM`s techniques to support and strengthening the firm's competitive position (El-Helbawy & El-Nashar, 2023). This led, firstly, to the necessity of carefully considering the external environment and the value creation for those parties outside the firm and paying attention to the CSFs that the firm will uniquely rely on in creating those values for its stakeholders, especially value for customers.

Secondly, taking the necessary current procedures that lead to positive results in the future, including attention to the Ex-Ante control of cost and value, and ultimately benefiting from that in guiding and managing performance towards achieving the desired results and reaching the desired state.

To accomplish its objectives, the emergence of SCM results from the blending of three important themes, they are also considered among the SCM techniques, and one of the most

important of these approaches or techniques is the Drivers` Analysis Approach. The researchers believe that this approach, especially when it deals with the area of value creation to include both cost drivers` analysis and value drivers` analysis to select both best cost drivers and best value drivers, has a vital role in conducting the strategic orientation of cost management, creating sustainable competitive advantages and enhancing the firms` strategic position.

2. The Research Framework

2-1. Research Problem

Strategic orientation of cost management remains a major and universal concern for all business and researchers. It is generally accepted that Traditional Cost Management (TCM) is inadequate for the requirements of a contemporary business environment. Turney 1996, emphasized that TCM systems can weaken firm's competitive position and not helpful in strategic decision making by encouraging a firm to set the wrong priorities and focus on the wrong problems; they can lead a firm to focus on the wrong markets, serve the wrong customers, create less value for the customer, poor control over costs, not achieving better management and control over performance, increase production costs, incorrectly change the structure of a firm, institute cost cutting programs that fail, and obtain the wrong parts from outside suppliers and, etc. yet, a lot of studies indicated the failure of TCM in the light of the contemporary business environment due to the following reasons: (El-Helbawy & El-Nashar, 2023; El Kelety, 2006; Kumar & Nagpal, 2011)

- *Internal focus and ignoring the external environment.*
- *Ignorance of critical stages of Value Chain (Total Value Chain)*
- *Ignorance of CSFs and other major aspects of Value Creation*
- *Providing distorted cost information*
- *Focus more on financial information and financial Performance measures rather than non-financial information and non-financial performance measures.*
- *Focus on the Ex-post control rather than Ex-ante control of cost and value creation.*

From the above problems, it becomes generally accepted that firms should conduct the strategic orientation of CM and switch from traditional CM to the SCM. The modern trend of CM began with the emergence of the term Activity Based Management (ABM), and the organic relationship between it and the Activity Based Costing (ABC) system through the Cross Model, and the emergence of the concept of Activity Based Cost Management (ABC/M), which indicates the possibility of using cost information not only to identify the products that must be produced, but to identify opportunities available to make changes in activities and processes to improve productivity (El-Helbawy & El-Nashar, 2023). SCM represents an extension of that organic relationship with the addition of a strategic aspect. Anyway, the strategic orientation of CM involves strategic planning and cost management:

1. Strategic Planning

Strategic planning identifies what should be done now to change the external environment to be favorable for the firm in the future.

Strategic Planning is based on two strategic questions as follows:

- First: "*where do you want to go*?" that means identifying and choosing the destination. It is known as "*mission*."
- Second: *"How do you want to get there?",* which means identifying the best route to reach destination, known as "strategy", which determines the best route to get there (desired state). (El-Helbawy & El-Nashar, 2023)

Based on the abovementioned, the following points can be concluded:

- SCM is related to the future.
- SCM considers the external environment and the **total value chain** including the relationships with customers and suppliers.
- "What should be done now" This expression justifies the importance of considering the **Ex-ante control** approaches to be placed at the heart of SCM.

2. Cost Management

According to a definition provided by Cooper & Slagmulder (2003), SCM is a set of techniques that can be used to maximize value for customers at lower cost, and to support the competitive position of the firm. Through the previous definition of the SCM concept, it is obvious that:

- SCM throughout its techniques provides suitable approaches to study the **trade-off between functionality (value creation) and cost**.
- SCM has three sides costs and value creation for customers, costs should create value, and value should justify its related costs, all to support the competitive position of the firm.
- The main goal of SCM is to **guide performance** toward achieving the desired state (desired competitive position) by providing appropriate performance measures to manage and measure performance and take the necessary corrective feedback in a timely manner.

Accordingly, Shank & Govindarajan (1993) argued that the emergence of the SCM results from blending of three underlying themes that are each taken from the strategic management literatures namely, Value Chain Analysis, Strategic positioning Analysis and **Drivers Analysis**, each of them represents an appropriate approach to conduct the strategic orientation of cost management. As to Strategic Positioning Analysis, it refers to an ability of firms to analysis and present of cost information suitable fit with the strategic position by concerned with the impact of internal and external environment of a firm to generate value information differently than competitors (Dimitrova, 2017). It is concerned with selecting the optimal mix of three general competitive strategies namely, cost leadership, product differentiation, and focus (Niche marketing strategy), each of which has its distinct route to deliver the value propositions to customers and thus, maximize customer value and achieving competitive advantage. (Hansen et al., 2021)

For Value Chain Analysis, is a strategic analysis that can be used to identify where value to customers can be increased and where costs can be decreased, it can be used to determine

whether each activity in the value chain is consistent with strategy, it helps firms to identify where value to customers can be increased and where costs can be decreased, to better understand and exploiting the firm's linkages with suppliers, customers, and other firms in the industry (El-Helbawy & El-Nashar, 2023) However, each value activity has its own costs and distinctive sources of value creation and competitive advantages. Accordingly, each value activity has a set of unique cost drivers that explain variations in costs in that activity as well as set of value drivers that contribute to creation of value for customers. This justifies the importance of considering the **Drivers Analysis Approach** to identify the best and relevant drivers that explain changes in unit cost and contribute to the value creation better than the others.

Drivers` analysis concerned with identifying the root cause cost drivers " the relevant drivers" by identifying and giving quantitative values of the effects of cost drivers upon total value chain. El kelety (2006) stated that this analysis helps in eliminating the root causes of major non-value-added activities and improving the root causes of major value-added activities in the total value chain. **On the other hand,** for conducting the two sides of SCM (cost and value), the researchers believe that driver analysis should deal with the area of value creation by identifying the main ***value drivers*** based on CSFs. Accordingly, the drivers` analysis should be developed to include two sides, **Cost Drivers Analysis** and **Value Drivers Analysis.**

Cost drivers` analysis is concerned with identifying the relevant cost drivers "the main factors that explain changes in cost/unit better than the other factors "by identifying and giving quantitative values of the effects of cost drivers upon total value chain. On the other hand, value driver`s analysis is concerned with identifying the main value drivers that contribute to creation of value for customers better than the others based on the dimensions of CSFs "value deliverables", CSFs are the success factors that the firm relies on and distinguishes itself when creating value for its customers, and they differ from one firm to another, they are considered the main determinants of value drivers.

From the previous lines, the researchers are aiming to investigate the role of drivers` analysis in conducting the strategic orientation of cost management. The researchers believe that the drivers analysis approach with its two sides could have a major and vital role in conducting the strategic orientation of cost management for the following reasons:

- This analysis considers the external environment. The scope of this analysis extends beyond the firm`s boundaries by studying and giving quantitative values of the effects of the drivers on the total value chain.
- It is related to the future. It represents one of the Ex-ante control approaches of cost and value through controlling their drivers and thus using it in building strategies and making strategic decisions that ensure the achievement of desired state in the future.
- It provides a better approach to study the trade-off between functionality (value creation/value drivers) and costs (cost drivers).
- The results of this analysis can be used in deriving measures for BSC that are not only best cost drivers-related but also best value drivers-related measures, to be merged with the four perspectives of BSC to attain all aspects of SCM. These measures should be tailored to

each firm, resulting in developing a Modified Value-Based BSC and a Customized strategy Map, dedicated to supporting the process of creating value for customers at the lowest possible cost.

So that, there is a need for a forward-looking that allows firms to anticipate and analysis drivers before implementing SCM, ensuring alignment with organizational goals, increasing customer value and enhancing cost efficiency. Accordingly, the main research problem lies in the following main question**: How to apply the Drivers Analysis Approach and what is the role it could play in conducting the strategic orientation of cost management?**

In pursuit of this aim, the researchers will try to solve the research problem by dividing the research problem into the following research questions and trying to give adequate answers to these questions throughout this research:

1- What are the general criticisms of the TCM approach in light of the contemporary business environment? And why is it necessary to conduct strategic orientation for cost management?

2- What are the main approaches to transition into SCM?

3- What are the scope and objectives of SCM?

4- What does the term value creation mean in managerial accounting, especially under the SCM, and how can customer value be measured?

5- What are the main CSFs that determine the value creation for customers and that consider the determinants of value drivers?

6- What are the major elements of SCM?

7- What are the problems related to the Drivers Analysis Approach as one of the major elements of SCM?

8- How to conduct the Drivers Analysis Approach with its two sides to select the main and relevant drivers, whether they are value drivers, under the Value Drivers Analysis based on the identified CSFs, or whether they are cost drivers, under the Cost Drivers Analysis?

9- What are the appropriate methods for conducting drivers` analysis? And how many drivers should be selected?

10- What is the pivotal role of this analysis in the process of managing and guiding performance towards achieving the desired state? The research problem can be explained through figure 1 as follows:

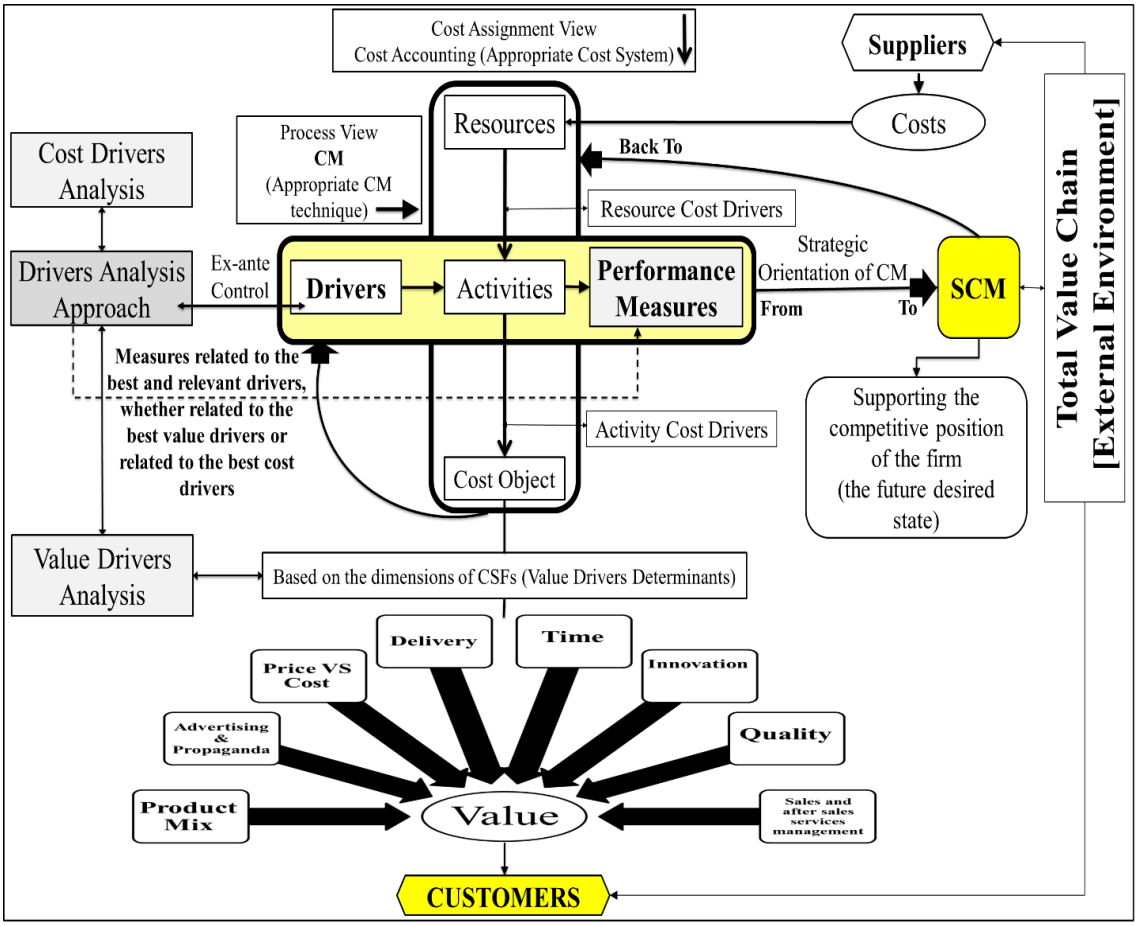

Figure 1: A Proposed Framework to Clarify the Research Problem
[Source: The Researchers]

2-2. Research Objectives

The main goal of this research is to **develop the Drivers` Analysis** approach **and to construct a proposed Drivers Analysis framework to conduct the strategic orientation of cost management.** This can be achieved by satisfying the following:

1- Determining the main problems of the TCM approach and the reasons to move the main focus and switch from the TCM to SCM and identifying the main approaches to transition into SCM.
2- Determining the scope and objectives of SCM.
3- Defining the value creation concept under the area of managerial accounting, especially under the SCM, and determining the dimensions of measuring customer value.
4- Determining the main CSFs that determine the value creation for customers and that consider the determinants of value drivers.
5- Reviewing the major elements of SCM.
6- Determining the problems related to the Drivers Analysis Approach as one of the major elements of SCM.

7- Conducting the Drivers Analysis Approach with its two sides to select the main and relevant drivers, whether they are value drivers, under the Value Drivers Analysis based on the identified CSFs, or whether they are cost drivers, under the Cost Drivers Analysis.
8- Determine the appropriate methods for conducting driver analysis and the appropriate quantity of drivers that should be selected.
9- Determining the pivotal role of this analysis in the process of managing and guiding performance towards achieving the desired state.

2-3. Research Significance

The implications of this study extend across various sectors and audiences, offering valuable insights and opportunities for improvement.

2-3-1. Economic Entities

1. The findings can contribute to a better conduction of the strategic orientation of CM through the application of the modified approach for drivers` analysis with its two sides. By applying the recommended approach, firms' competitive advantages could be enhanced. This providing solutions for the management of economic entities in Egypt is also evident through the comprehensive vision provided by the research on the interrelated and overlapping dimensions and systems in the process of building and selecting a more strategic system of cost management techniques.

2. Implementing the findings of this study can lead to maximum value creation, resource savings in terms of time, money and so on. firms can gain a competitive edge by making more efficient decisions in a highly competitive industry with limited resources.

3. It will create the opportunity to design an appropriate SCM System

2-3-2. Researchers

1. This is the current trend of scientific research that attempts to create integration between different sciences as it brings together the disciplines of accounting and management and sheds light on important variables in Accounting and Administrative literature and thought Cost Management techniques.

2. It will serve as an additional contribution to studies conducted in Egypt relating to the strategic orientation of CM and the application of the drivers` analysis.

2-4. Research Limitations and Scope

The scope of this research study has been delimited by the following:

First: This research focused only on the value-creation and value drivers for one group of stakeholders, namely: customers` value creation and the customers` value drivers as the SCM focuses on this group and is considered the main pillar in the firm to create sustainable competitive advantages and strengthen the firm`s competitive position.

Second: The research focuses solely on three criteria for drivers` selection: value creation, cost of measurement, cost of errors and cost of behavioral effects. Other criteria, such as complexity, diversity, matching activity type. Other criteria that might be relevant in different contexts are not included.

Third: For value drivers` analysis, the study focused only on identifying the relevant drivers of customer value. For drivers` analysis, the researchers used AHP to select the best drivers based on some criteria nominated by the researchers.

Fourth: The researchers emphasized only the analysis of SCM practices which serve the research framework and neglected the other tools. Also, when utilizing the value-based BSC and strategy map, the researchers placed more focus on the best roots of value creation for customers (best drivers) than other stakeholders (are not in the scope of this thesis) to extract measures of performance.

Fifth: The researchers selected only five branches of the NBE`s sector in Gharbia to apply the proposed framework because getting complete information is very difficult. The findings and conclusions are specific to the bank and may not be generalizable to other banks.

Sixth: The study relies solely on the AHP for decision-making analysis. Other advanced decision-making techniques such as Scoring Model may offer different insights or more efficient methods for solving complex logistics problems. The researchers selected only twenty-two drivers that are considered the most obvious and most important in the NBE.

2-5. Research Structure

In light of the research problem, its significance, and to achieve its objectives, the study can be divided into the following sections:

- Literature Review
- Theoretical Framework
  - The Strategic Orientation of Cost Management
  - Drivers Analysis Approach, as an Ex-ante Control Approach and determining the Role of Drivers Analysis Approach in Conducting the Strategic Orientation of Cost Management
  - A proposed Framework for Conducting the Strategic Orientation of Cost Management, Drivers Analysis Approach
- The Case Study: Based on AHP
- Conclusion, Recommendations and Opportunities for Future Research.

3. Literature Review

The previous studies could be divided into three main categories as follows:

3-1. Studies Related to the Strategic Orientation of Cost Management

Reviewing the literature shows that there are several studies and pioneering literature related to SCM. Some of them are:

- **Shank (1989)**

John Shank is credited with the first mention of the term of Strategic Cost Management (SCM) in the United States in 1989. Shank (1989) posits that the emergence of SCM is the third stage of the development of the management accounting discipline: from cost accounting to managerial accounting to SCM, concluding that SCM is a critical survival skill in the current intensive competitive environment.

He also suggested the following regarding the definition of SCM and the four stages of the strategic management cycle in that SCM is: the managerial use of cost information explicitly

directed at one or more of the four stages of strategic management: (1) formulating strategies, (2) communicating those strategies throughout the organization, (3) developing and carrying out tactics to implement the strategies, and (4) developing and implementing controls to monitor the success of objectives.

- **Slagmulder and Cooper (2003)**

The purpose of the paper is to expand the scope of the SCM. In this paper the researchers argued that SCM is "the application of cost management techniques so that they simultaneously reduce costs and improve the strategic position of a firm"

The paper proposed three distinct steps or approaches for a firm to switch from the TCM to SCM which are: first, to audit existing and planned cost management initiatives to ensure that they enhance the firm strategic position, second to extend the scope of internal cost management beyond the walls of the factory and third is to extend the cost management program beyond the boundaries of the firm.

- **Cugini et al. (2007)**

The researchers proposed and tested a framework to analyze and manage the relationship between company costs and customer satisfaction for SCM in service industries. Based on a case study from the tourism industry, we show how service components can be used as a key medium to link customer satisfaction to the costs of service production and delivery. In doing so, we provide guidance for identifying specific sources of customer satisfaction and assessing their costs, thereby extending to service industries previous research on SCM. CSFs such as quality of product, employees, quality of service, customer satisfaction, location and the quality of the infrastructure can be measured and benchmarked against the competitor in order to provide a sustainable competitive advantage and therefore, it should be a part of the performance measurement and management process.

- **Kumar and Nagpal (2011)**

The authors suggested a framework for SCM which has far more impact on any firm compared to TCM. The paper explained cost management had to switch from a traditional role to a strategic role, that the term SCM should have a broad focus. The researcher argued that SCM is not confined to the continuous cost reduction and control, and it is far more concerned with management's use of cost information for decision-making and to improve the strategic position of a firm at the same time. The paper concluded that SCM is a philosophy, an attitude, and a set of techniques to contribute to shaping the future of the firm.

- **Apak et al. (2012)**

This study examines the use of contemporary developments in cost accounting in SCM and the importance of considering the CSFs in all aspects and within each SCM technique. The researcher argued that quality, price, innovation, time, delivery, product mix and after sales services are the most important CSFs for customer value-creation. The study intended to propose some applications of SCM that provide the required information to determine the firm's CSFs and help in better deriving those factors such as benchmarking, ABC, target costing, strategy map and value chain analysis.

- **Kamal (2015)**

The researcher in this study reviews the evolution of CM innovations over the past century to examine whether there has been a significant impact of CM on the firm. The researcher argued that in the light of the highly competitive contemporary business environment, the focus of CM shifted to SCM and the generation or creation of value through the effective use of resources to support a firm`s competitive position. This was to be achieved through the use of technologies which checkup the drivers of customer value, shareholder value, and organizational innovation.

- **Effiong and Beredugo (2015)**

The study examined Balanced Scorecard (BSC), Strategy Maps and SCM as recipes for productivity rating among manufacturing firms in Nigeria. The research adopted the survey research design. Data was sourced from both primary and secondary sources. An estimated population of four hundred and forty seventeen (417) staff from ten (10) companies in Lagos State and Rivers State, Nigeria, was used as respondents for the study. OLS and Pearson Product Moment Correlation Coefficient were used for the hypotheses` tests. The results showed that BSC and SCM are complementary measures used in assessing the performances of a firm in order to align business activities to the overall strategic objectives and ensure both short-term and long-term productivity through financial and non-financial planning, implementation and performance evaluation processes.

- **Galic (2020)**

The aim of this paper is to analyze the instruments and propose a model of SCM with the aim of more realistic presentation of the amount of costs and achieving more effective and efficient operations. The results suggested that the application of integrated SCM model ensures cost reduction and a more realistic assessment of future costs and thus product profitability in addition to the impact on the amount of costs and the assessment of the justification of product redesign, the significant role of integrated SCM model in continuously encouraging creative and innovative activities within the company that enables management to maintain and improve the firm's competitive position.

- **Hansen et al. (2021)**

Hansen et al. (2021) argued that SCM is the use of cost data to develop and identify superior strategies that will produce a sustainable competitive advantage. However, a competitive advantage is creating better value for customers for the same or lower cost than offered by competitors or creating equivalent value for lower cost than offered by competitors. The researcher defined the customer value as the difference between what a customer receives (customer realization) and what the customer gives up (customer sacrifice) based on CSFs. He argued that the SCM system consists of two major subsystems: the cost accounting system and the strategic-based performance measurement and control system.

- **Al-Salmawi (2024)**

This study aimed to demonstrate the importance of using SCM tools in developing and improving production processes in order to achieve competitive advantages for industrial firms, especially given the changes brought about by the modern economic environment. The most

important findings of the research are summarized in that SCM in its various Pathways play an important role in reducing cost and develop the current product according to customer requirements, which helps the business entity achieve a competitive advantage that allows it to compete and survive in the market.

3-2. Studies Related to the Drivers Analysis Approach

Reviewing the literature shows that there are several studies related to the drivers` analysis approach and the selection of best and relevant drivers whether cost and/or value drivers. Some of them are:

- **Cokins and Căpuşneanu (2010)**

The purpose of this paper is to capture the evolution of applying cost drivers` analysis in calculating costs since their initial occurrence until the present times. The paper looks at the typology, criteria for selection of drivers and their benefits. The researcher argued that easy identification, use and understanding, the existence of a direct relationship between indirect costs and cost drivers, Degree of complexity, diversity and variation of the product, Degree of accuracy of calculation and Degree of usefulness of information are the primary criteria for cost driver selection.

The researcher concluded that cost driver is the key element around which revolves cost behavior. This then ensures the viability and accuracy of information obtained for aiding a firm to make better long-term strategic decisions and intermediate-term operational decisions. Both types of decisions will improve the firm’s level of profitability and its success.

- **Valcheva (2011)**

The aim of this study was to analyze and explore the main drivers of customer value in the context of the three biggest online newspapers in Norway. The researcher explored the business activities and the strategic choices of the three media firms, by conducting a qualitative content analysis of their business model. By scrutinizing their key activities through the lenses of the Business Model Ontology, the researcher was able to elucidate the locus of customer value, and, more specifically, the intrinsic benefits appropriated to the customer segments. The interview responses of three newspaper executives provided sufficient grounds for identifying efficiency, complementarities, novelty, convenience, interactivity, connectivity, and customer integration as the key drivers of customer value in the three newspapers.

- **Toompuu and Põlajeva (2014)**

The aim of this paper is to present the theoretical framework of the cost drivers, including the selection of cost drivers. The paper describes cost drivers, specified their meaning, gives an overview of their classification, typologies, and discusses the selection methods, relevant research papers and other issues regarding the cost drivers. The survey was conducted among different universities all over the world in the period from May to September 2013.

The results suggested that the decision on the number and type of cost drivers is of critical importance. There is a common understanding that the use of more drivers provides more accurate results and that appropriate drivers should be used. However, there is also an understanding that the number of cost drivers should be optimal. The selection of drivers should

be performed with ultimate care and awareness, and there should be a compromise between accuracy, correctness, and measurement costs.

- **Murphy and Frick (2023)**

This paper aimed at exploring the drivers of the cost of saved electricity in these programs with an econometric model and nearly a decade of data reported by efficiency program administrators. The researcher consumed a regression analysis for drivers` analysis. The findings of this research revealed the importance of ex-ante estimates of cost and gross savings for each program as reported by program administrators in annual filings.

- **El-Helbawy and El-Nashar (2023)**

The authors in chapter four argued that the drivers` analysis should deal with the area of value creation by identifying the main value drivers based on the CSFs. They defined the drivers` analysis as the analysis that is used to identify the main factor that explain changes in cost/unit and/or contribute to creation of value for customers better than the other factors. They also argued that driver analysis requires treating two problems each of which requires separate decisions: first; determining how many Drivers should be used, second; what are the main criteria to select the relevant drivers: Measurement cost, Cost of Errors, and Cost of Behavioral Effects.

3-3. Studies Related to the role of Drivers Analysis for Conducting the Strategic Orientation of Cost Management

There is a paucity in the previous studies related to the role of Drivers Analysis for Conducting the Strategic Orientation of CM, However, some of the most relevant studies that have been conducted in this area are:

- **El-Nashar (2003)**

The main objective of the research was to develop a scope for drivers` analysis in order to ensure integration between the cost management techniques for conducting the strategic orientation of CM. The researcher depended on the inductive approach in an attempt to build a synthetic framework to show how to use drivers` analysis to achieve integration between strategically oriented cost tools using an empirical study.

The study concluded that, for conducting the strategic orientation of CM, the scope of drivers` analysis should be broadened outside the firm by studying the effect of drivers on the total value chain to create sustainable competitive advantage. The possibility of using fewer resources must be studied by controlling the various cost drivers, whether they are structural or executional drivers. Also, it was found that the use of drivers` analysis approach is an appropriate approach to achieving integration between the strategically oriented cost management tools.

- **Niu et al. (2012)**

This paper used AHP to make a brief analysis of cost drivers for SCM purposes. The study concluded that, drivers` analysis help to enhance the effectiveness of China's enterprise management strategy and will help solve the current implementation of the strategic reorganization of state-owned enterprises have faced the strategic cost management issues and

enhance the value a firm creates for its customer at lower costs and enhance the competitive position of a firm.

- **Ramesh and Sumitra (2024)**

This study envisages the influencing attributes of Cost Drivers in SCM and Strategic Management Decision Making. Identifying cost drivers is crucial for conducting an effective cost analysis. By understanding the factors that influence costs, firms can make informed decisions to optimize their operations, maximize customer value creation, create competitive advantages, maximize profitability and thus, facilitating SCM.

3-4. Comment on Previous Studies and Identify the Research Gap

Drawing off the previous studies, it is clearly observed that the focus is on the importance of conducting the strategic orientation of cost management and providing several implications for managers and policy makers. Studies also focused on explaining the role of SCM in supporting the competitive position of the firm by providing guidance performance measures to manage and measure performance. Consequently, some previous studies focused on the importance of integration with different performance management and measurement systems such as BSC and strategy map.

Second, given the importance of value creation for customers to create sustainable competitive advantages, SCM uses a set of techniques to trade-off between functionality (value-creation) and cost to support the competitive position of a firm and to achieve better Ex-ante control on cost and value. Generally accepted, one of these techniques is Drivers` analysis. Drivers` analysis is one of the three elements that are blended and resulted in the emergence of SCM. Literature dealing with drivers could be clustered within three mainstreams, driver analysis along the Overall value chain and for strategic purposes, drivers` selection to improve cost calculation, by ABC techniques, the relationship among technology, product characteristics and drivers. According to the purposes of this study, the first and third mainstreams are particularly useful since this study does not deal with cost calculation accuracy.

Many previous studies focused on the Drivers Analysis Approach and the selection of the best drivers using different methods, recommending different criteria, and explaining its role in conducting the strategic orientation of CM. **However, most of these studies did not consider value-creation for customers (the other side of SCM) within the framework of the drivers` analysis approach.**

Given the importance of creating value for the customer in light of SCM, the cost should create value for the customer and that value must justify the occurrence of the cost. Therefore, the creation of value for the customer must be taken into account within the criteria of selecting the best drivers. In addition to selecting the best cost drivers, it is also vital to start with the selection of best value drivers.

So that, for better conduction of SCM, the researchers believe that the drivers` analysis should deal with the area of value creation. That is why this research goes beyond the earlier studies and tries to add another side to this analysis concerning the value creation criteria. So that, this analysis includes both cost drivers` analysis and value drivers` analysis. Therefore, as a response to the recent calls for research on the importance of implementing drivers` analysis

for conducting the strategic orientation of CM, the researchers attempt to study this through building a framework that shows how this approach with its two sides helps in conducting the strategic orientation of CM.

4. Theoretical Framework

In this section, the researchers discussed the theoretical framework of the study, which begins by reviewing the strategic orientation and the SCM concept, then addresses the Ex-ante approach and the Drivers Analysis concept and ends by clarifying the role of Drivers Analysis approach for conducting the strategic orientation of cost management and presenting the proposed framework.

4-1. The Strategic Orientation of Cost Management (SCM)

4-1-1. Overview

The continuous changes in the contemporary business environment have led to the need to reconsider methods of managing and controlling cost and information systems that are used in order to meet the requirements of the modern industrial environment and help in determining the factors of success (CSFs) and industrial excellence, which must be linked to the firm strategy to achieve its long-term goals and create a sustainable competitive advantage necessary to its long-term growth and survival. A strategy is a set of goals and specific action plans, which, if achieved, will provide the desired competitive advantage. (El Kelety, 2006)

Creating a sustainable competitive advantage can be accomplished by creating equivalent or better value for lower cost than offered by competitors whereby firm can achieve superior performance compared to its rivals (ATOUT, 2017; Sigalas et al., 2013). Therefore, cost and value together are vital strategic factors that must be considered and managed strategically by focusing on factors that would lead to cost reduction, not erode product quality and thereby customer satisfaction. (Slagmulder & Cooper, 2003)

The previous requirements have been imposed that cost management systems are not only based on serving short-term operational goals, but it has become necessary for these systems to be strategically oriented to serve strategic goals and strategic decision-making, that is, they must be based on providing strategic information (financial and non-financial) that contributes to clarifying strategic goals, long-term plans and strategies needed to retain a sustainable competitive advantage. (El-Helbawy & El-Nashar, 2023).

Consequently, Govindarajan and Shank (1992) considered the strategic orientation of cost management and the transition from "Cost Accounting" and "CM" to what is called "Strategic Cost Management (SCM). This transformation and the role of each of the three areas can be clarified by studying the cross model in the following figure2.

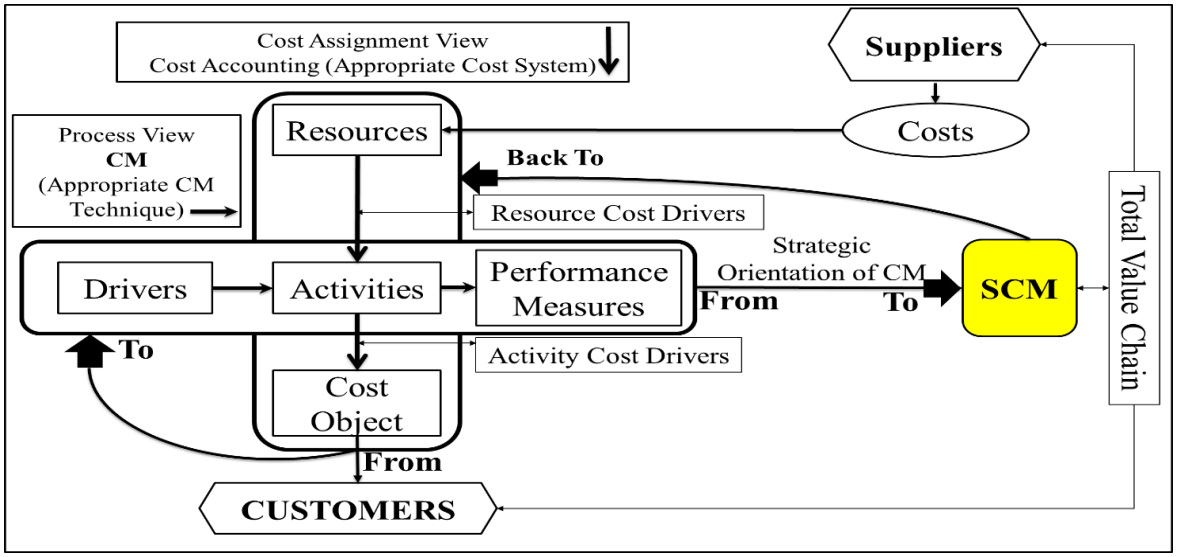

Figure 2: The Strategic Orientation of Cost Management [Source: The Researchers]

Figure 2 shows that, as a result of the managerial approach to accounting, with the emergence of the concept of planning control, the concept of cost accounting, which is concerned with determining, measuring and assigning costs to cost object evolved into the concept of cost management, which crystallizes around the question of "how to manage the cost!", which is concerned with the use of cost information produced by the cost accounting system in cost management to reduce costs and increase value for the customer and providing *operational* performance measures that help guiding performance. (El-Helbawy & El-Nashar, 2023)

However, in light of recent developments in the contemporary business environment, the role of cost management has escalated to include participation in formulating and executing strategies, focusing on the strategic performance of the firm, and the necessity of translating the firm's strategy into operational measures to achieve continuous improvement programs, towards supporting efforts to create sustainable competitive advantages and to support the firm's competitive position. Accordingly, SCM seeks to provide strategic performance measures that guide the firms` strategic performance and facilitated strategic measurement of performance. (Omotilewa et al., 2021)

In order to achieve this, a lot of problems appeared that might hinder this orientation, and therefore it was necessary to reconsider once again by referring to cost accounting systems to provide more comprehensive information on cost that helps SCM in achieving its goals and fulfilling its role to the fullest.

SCM is the use of cost information to develop and identify superior strategies that will produce a sustainable competitive advantage. It provides necessary strategic information on

cost and value, its drivers, the appropriate measures, and others across the total value chain. This is with the aim of facilitating strategic planning, strategic decision making, achieving better cost control, more balanced performance measurement (measuring achievement of strategic objectives), and maximizing value for the customer along with interfacing cost structure with long-term business strategy and short-term tactics. (Diefenbach et al., 2018)

Accordingly, the strategic orientation of Cost Management involves strategic planning and cost management. Strategic Planning is one of the most widely used management tools in contemporary organizations (Wolf & Floyd, 2017). It defines what should be done now to change the external environment to be favorable for the firm in the future. It is based on two strategic questions as follows:(El-Helbawy & El-Nashar, 2023)

- First: "where do you want to go?" that means identifying and choosing the destination. It is known as "mission." The ultimate destination of SCM is to create sustainable competitive advantages and support the competitive position of the facility.
- Second: "How do you want to get there?" which means identifying the best route to reach destination, known as "strategy," which determines the best route to get there (destination). Under SCM, creating sustainable competitive advantage can be accomplished by selecting optimal combination of three competitive strategies (routes) namely: (Phornlaphatrachakorn, 2018; Rounaghi et al., 2021)

a. ***Cost leadership Strategy***: Is a strategy in which a firm outperforms competitors in producing products or services at the lowest cost.
b. ***Differentiation Strategy***: This strategy is implemented by creating a perception among customers that the product or service is unique in some important way, usually by being of higher quality.
c. ***Niche Marketing (Focus) Strategy***: Is where a firm makes choice of a narrow competitive environment of an industry, selects a segment or group of segments in the industry and tailors its superior capabilities and strategy to serve them.

4-1-2. Approaches To Transition into Strategic Cost Management

Cooper & Slagmulder (2003) argued that there are three approaches required to convert unfocused, traditional CM to SCM as follows:

1- Audit existing and planned management initiatives to ensure that they enhance the firm's strategic position.

By distinguishing between initiatives that enhance the competitive position of the organization and those that weaken it or have no effect at all, they conclude that reducing processing time is the most effective cost management initiative.

2- Extend the scope of internal cost management beyond the walls of the factory.

The philosophy of Activity-Based Management (ABM) had a prominent role in shifting the focus from only the costs that occur within the factory to overall value chain costs. This approach requires managing costs outside the factory strategically through using ABM, which provides the ability to tie these costs with cost objects such as suppliers and customers. Important costs such as procurement, marketing, selling and customer services costs and others can be handled correctly. Thus, developing suppliers-selection model, focusing on the optimal

customer mix that achieves the highest profitability of the company, which will strategically increase the organization competitiveness.

3- *Extend the cost management program beyond the boundaries of the firm to customer and suppliers.*

The emergence of the Extending Enterprise Concept ensures the possibility of coordination between firm`s strategic cost management programs and cost management programs with suppliers and with customers, as new tools have appeared in cost management such as interorganizational cost management (IOCM) and others.

4-1-3. Strategic Cost Management: The Main Concept

SCM can be defined as a set of techniques that can be used by revealing problems to maximize customer value at lower cost and simultaneously to support the competitive position of the firm, based on CSFs. Accordingly, SCM has two dimensions are: (El-Helbawy & El-Nashar, 2023)

- 1st dimension: The Cost that should create value for customer.
- 2nd dimension: The Value for customers that can be used to justify cost. Thus, cost should be classified into value-added and non-value-added costs.

❖ Value for customers can be measured according to CSFs and their different dimensions. SCM information includes financial information about cost and its drivers, and non-financial information related to value, CSFs, and its dimensions. Figure 3 exhibits the strategic cost management concept as follows:

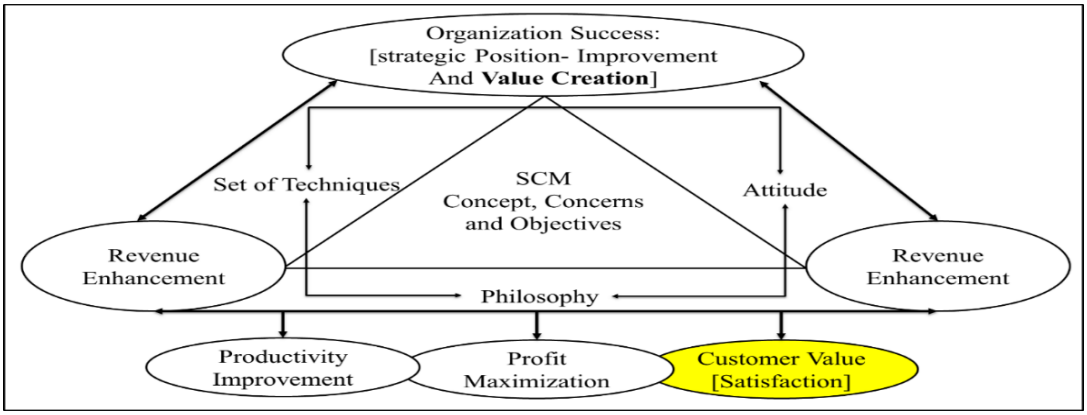

Figure 3: Strategic Cost Management Concept [Source: The Researchers]

4-1-4. Strategic Cost Management System

Based on the organic relationship represented by the CAM-I Cross Model, Hansen et al. (2021) argued that the SCM systems are made up of two subsystems: the cost accounting system (cost assignment view) and performance management system (control system, process view), that is clearly illustrated if figure (2) above.

4-1-5. Strategic Cost Management Concerns, Scope, and Objectives

The primary concerns of SCM will not be only cost reduction in the production stage, but inclusive to all resources used and deployed across the overall value chains (Slagmulder & Cooper, 2003). Enhancing the firm's profitability, value creation, gaining sustainable competitive advantage, depends not only on understanding and analyzing a firm's value-added activities and the linkages between these activities, but also on recognizing and managing the relationships between those activities and the value chains of its suppliers, customers and other

firms in the industry and understanding how the firm's value chain activities fit into suppliers' and customers' value chains.

4-1-5-1. Firm`s Overall Value Chains

Overall value chains is a SCM technique that identifies the firm's internal value chain, industry value chain and the Total Value Chain that linkages with suppliers, customers, and other firms in the industry (El-Helbawy & El-Nashar, 2023; Yu et al., 2020). The total value chain links the firm's internal processes with:

- The processes of suppliers (upstream), backward vertical integration
- The processes of customers, forward vertical integration
- The processes of other firms in the industry, horizontal integration (mergers, etc.)

SCM should not confine its concerns only to cost but should extend to value-creation and other CSFs in all its financial and non-financial aspects across the total value chain. SCM role is to understand, measure, and portray the cost/value/revenue relationships that boost revenues, profitability, productivity, value creation and customer satisfaction with the aim of strengthening firm's competitive position and ensuring its long-term success more thoroughly.

4-1-5-2. Cost Improvement, the First Aspect of SCM

As explained earlier, the first side of SCM concept is the cost that should create value for customers. To survive, firms must decide and manage their profitability. Profitable performance is vital for firms` long term viability and growth. Profitability is determined by the difference between revenue and costs incurred during that period. So that, businesses must maximize revenue from their products and increase their profitability by selling the right product to the right consumer at the right time for the right price (cost) (Kumar & Nagpal, 2011). Accordingly, organizations need to know and understand what their total cost was, are and are going to and determine their profitability. However, successful SCM should focus not only on cost improvement, but also on revenue enhancement.

SCM is concerned with achieving the greatest possible productivity throughout the firm. A more comprehensive understanding of productivity would include the three (E's) of effectiveness, efficiency, and economy which is "Do the right job, do it right and do it cost-effectively." Accordingly, In SCM, reducing costs alone is not productivity improvement, instead, decreasing lead time, boosting quality, enhancing revenue, continuous improvement and customer value-creation are examples for productivity improvement. (Kumar & Nagpal, 2011)

4-1-5-3. Value-Creation, the Second Aspect of SCM

The second dimension of the SCM concept is the customer value that justifies the cost occurrence. A recent development in the SCM discipline is to more explicitly link value created by the firm to the individual activities performed by the firm and the costs of doing so. The issue is that cost must be managed by simultaneously looking at the value it creates for the customer. Successful SCM must help a company to develop and identify superior strategies that will produce a sustainable competitive advantage. Competitive advantage is creating better value for customer at the same or lower cost than competitors or creating equivalent or better value at lower cost than competitors (Kumar & Nagpal, 2011). Value is measured by CSFs.

CSFs are measures of those aspects of the firm's performance essential to its competitive advantage and, therefore to its success. (Blocher et al., 2019).

For SCM, customer value based on CSFs, is the difference between what a customer receives (customer realization) which called the total product "the complete range of tangible and intangible benefits that a customer receives from a purchased product or services", and what the customer gives up (customer sacrifice) (Hansen et al., 2021, p. 555). Thus, the potential role of SCM comes in boosting customer value creation by improving customer realization and/or reducing customer sacrifice.

Figure 4 shows the two dimensions of customer value and the potential role of SCM.

Customer Value = Customer Realization -Customer Sacrifice [Based on CSFs]

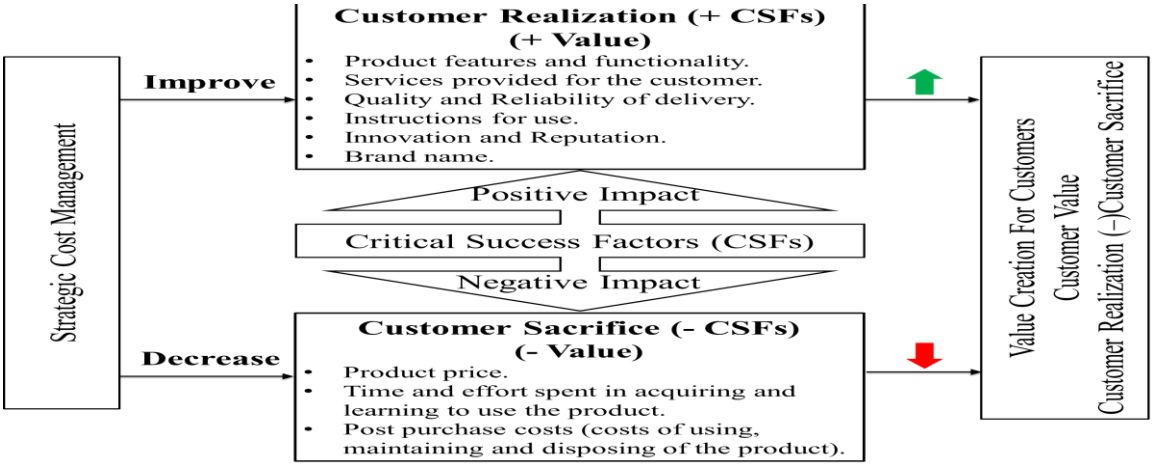

Figure 4: Value Creation Under SCM [Source: The Researchers]

Based on CSFs, Customer Realization includes the positive impact of CSFS, where Customer Sacrifice includes the negative impacts of CSFs. (El-Helbawy & El-Nashar, 2023). Essential factors such as quality, cost, time, innovation, creativity, delivery and others represent the dimensions of CSFs for customer value creation, through which that value can be measured. (Apak et al., 2012)

We can conclude that, SCM's fundamental role in developing and implementing strategies is to identify the available opportunities in which value can be maximized and costs can be reduced throughout the overall value chains by studying the trade-off between functionality (value creation) and cost and the importance of adopting different approaches of the Ex-ante control over cost and value to be placed at the heart of SCM. Controlling drivers, their triggers, and better deriving CSFs to enhance their positive impact and/or minimize their negative impact helps to reconfigure the entire value chain by deciding on those areas of the overall value chains where the firm has a competitive advantage. It is essential that the cost reduction and value maximization performance is continuously monitored to achieve objectives of continuous improvement, value creation, increase profitability and improve productivity, and thus achieving the strategic goals of creating sustainable competitive advantage. Figure 5 shows the scope for conducting the strategic orientation of cost management.

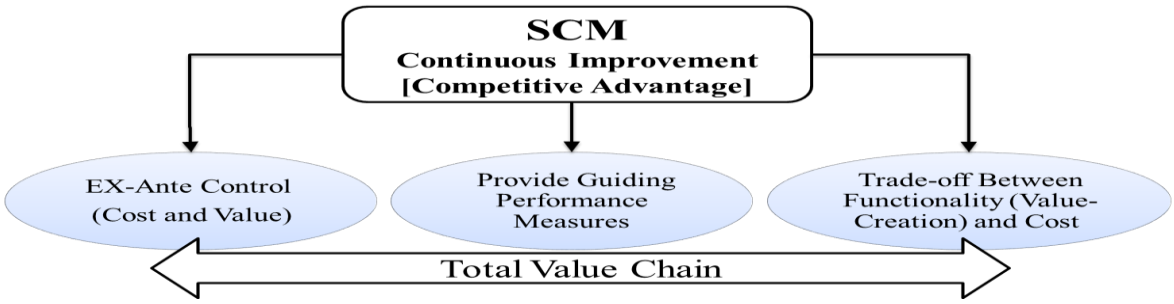

Figure 5: The Scope of Conducting the SCM [Source: The Researchers]

4-1-6. **Basic Elements of Strategic Cost Management**

Based on the abovementioned, the concept of SCM arises as a result of combining three basic elements that are central to the SCM perspective namely, Strategic Positioning Analysis, Value Chain Analysis and Drivers Analysis. (Phornlaphatrachakorn, 2018; Rounaghi et al., 2021; Silvi & Cuganesan, 2006)

4-1-6-1. Strategic Positioning Analysis

Strategic positioning analysis refers to an ability of firms to analysis and present of cost information suitable fit with the strategic position by concerned with the impact of internal and external environment of a firm to generate value information differently than competitors (Dimitrova, 2017). It is concerned with selecting the optimal mix of three general competitive strategies. Increasing customer value and simultaneously reducing costs to achieve a sustainable competitive advantage is tied closely to judicious strategy selection. Three general strategies have been identified: cost leadership, product differentiation, and focusing (Niche marketing strategy), each of which has its distinct route to deliver the value propositions to customers and thus, maximize customer value and achieving competitive advantage as follow: (Hansen et al., 2021)

4-1-6-2. Value Chain Analysis

Value chain analysis (VCA) is a strategic analysis tool used to better understand the firm's competitive advantage, to identify where value to customers can be increased and where costs can be decreased, to better understand and exploit the firm's linkages with suppliers, customers, and other firms in the industry. It can be an effective mean of optimizing the use of limited resources as it is used to decompose the firm into strategically important activities, determining its strategic advantages and disadvantages and value-creating processes, analyzing and understanding their impact on the cost and value. (Blocher et al., 2019)

VCA supports the focus of SCM efforts on improving the strategic activities of the firm by disaggregating the firm's value chains to identify important factors for improving cost position and value creation for customer such as, where costs can be reduced, what are cost and value drivers for each activity, ways used to increase value for customers, which activities are not competitive, which activities should be internal and which should be outsourced and, how each activity contributes to the firm's profit and competitiveness. Accordingly, to exploit a firm's internal and external linkages, we must identify the firm's activities and select those that can be used to gain a competitive advantage. This selection process requires knowledge of the cost and value, of each activity, their drivers revealing the importance of conducting drivers` analysis.

4-2. Drivers Analysis Approach

4-2-1. Ex-ante Control, The Origin of Drivers Analysis Approach

To be competitive, a firm has to emphasis cost reduction, while simultaneously maximizing value-creation for all stakeholders (El Kelety, 2006). Indeed, this can be accomplished by achieving better control over cost and value before they occur. Control is a set of procedures, tools, and systems firms use to reach their objectives and goals (Blocher et al., 2019). For better control, the focus must be directed toward the pre-occurrence of cost and value (Ex-Ante Cost and Value) by identifying and controlling the prior factors responsible for cost occurrence and value creation through the "*Ex-Ante Cost & Value Control*". Figure 6 below presents this clearly and illustrates the Ex-ante control concepts, approaches including the origin of Drivers Analysis Approach.

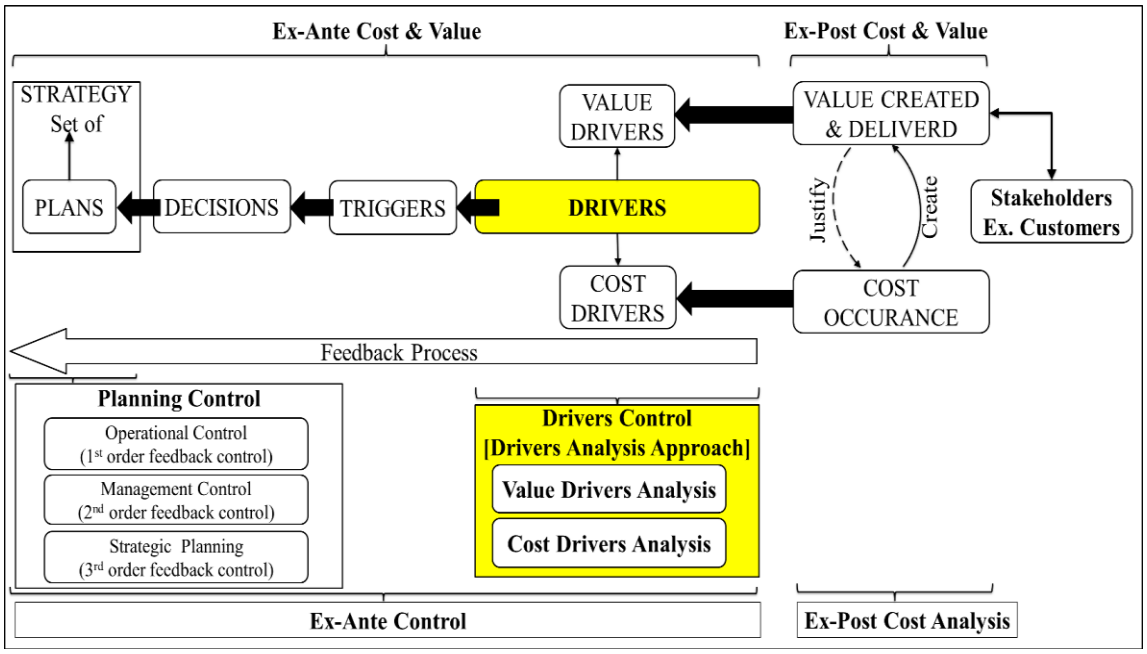

Figure 6: The Ex-Ante Cost & Value Control and The Origin of Drivers Analysis Approach [Source: The Researchers]

From figure 6 above we can conclude that "*Drivers"* are the main direct cause of cost occurrence and value creation. Factors directly responsible for the occurrence of these drivers are called "*Triggers*". "*Decisions*" and the decision-making process is the main responsible for the occurrence of these triggers, and whereas decisions are taken in order to accomplish the Planning Process and to implement plans that are an integral part of the strategy a firm seeks to achieve to provide the desired competitive advantage. (El Kelety, 2006). Then we can conclude that "*Planning Process and Plans"* are the main ones responsible for decisions.

Accordingly, unlike traditional ex-post cost analysis that is viewed as the process of assessing the actual financial impact of alternative managerial decisions (Govindarajan & Shank, 1993). Ex-Ante cost & value control is done through the control of any of the pre-occurrence factors that lead to the occurrence of cost, including drivers, decisions, and planning. Therefore, *Drivers Analysis Approach* and *Planning Control* are considered among the important Ex-Ante cost & value control approaches, and they could be used to achieve better control over cost and value.

4-2-2. Drivers Analysis Approach, the Main Concept

As shown in figure 6 above, drivers are considered the main and direct cause of cost occurrence and value-creation. Accordingly, the Drivers Analysis Approach is an Ex-ante form of cost & value control. This analysis is concerned with the trade-off between the different drivers, whether for value or cost, and identifying the relevant drivers by identifying and giving quantitative value-financial and non-financial- to the different effects of each driver on the overall value chains including, firms internal value chain, industry chain and the total value chain.

However, for SCM, drivers analysis is concerned with identifying and giving quantitative value to the effect of drivers on the Total Value Chain (TVC) based on CSFs and its related quantitative measures (El-Helbawy & El-Nashar, 2023). This information could help firms to focus their efforts on areas through which value-creation can be maximized for stakeholders at the lowest possible cost, thus achieving their own strategies and gaining sustainable competitive advantages. Based on the above, the Drivers Analysis Approach would have two sides that will be next covered in detail, The Cost Drivers Analysis and The Value Drivers Analysis.

4-2-2-1. Cost Drivers Analysis, Overview

4-2-2-1-1. Cost Drivers Concept

Cost driver is a characteristic of an activity or event that causes that activity or event to incur costs and can be more or less under a firm's control (Estermann & Claeys-Kulik, 2013). It is

Figure 7: Types of Activities and Its Related Cost Drivers and Their Interrelated Relationship [Source: The Researchers]

the driving factor that triggers costs and the mediating factor between cost object and directly related activities and its ultimately relevant resources (Toompuu & Põlajeva, 2014). information about cost drivers of each activity help firms to identify their overall value chain activities and select those that can be used to achieve major cost improvement and enhance their competitive advantage. For strategic analysis, activities are divided into *organizational activities* and *operational activities*. The costs of these activities, in turn, are determined by organizational and operational cost drivers which constitutes the basic outline of cost drivers as a guide for firms to improve their cost position. Figure 7 demonstrates the several types of activities, its related cost drivers and their interrelated relationship as follows:

4-2-2-1-1-a. Operational Activities and Operational Cost Drivers

Operational activities are day-to-day activities carried out as a result of the structure and processes preselected by the firm such as receiving and inspecting materials, shipping products,

etc. Operational cost drivers are factors that drive the cost of operational activities which could be divided into two groups, Volume-Based Cost Drivers, and Non-Volume-Based Cost Drivers.

4-2-2-1-1-b. Organizational Activities and Strategic Cost Drivers

Two types of organizational activities: structural and executional activities. Structural activities determine the underlying economic structure of the firm. Executional activities define the processes and capabilities of a firm and thus are directly related to the ability of a firm to execute successfully and perform processes efficiently and effectively. Those activities are closely linked with business strategy, their impact on product cost more long-term, more durable, more far-reaching. So that, the costs of performing such activities are referred to as strategic costs. Accordingly, such costs can be driven up or down by two types of strategic cost drivers: *structural cost drivers* and *executional cost drivers* that are used to facilitate strategic decision making. (Anderson & Dekker, 2009; Niu et al., 2012)

4-2-2-1-2. Cost Drivers Analysis, Definition

Cost Drivers Analysis is used to identify the root causes of costs, which are the main factors that explain changes in cost/unit better than the other factors. It is modern and valuable technique which integrates the problem-solving and analytical tools for quality and process improvement by the examination, quantification and explanation of the effects of cost drivers (Thapayom, 2021). Accordingly, this analysis is concerned with identifying and providing information about the relevant cost drivers by identifying and giving quantitative values of the different effects of cost drivers on the overall value Chains.

4-2-2-1-3. Criticism To Cost Drivers Analysis in The Light of Contemporary Tends of Management Accounting

As mentioned, achieving sustainable competitive advantages is the only hope for companies to survive in the contemporary business environment, through the selection and implementation of strategies, whose top priority is stakeholders` satisfaction and value-creation (Kaličanin & Knežević, 2013). That is why value creation must be the top concern to be considered in all aspects of the firm, and the management accounting and cost management is no exception. as an important theme of SCM. A key issue to remember when considering cost drivers is that cost drivers are not inherently good or bad. They must be analyzed relative to their value. One must always look at cost drivers relative to the value that they add and create (Mena et al., 2018). Overall, this supports the view that driver analysis should deal with the area of value creation by identifying the main value drivers based on the critical success factors (CSFs) for two reasons:

1. To keep pace with modern trends of management accounting and SCM by better studying the trade-off b/w functionality (Value Creation/ value drivers) and costs (cost drivers).

2. To conduct the two sides of SCM (cost and value). This can be explained through the following figure 8:

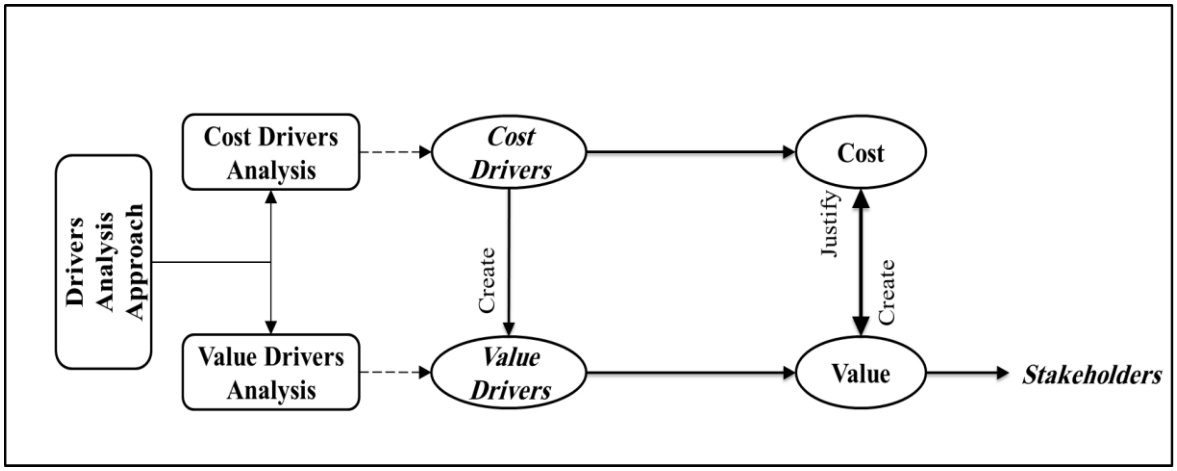

Figure 8: The Relationship Between Cost, Value, Cost Drivers and Value Drivers [Source: The Researchers]

Accordingly, the starting point for the drivers` analysis approach must be to identify the relevant value drivers that ensure the creation of the highest value for stakeholders, followed by the role of the cost drivers` analysis, which selects the relevant cost drivers.

4-2-2-2. Value Drivers Concept

Value drivers are at the root of value creation-factors that contribute to creating value for all stakeholders. Value creation is a function of value drivers that impact positively on operational efficiency and cost reduction, both which create value for all stakeholders along the Overall Value Chains, the ability of companies along the supply chain to generate value for themselves is derived from the extent to which they effectively exploit value drivers (Chivaka, 2003). Value drivers make the value creation strategies real at all levels of specificity that are meaningful and actionable and incorporate the entire decision-making dynamic towards supporting the value creation process along the overall value chains.

4-2-2-2-1. Critical Success Factors, The Determinants of Value Drivers

CSFs are measures of those aspects of the firm's performance essential to its competitive advantage and, therefore, to its success. they are sometimes called value propositions, that is, the CSF represents the critical process in the firm that delivers value to all stakeholders (Blocher et al., 2019). CSFs vary from one firm to another. Value is measured by the difference between what stakeholders receive (realizations) and what they give up (sacrifices) based on CSFs. For SCM. Customer value is the difference between what a customer receives (customer realization) and what the customer gives up (customer sacrifice) (Hansen et al., 2021). Accordingly, CSFs are the main determinants of value drivers. **Customer Value** = *Customer Realization – Customer Sacrifice* **[Based on CSFs to create value for customers]**. It is easy to understand why CSFs are often misunderstood as a synonymous or similar term to Key Performance Indicators (KPIs), understanding the difference between these two terms is a vital step in implementing Performance Measurement.

A single CSF can also have more than one KPI, if necessary, and KPI targets should be Specific, Measurable, Achievable, Relevant and Time Constrained. KPIs must be selected and designed in a way that ensures that the CSF is delivered, and the CSFs in turn must be designed and constructed in a way that ensures that the firm's strategic vision is delivered if the CSFs are met. The objectives, CSFs, and KPIs together represent a chain of links that together deliver a firm's strategic goal. The CSFs should also be reviewed and evaluated with respect to the firm's high-level strategic goals. Having KPIs set up without a well governed feedback and monitoring process can result in a firm aimlessly chasing targets which don't ultimately deliver the firm's strategy (ICAI, 2020). Here the ex-ante control through drivers` analysis could have a vital role.

4-2-2-2-2. Value Drivers Analysis, Definition

Value Drivers Analysis is used to identify the root causes of value, which are the main factors that contribute to value-creation better than the other factors. Value driver analysis is concerned with identifying the main value drivers that best contribute to creation of value for stakeholders by giving quantitative values to the effect of each value driver according to the dimensions of CSFs.

4-2-3. Considerations When Adopting the Drivers Analysis Approach

Driver Analysis requires addressing two problems each of which requires taking separate decisions: (Cokins & Căpuşneanu, 2010; El-Helbawy & El-Nashar, 2023)

4-2-3-1. First Problem: Determining How Many Drivers Should Be Used.

- The greater the number of drivers used, the more accurate the cost allocation and the greater the contribution to the value creation process (Positive relationship). But on the other hand, there is a trade-off relationship between the number of drivers and the degree of complexity (small number of drivers means lower costs and ease of understanding the system. In general, the determination of the number of drivers is related to the following factors:
- *Product diversity*: the quantity of support activities used in each product, the greater the quantity of support activities the greater the number of drivers should be used (positive relationship).
- *Volume diversity*: producing both high and/or low volume products, the greater the degree of volume diversity the greater the number of drivers should be used (positive relationship).
- *Relative cost (Cost Structure) and value of activities*: the greater the number of activities that have an essential ratio of total costs and/or value, the greater the number of drivers should be used.

4-2-3-2. Second Problem: How to Trade-off Between Drivers: To Select the Relevant Drivers

The choice of drivers is related to the following factors:

- The cost of measuring the effect of the drivers, which must be balanced with the importance of this measurement in obtaining the best measures for use in cost management and performance measurement.

- The wrong decisions that are made as a result of obtaining wrong measures when selecting irrelevant drivers. It will be the difference between the desired return that should be, and return achieved when making the wrong decision.
- The cost of the behavioral effects (desirable or undesirable) resulting from relying on the different measures that were obtained as a result of selecting a set of drivers. This includes positive or negative influence on staff.
- The value-creation reflects the other side of SCM and the main focus of SCM in creating competitive advantages and enhancing strategic position.

4-2-4. Role of Drivers Analysis Approach in Conducting the Strategic Orientation of Cost Management

The researchers believe that the drivers` analysis could be a vital approach for conducting the strategic orientation of cost management for two reasons as follows:

- It provides a better approach to study the trade-off between functionality (value creation/value drivers) and costs (cost drivers).
- It represents one of the Ex-ante control approaches of cost and value through controlling their drivers.
- Deriving measures that are not only best cost drivers-related but also best value drivers-related to be merged with the four perspectives of BSC to attain all aspects of SCM .
- Facilitating strategic decision making by extending the scope of the analysis outside the scope of the firm to study the effects of different drivers on the overall value chain (El-Helbawy & El-Nashar, 2023). Thus, it contributes substantially to the strategic decision-making process related to overall value chains.
- Using this analysis in highlighting areas of integration between various SCM techniques. This can be explained through figure 9 as follows:

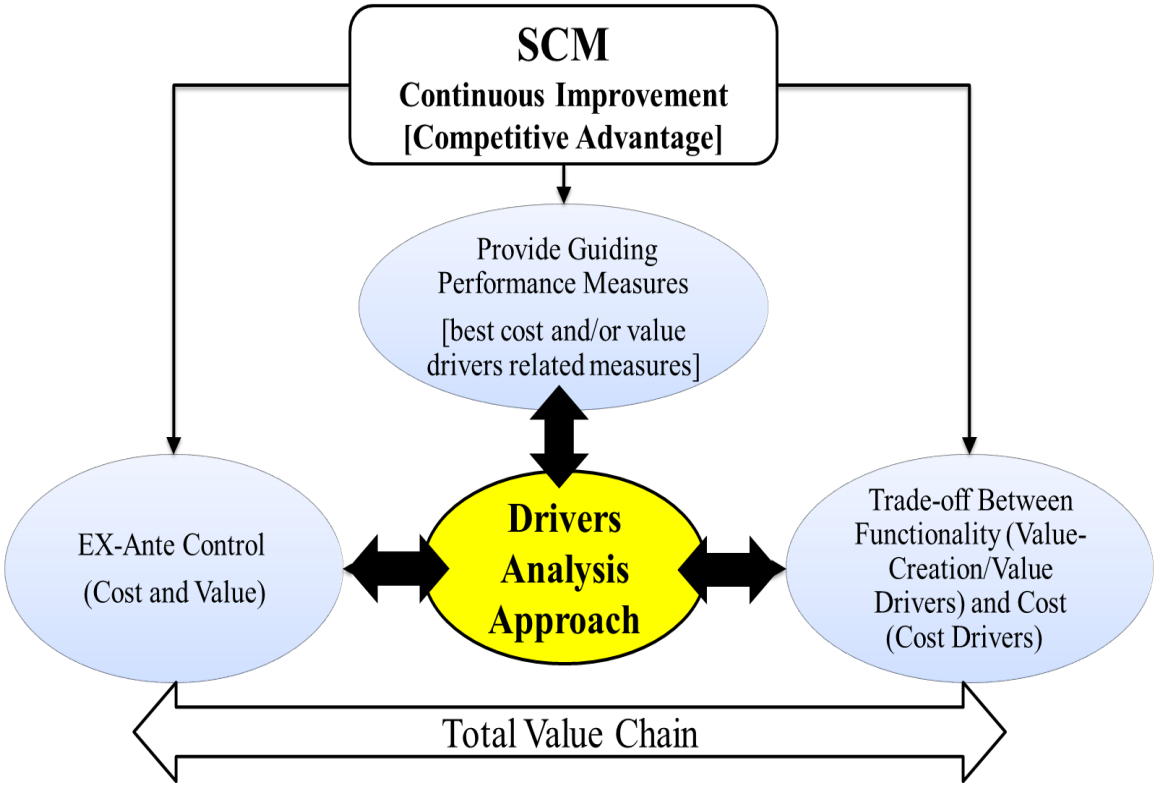

Figure 9: Drivers Analysis as an Essential Approach to SCM
[Source: The Researchers]

4-3. A Proposed Framework for Conducting the Strategic Orientation of Cost Management: The Drivers Analysis Approach

4-3-1. The General Objective of The Proposed Framework

The researchers developed a general structure of the proposed framework to clarify the role drivers` analysis could play in conducting the strategic orientation of cost management.

4-3-2. The Analytical Structure for Applying for Drivers` Analysis Approach

The analytical structure for applying drivers` analysis includes *Gather relevant data, Identify, Classify and Analyzing drivers to select the best and most relevant drivers*.

4-3-2-1. Gather Relevant Data

Gathering relevant data on CSFs, total value chain, and the related cost elements. To serve as a foundation for identifying, classifying, and analyzing value drivers and cost drivers. This step involves identifying the total value chain activities, identifying, and categorizing the related cost elements and the CSFs that the firm relies on to create and sustain value for customers.

- Identifying CSFs (Value Propositions/Value-Drivers` Determinants): Identifying what a firm`s success in maximizing value for customers should depend on, distinctively from other firms. Generally Accepted, time, quality, price, delivery, innovation, sales management, propaganda & advertising, product mix and etc. could be CSFs that a firm may concentrate on to create value for customers and that vary from one firm to another. (Apak et al., 2012; El-Helbawy & El-Nashar, 2023)

- Identifying the activities carried out by the firm that it deems important and necessary to create value for the customer and that are consistent with its strategy along the total value chain. Each value activity in the total value chain must have a significant proportion of the costs and also of the value created for customers. Therefore it has drivers whether cost or value, that are different from the rest of value activities. (Blocher et al., 2019).

4-3-2-2. Identification and Classification of Drivers

This step involves identification of the primary cost drivers that are responsible for the occurrence of each cost elements and the Identification of value drivers that contribute to the creation of value for customers by assessing the identified firm's CSFs, value propositions. Different ways can be used to identify drivers including Examining the basic economics of activity, Examining the internal experience of the firm, Interview and Competitive cost and value creation analysis (El Kelety, 2006). And whereas the Customer value is measured by the difference between customer realization and customer sacrifices based on CSFs (El-Helbawy & El-Nashar, 2023). CSFs are considered the main determinants of value drivers. Accordingly, a value driver will represent the following:

a) **An Increase in customer realization/satisfaction (positive CSFs)** in terms of **higher quality, faster delivery, existing innovation, optimal product mix, sales and after sales services and suitable advertising & propaganda, etc.**

b) **A Decrease in customer sacrifices/dissatisfaction (negative CSFs)** in terms of **shorter time, lower costs, and lower prices, etc.**

4-3-2-3. Analyzing the Drivers

Within SCM, Drivers` analysis is concerned with identifying the relevant drivers by giving quantitative values of the effect of each driver upon the total value chain, which is done by studying the effect of change in one measure (lead) on the change in one of the total value chain-related measures (customer perspective-related measures/lag) after a lag period. Figure 10 shows the methodology of drivers` analysis as follows:

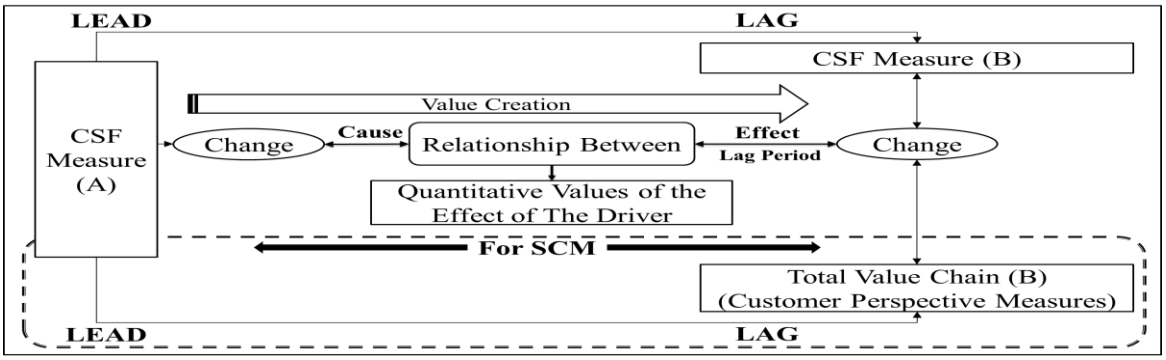

Figure 10: The Methodology of Drivers Analysis Approach [Source: The Researchers]

4-3-2-3-1. Methods For Drivers Analysis

There are different methods for selecting the best and relevant drivers that can be grouped into two main clusters as follows: which are: Methods based on statistics theory (Correlation and Regression Analysis) such as Cost and Value Estimation and Methods based on operations

research theory (Analytical Hierarchy Process – AHP, Zero-One Goal Programming– ZOGP and Scoring Model). (Bokor, 2010)

- *Cost and Value Estimation*

Cost and value estimation means estimating the relationship between ***drivers*** and ***Cost and/or value***, for the purpose of predicting cost and value along the total value chain. The main function is to select the best driver, which explains the behavior of cost and value creation better than the other, this is clearly illustrated in figure 11:

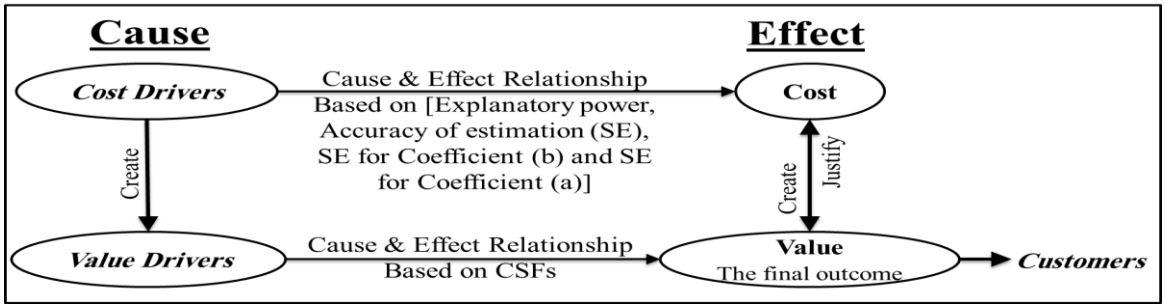

Figure 11: The Relationship Between Drivers and Their Various Effects [Source: (El-Helbawy & El-Nashar, 2023), emphasis added by The Researchers]

As Costs represent financial information therefore, the effect of the drivers on cost will be in the form of financial amount. On the other hand, the effect of drivers on value will be in a quantitative and non-financial form and within the specified scale for measuring the value, whereas value drivers represent either an increase in realization and/or a decrease in customer sacrifices. Figure 12 illustrates the cost and value estimation for drivers` analysis to select relevant cost and/or value drivers as follows:

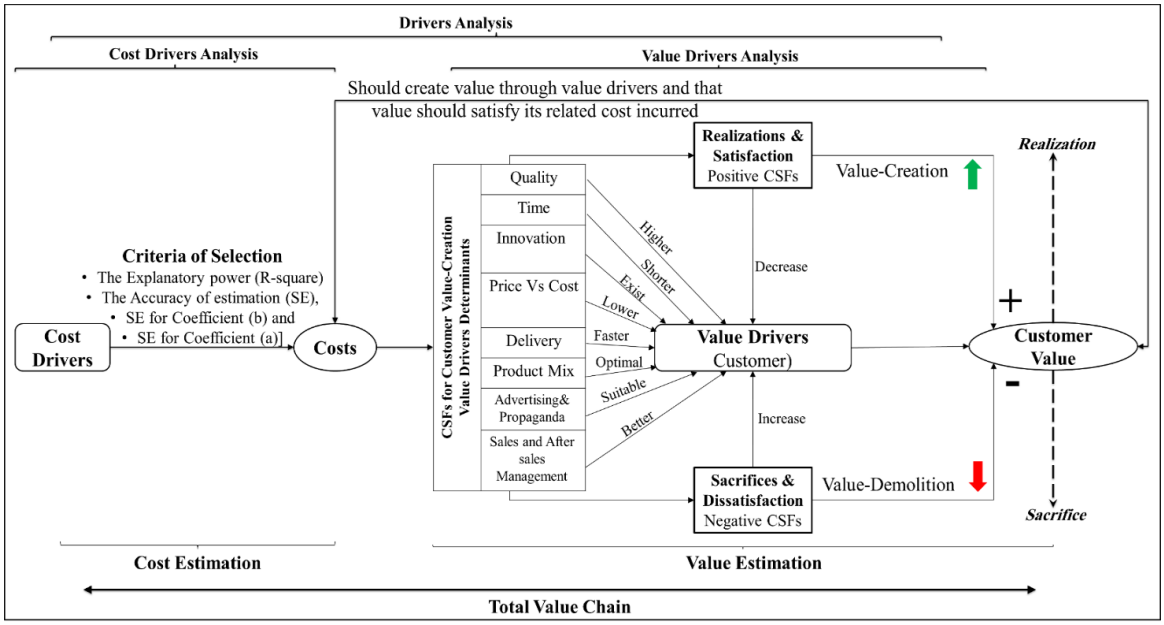

Figure 12: Cost and Value Estimation for Drivers Analysis [Source: The Researchers]

- *Methods Based on Operations Research Theory*

In case of lacking sufficient real quantitative information, the selection of appropriate cost drivers from the larger set of available candidate drivers is based mainly on human judgment supported by analyses using simple accounting techniques or more sophisticated correlation techniques from statistics, for example, AHP.

4-3-2-4. The Proposed Criteria for Selecting Best and Relevant Drivers

Based on the above and taking into account the problems related to selection of the best drivers that we referred to in chapter three, the researchers proposed a set of criteria that can be used to trade-off between drivers to select the best and most appropriate ones as follows:

1. ***Cost of Measurement:*** The lower the cost of measuring drivers' effects relative to its importance, the better the driver and should be used.
2. ***Cost of Errors:*** The lower the cost of errors, the better the driver and should be used.
3. ***Cost of Behavioral Effect:*** The more desirable the behavioral effects of the use of the driver, means it is preferable and should be selected.
4. ***Value Creation*****:** The greater the effect of driver in terms of value it creates for customers based on CSFs (its contribution to value creation), the better the driver should be selected.

4-3-2-5. Prioritize and selecting the best and Relevant Drivers

To overcome the first problem for cost drivers` analysis the basic issue for applying the drivers` analysis approach is to search for the most important drivers, not all of them.

Generally accepted, using a lower quantity of drivers means lower costs while creating value at the same time. So that, based on the Pareto principle, which specifies that 80% of consequences come from 20% of the cause, we are searching for the best 20% of drivers that cause 80% of value creation (based on value drivers) for customers thus ensuring the maximization of value for customer at the lowest possible cost and in the long term will contribute to creating competitive advantages

4-3-2-6. Utilizing Results of Drivers Analysis to Develop a Value-Balanced Scorecard (V-BSC) and Customized Strategy Map

The results of this analysis can be used in deriving measures for BSC that are not only best cost drivers-related but also best value drivers-related measures, to be merged with the four perspectives of BSC to attain all aspects of SCM. These measures should be tailored to each firm, resulting in developing a Modified Value-BSC and a Customized strategy Map. This indeed can enable the firm to identify areas of weaknesses within its performance in adopting SCM. **Figure 13 below shows the proposed framework of the study.**

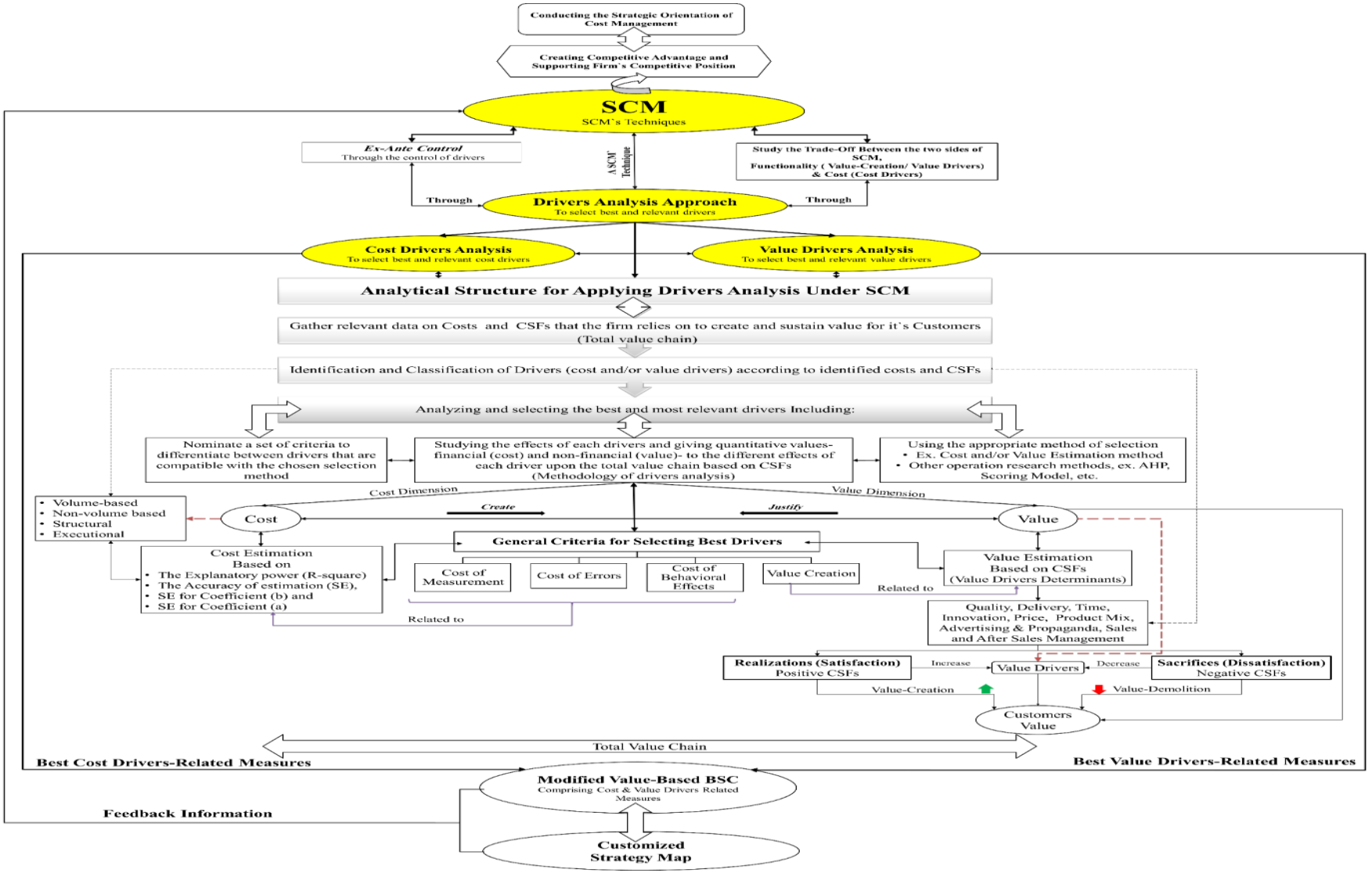

Figure 13: The Proposed Framework of the Study [Source: The Researchers]

5. The Case Study

5-1. The National Bank of Egypt (NBE), the Main Firm: Overview

5-1-1. The National Bank of Egypt `s Vision, Mission, and Overall objectives

NBE limited vision is to be the trusted bank of choice for all our clints' banking needs, building on our core values, people, and expertise established over many years operation. As the leading bank in Egypt, NBE targets optimizing financial intermediation, promoting financial inclusion while protecting depositors" funds and maximizing return on capital to support the national economy and financial stability."

The NBE`s overall objectives are to enhance client`s value and deliver world-class products and the highest quality service to our clients, attract, develop, and retain the best banking talent in the region. support the communities in which we operate. adhering to our core values of passion, integrity, conservatism and knowledge, exceptional client service as a top priority, excellence in all operations, teamwork, accountability, innovation, and sense of belonging.

5-1-2. The Reasons Behind the Unit of Analysis Selection

The researchers had chosen the National Bank of Egypt (NBE) as a unit of analysis for the conducted case study in this thesis due to a couple of reasons. These reasons are represented as follows:

- The strategic objectives that NBE desires to achieve, represented in enhancing the client`s value and deliver world-class products and the highest quality service to clients to maintain and enhance its excellent competitive position are the same objectives on which the proposed framework is based.
- The NBE intensive competitive environment, at the forefront of other Egyptian Governmental Banks plays a significant role in the stability of the Egyptian economy. But recently, many leading foreign banks have been established in Egypt besides the other governmental banks. So, SCM is a strong imperative for NBE.
- NBE is always seeking a continuous review of spending, optimizing current resources, costs, driving efficiencies, and shifting savings to investments that deliver value to the bank and its clients along the total value chain. Which indicates the importance of adopting ex-ante control approaches, especially Drivers` analysis. Within the framework of the bank conduction of the strategic orientation for cost management, the bank adopts the BSC as one of the SCM techniques to manage and measure performance. NBE is based on an excellent and clear set of important CSFs that are necessary to create and maximize value for the clients.

5-2. The Research Population and Sample, Units of Analysis

The researchers had applied the proposed model of drivers` analysis and its role for conducting the strategic orientation of cost management at the NBE, specifically, the NBE`s sector in Gharbia. The research sample included the five largest and most important NBE`s branches in Gharbia, including three branches in Tanta city that are [Al-Moatasem] branch [1], [El-Fateh] branch [2] and [Al-Kornish, Al-Estade, Qism 2] branch [3], one branch in Bassyoun center [NBE Bassyoun] branch [4] and one branch in Kafr El-Zayat center [NBE Kafr El-Zayat] branch [5].

5-3. Case Study Methodology

The researchers relied on a case study of the NBE`s branches under study to apply the proposed framework, where the bank's total value chain was determined. A set of value drivers and associated cost drivers were proposed based on the CSFs of the bank, which the bank uniquely relies on to achieve its strategies, objectives, and goals. The NBE`s CSFs ranked in order of significance in creating client` value as follows:

1. Delivery (Accessibility), to achieve faster, safe, and easy access and delivery.
2. Product Mix, to provide an optimal and wide range of diversified financial products and services.
3. Innovation, to be exist at all levels such as NBE`s digital banking services and innovative financial products.
4. Time, shorter time.
5. Price vs Cost (Affordability and adequacy), affordable services and products.
6. Advertising and Propaganda, use suitable advertising campaigns and reachable channels.
7. Quality, higher quality in providing NBE`s services.

Data were obtained through interviews, questionnaires, documentary analysis and observations, and the data was analyzed using MS EXCEL to evaluate the relative weight of each Drivers using the AHP approach. Considering this, the steps of the case study are as follows:

First: The application of the AHP to prioritize and select the best Drivers to support the competitive Position of the NBE and conduct the strategic orientation of Cost Management within the NBE. And discussing the AHP results.

Second: Utilizing Drivers` Analysis Results to Develop a Modified Value-Based BSC and a Customized Strategy Map for the National Bank of Egypt. The researchers suggested some value drivers and their related cost drivers for NBE, based on the NBE`s identified CSFs as shown in table (1) below:

Table 1: The Proposed Value Drivers and Their Related Cost Drivers Based on the Main Categories of NBE`s CSFs for Client Value-Creation for SCM
[Source: The Researchers]

Code NO.	Related Cost Drivers	NBE`s CSFs	Value Drivers
X1	**Adopting Al-Ahly net and other NBE`s digital banking services**	Quality	• Low transactions processing error rate • Increasing efficiency and quality of remittances
		Delivery	• Reducing lead time of services delivery. • Quick access to NBE`s services • Secured and safe online banking services. Reducing client waiting squeeze
		Time	• Shorter client response time • Shorter client wait time

		Innovation	Adopting digital banking and other advanced technologies
		Price vs Costs	• Low administrative fees • Offering free opening accounts fees Offering free account subscription fees
		Product and services Mix	Offering variety financial products and services
		Advertising & Propaganda	• Informing clients of NBE`s new products, services and the new offers • Raising client`s awareness of NBE`s services and their uniqueness of providing those services
X2	**No. of NBE`s ATMs**	Quality	Low transactions processing error rate
		Delivery	• Reducing lead time of services delivery • Reducing client waiting squeeze Quick access to NBE`s services
		Time	• Shorter client Wait time • Shorter time for making deposits Shorter client response time
		Price vs Costs	Lower services and administrative fees
		Product Mix	Offering variety financial products and services
X3	**No. of NBE`s Branches Including NBE`s flagship digital branches**	Delivery	• Reducing lead time of services delivery • Secured and safe online banking services • Quick access to NBE`s services • Reducing client waiting squeeze
		Time	• Shorter client response time • Shorter client wait time
		Product and services Mix	• Offering variety financial products and services • Informing clients of differences between NBE`s products and services
X4	**No. of front office employees, tellers and other NBE`s staff using IT in their work and Types of staff skills & capabilities**	Delivery	Reducing client waiting squeeze
		Time	• Shorter client response time Shorter client wait-time
		Product and services Mix	Informing clients of differences between NBE`s products and services
X5	**No. of NBE`s products and services that achieved its success in their first time issuing (No. of design changes)**	Quality and Innovation	First pass through NBE`s financial products & services
		Quality	Low transactions processing error rate

X6	**No. of training hours provided by NBE`s to its staff**	Delivery	Reducing client waiting squeeze
		Time	Shorter client` wait, response time
		Product and services Mix	Offering variety financial products and services and informing clients of differences between NBE`s products
X7	**Types and No. of advertising media and media channels**	Advertising and Propaganda	• Using fantastic and reachable advertising media channels Informing clients of NBE`s new products, services, the new offers and the differences between NBE`s products and services
X8	**No. of POS digital machines**	Quality	• Low transactions processing error rate Increasing efficiency and quality of remittances
		Delivery	• Reducing lead time of services delivery • Quick access to NBE`s services
		Time	Shorter client response time
		Innovation	Adopting digital banking and other advanced technologies
		Price vs Cost	Low administrative fees
		Product and services Mix	Offering variety financial products and services
X9	**No. of new saving programs and other financial services**	Innovation	Developing and offering new NBE`s services and saving programs
X10	**Types and No. of services provided by NBE**	Products and services Mix	Offering variety financial products and services
X11	**No. of up-to-date certificates issued by the NBE**	Innovation	Issuing up-to-date NBE`s certificates that preserve the client's funds against the effects of current economic events
X12	**No. of platforms and websites available for NBE`s clients**	Advertising and Propaganda	• Using fantastic and reachable advertising media channels • Informing clients of NBE`s new products, services, the new offers and the differences between NBE`s products and services
X13	**No. current saving programs and other financial services**	Innovation	Improving current NBE`s services and saving programs
X14	**Quality problems due to software failure**	Quality	Using high quality software and other e-system
X15	**Time of product development cycle**	Time	Reducing Time of product development cycle
X16	**Virtual wait line systems**	Time	Shorter client wait time

X17	**Percentage change in credit limits for NBE`s clients**	Innovation	Increasing volume of credits for SME`s and other NBE`s clients
X18	**No. of awareness sessions and conferences provided by NBE**	Advertising and Propaganda	Raising client`s awareness of NBE`s services and their uniqueness of providing those services
X19	**No. of NBE`s financial literacy workshops**	Advertising and Propaganda	Promoting financial literacy
X20	**Data management and analytics**	Cost vs price	Tailored product recommendations and customized financial advice
X21	**Average resolution time for client Queries in branches**	Time and Delivery	Shorter Queue time in NBE branches
X22	**Average Call handling time**	Time	Shorter average call handling time
X23	**Staff salaries and benefits**	Quality	Accuracy of handling transactions and good client services

5-3.1. The Application of the Analytical Hierarchy Process

5-3-1-1. Step One: Developing the Hierarchy of the understudy problem (Decompose the decision-making problem into a hierarchy)

The researchers developed a graphical representation of the problem in terms of the overall goal, the criteria to be used, and the decision alternatives. Figure 14 shows the developed Hierarchy that reflects the understudy problem.

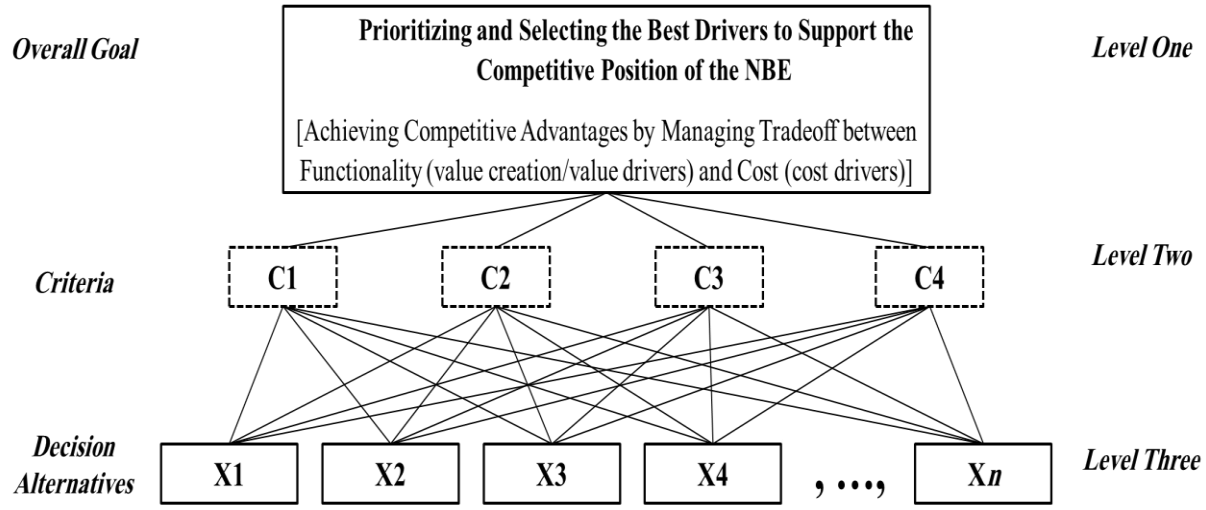

Figure 14: The Sample Hierarchical Tree for the Understudy Problem
[Source: The Researchers]

From figure 13 above we can note that shows the developed Hierarchy that reflect the understudy problem consists of three levels as follows:

- Level one: represents the *Overall Goal* which is prioritizing and selecting the best Drivers to support the competitive Position of the NBE by managing tradeoff between functionality (value creation/value drivers) and cost (cost drivers).
- Level two: represents the proposed *Criteria* for selecting the best drivers for the NBE, the researchers used four criteria coded from [**C1, C2, …, C*i***] *where **i** = 4.* Where [**Value Creation C1**], [**Cost of Measurement C2**], [**Cost of Errors C3**] and [**Cost of Behavioral Effects C4**]
- Level three: represents the decision *Alternatives (NBE`s drivers)* that represents the identified twenty-three (23) drivers for the NBE that are coded in table (5-1) above from [**X1, X2, …, X*n***] *where **n*** (is the total number of alternatives) = 23.

Furthermore, the data collected from the fifteen (15) expert officials in the selected NBE branches was first grouped before estimating the geometric mean for each alternative based on the following equation:

$$\mu_{geometric} = \sqrt[n]{X_1 \times X_2 \times, \ldots, \times X_n}$$

Where: ***n:*** is the number of alternatives (Drivers) applied in the study = 23

5-3-1-2. Step Two: Pairwise Comparisons and Establish Priorities Among the Elements in the Hierarchy

In this step, the researchers conducted three procedures to estimate the relative priorities (weights) of the alternatives in terms of each criterion. However, those procedures will be repeated to estimate the relative priorities (weights) of each criterion in terms of the overall goal. The influence and importance of each factor are defined by making pairwise comparisons matrices, and the factors are valued on a scale. The researchers used the Saaty Scale from 1 (equal significance) to 9 (extreme significance), as shown in table (2) as follows:

Table 2: Scores for the importance of variable for AHP

Importance Scale	Definition	Importance Scale	Definition
1	Equally Important Preferred	**6**	Strongly to Very Strongly Important Preferred
2	Equally to Moderately Important Preferred	**7**	Very Strongly Important Preferred
3	Moderately Important Preferred	**8**	Very Strongly to Extremely Important Preferred
4	Moderately to Strongly Important Preferred	**9**	Extremely Important Preferred
5	Strongly Important Preferred		

5-3-1-2-1. Pairwise Comparison Matrices Between the Alternatives in Terms of Each Criterion

5-3-1-2-1-A. Pairwise Comparison Matrix Between the Alternatives in Terms of Each Criterion

Using the geometric means of each Alternative and their reciprocals, a pairwise comparisons matrices between *Alternatives* in terms of each *Criterion* was established. For example, table (3) shows the pairwise comparison matrix between the *Alternatives* (drivers) in terms of Value Creation Criterion [**C1]**. Also, the pairwise comparison matrices between the *Alternatives* (drivers) in terms of other criteria, including [Cost of Measurement Criterion **C2**], [Cost of Errors Criterion **C3**] and [Cost of Behavioral Effects Criterion **C4**] are also shown in tables (4), (5) and (6) as follows.

Table 3: The Pairwise Comparison Matrix Between *Alternatives* (Drivers) [**X1, X2, …, X$_i$**] in Terms of Value-Creation Criterion **[C2]**

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23
X1	1	2.022684	3.002305	2.062106	3.278866	3.244379	1.742544	2.140863	2.107765	2.218804731	1.48054	4.638762	4.726562	2.737269	2.652831	1.605127	2.487526	2.652043	3.191422	2.70192	2.253959	2.385435	2.555683
X2	0.494393	1	2.419931	2.100629	1.584893	2.472778	2.16932	2.598091	2.935709	1.91647393	2.287533	2.031657	2.72838	2.191999	2.900242	2.912747	2.63703	2.900242	2.218805	2.321818	2.391935	2.517946	2.585204
X3	0.333077	0.413235	1	2.790274	3.114728	2.764034	2.457473	1.63534	1.906666	1.91647393	2.819096	2.450795	2.165517	2.093012	2.404239	1.97435	2.422473	2.555683	2.815224	3.000711	3.580901	2.252059	1.915905
X4	0.484941	0.476048	0.358388	1	2.506391	1.519847	2.671489	3.738078	4.162442	3.749143559	3.749144	2.835945	3.6285	3.48535	2.374488	2.797878	2.495837	1.645139	1.611192	3.487255	2.557041	3.21658	1.725027
X5	0.304984	0.630957	0.321055	0.39898	1	2.563248	1.741894	3.996103	2.593216	2.54260414	3.672872	3.199169	2.168944	1.842572	1.388524	1.65423	2.586617	2.535694	2.488847	3.042488	3.002305	2.191999	2.347745
X6	0.308225	0.404403	0.36179	0.657961	0.39013	1	2.586936	3.259336	2.076641	1.697502941	1.765866	1.413681	1.848832	1.769627	1.880068	1.687392	2.49563	3.197421	1.795168	2.224191	2.470114	1.509209	1.92869
X7	0.573874	0.460974	0.406922	0.374323	0.574088	0.386558	1	0.973331	2.358568	2.743913944	2.915205	3.182748	2.832093	3.568213	2.145688	2.740145	1.254512	2.218805	2.304406	3.957409	2.506391	2.604398	2.019139
X8	0.467101	0.384898	0.611494	0.267517	0.250244	0.306811	1.0274	1	0.743462	1.522945028	1.839916	2.542251	3.112149	3.063024	1.190134	1.546615	1.580586	1.660731	2.781212	2.481932	3.016146	2.293449	1.90054
X9	0.474436	0.340633	0.524476	0.240244	0.385622	0.481547	0.423986	1.345059	1	2.005005742	0.947538	1.755131	2.664269	2.586936	2.776433	2.624928	2.30124	1.746122	2.429074	1.725027	1.567173	1.081802	2.076641
X10	0.450693	0.521792	0.521792	0.266728	0.393298	0.589101	0.364443	0.656623	0.498752	1	1.443586	2.103778	2.15036	3.175041	2.844304	2.824396	4.31373	1.525252	1.218764	2.166668	2.803137	3.206135	2.24239
X11	0.675429	0.437152	0.354724	0.266728	0.272266	0.566294	0.343029	0.543503	1.055367	0.692719298	1	1.982864	2.019906	1.837819	2.67153	2.97161	1.908246	2.350211	2.294986	2.014696	1.675581	1.735062	2.548737
X12	0.215575	0.492209	0.408031	0.352616	0.312581	0.707373	0.314194	0.393352	0.569758	0.475335316	0.504321	1	2.387411	2.480765	1.5738	2.34452	2.644792	2.872115	2.901783	3.944557	2.989416	2.39572	1.402313
X13	0.21157	0.366518	0.461784	0.275596	0.461054	0.540882	0.353096	0.321321	0.375337	0.465038507	0.495073	0.418864	1	1.93991	2.022934	2.295668	1.81425	2.191999	1.685621	2.050569	3.135751	1.708534	1.885192
X14	0.365328	0.456205	0.47778	0.286915	0.54272	0.565091	0.280252	0.326475	0.386558	0.314956566	0.544123	0.403101	0.515488	1	3.285029	2.107765	1.632247	2.472161	1.441056	3.412414	3.618638	2.749888	2.555683
X15	0.376956	0.344799	0.415932	0.421143	0.720189	0.531896	0.466051	0.840242	0.360174	0.351579842	0.374317	0.635405	0.494331	0.304411	1	2.016365	2.618572	1.916474	2.269138	3.258663	2.250195	1.927957	2.872115
X16	0.623004	0.343318	0.506496	0.357414	0.604511	0.592631	0.364944	0.646573	0.380963	0.354058044	0.336518	0.426527	0.435603	0.474436	0.495942	1	2.107765	1.929983	3.10631	3.053031	2.478162	2.89236	1.870447
X17	0.402006	0.379215	0.412801	0.400667	0.386605	0.4007	0.797123	0.632677	0.434548	0.231817921	0.524041	0.378102	0.551192	0.612653	0.381888	0.474436	1	1.157754	2.992556	4.480074	4.534861	3.134086	1.215813
X18	0.377068	0.344799	0.391285	0.607851	0.394369	0.312752	0.450693	0.602144	0.572698	0.655629518	0.425494	0.348175	0.456205	0.404504	0.521792	0.518139	0.863742	1	2.528803	2.476846	2.669278	2.825235	2.323741
X19	0.31334	0.450693	0.355212	0.620658	0.401792	0.557051	0.433951	0.359555	0.411679	0.820503234	0.435733	0.344616	0.593253	0.693936	0.440696	0.321925	0.334163	0.395444	1	1.759609	1.212937	1.293662	1.156209
X20	0.370107	0.430697	0.333254	0.286759	0.328678	0.449602	0.252691	0.402912	0.579701	0.461538266	0.496353	0.253514	0.48767	0.293048	0.306874	0.327543	0.223211	0.403739	0.568308	1	1.938828	2.018923	1.1242
X21	0.443664	0.418072	0.279259	0.391077	0.333077	0.40484	0.39898	0.331549	0.638092	0.35674317	0.596808	0.334514	0.318903	0.276347	0.444406	0.403525	0.220514	0.374633	0.824445	0.515775	1	2.20145	0.53582
X22	0.419211	0.397149	0.444038	0.310889	0.456205	0.662599	0.383966	0.436025	0.924384	0.311902065	0.576348	0.417411	0.585297	0.363651	0.518684	0.345738	0.319072	0.353953	0.773	0.495314	0.454246	1	0.895465
X23	0.391285	0.386817	0.521947	0.579701	0.425941	0.518487	0.495261	0.526166	0.481547	0.445952734	0.392351	0.713107	0.53045	0.391285	0.348175	0.534632	0.822495	0.430341	0.864895	0.889522	1.866299	1.116738	1
Sum	10.07627	11.90327	14.89069	15.31678	19.11825	22.1385	21.51972	27.70532	27.55403	27.25064242	29.62278	33.81012	38.40131	37.58581	36.5687	38.02967	41.08425	40.48594	46.10501	56.46049	55.9733	50.25863	42.6827

Table 4: The Pairwise Comparison Matrix Between *Alternatives* (Drivers) [**X1, X2, …, X$_i$**] in Terms of Cost of Measurement Criterion [**C2**]

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23
X1	1	2.901783	1.680148	3.023468	3.677925	3.507011	2.107765	2.368738	2.511102	1.939910374	1.643752	2.548737	3.03902	1.77348	2.358568	2.107765	2.285812	2.244079	1.958908	2.517946	3.21658	2.676552	1.892052
X2	0.344616	1	2.758848	2.323741	1.700694	3.428201	3.399417	3.342357	3.045261	2.422933377	2.187236	2.027845	2.550616	2.500321	2.601055	2.655617	2.375193	2.336971	2.844304	2.476111	2.509024	2.735816	2.669278
X3	0.595186	0.36247	1	3.150208	2.240534	1.878512	1.820564	1.543904	2.325011	2.191998908	2.20745	2.923105	2.165517	1.230681	2.439548	2.089085	2.773654	2.292231	1.816218	0.365081	1.856111	2.559727	1.567173
X4	0.330746	0.430341	0.317439	1	3.293004	2.710764	2.829355	2.760313	3.169084	4.192962713	2.339831	2.399728	2.252246	1.840894	1.912878	2.901783	2.017187	1.921697	1.342034	1.345271	1.973764	2.725517	1.220237
X5	0.271892	0.587995	0.446322	0.303674	1	1.48233	2.38163	2.95081	2.356616	3.029151524	2.790274	1.896317	1.979113	1.413681	1.171289	1.841593	2.769272	2.881472	2.502431	2.19732	1.767196	2.102036	2.387411
X6	0.285143	0.291698	0.532336	0.3689	0.674614	1	1.501277	2.09161	3.182748	2.725517369	2.258196	3.245342	3.276151	2.624928	1.738109	2.383837	2.213158	2.978823	2.662854	2.357868	2.234445	1.65671	1.111773
X7	0.474436	0.294168	0.54928	0.353437	0.419881	0.6661	1	1.472963	1.979113	1.865363603	1.208571	1.993063	1.593046	1.075269	2.271916	2.52193	1.687018	1.796682	1.799525	1.632582	1.972686	2.076641	0.838165
X8	0.422166	0.29919	0.647709	0.362278	0.33889	0.478101	0.678904	1	1.147929	1.962590595	1.069766	1.73835	1.629803	2.357129	2.132907	1.803423	1.134061	1.945197	2.035829	1.904665	1.269853	2.879942	2.720965
X9	0.398231	0.328379	0.430105	0.315549	0.424337	0.314194	0.505277	0.871134	1	1.161318852	0.751427	1.146543	1.485928	1.519847	2.81227	2.89236	1.358953	1.953584	1.865364	1.790289	0.913059	1.261585	0.711656
X10	0.515488	0.412723	0.456205	0.238495	0.330125	0.366903	0.536089	0.509531	0.86109	1	1.823761	2.624928	1.677886	3.621691	2.148579	3.701826	1.92502	2.271916	1.777785	1.996247	2.337665	2.261769	1.170474
X11	0.608364	0.457198	0.453011	0.427381	0.358388	0.442831	0.827423	0.934784	1.330801	0.548317411	1	1.325427	2.052643	2.031657	2.36271	2.007112	1.979143	1.76866	2.285133	1.529512	1.211505	0.936154	2.093012
X12	0.392351	0.493134	0.342102	0.416714	0.527338	0.308134	0.50174	0.575258	0.872187	0.380962782	0.754474	1	0.963547	1.689083	2.934837	2.697651	2.113216	2.241724	2.643431	2.452825	2.622174	2.835516	0.969152
X13	0.329053	0.392062	0.461784	0.444001	0.505277	0.305236	0.627728	0.613571	0.67298	0.595987995	0.487177	1.037832	1	1.283458	1.492211	1.461674	2.635263	2.377197	1.674459	2.395189	1.402624	0.740916	1.079303
X14	0.563863	0.399949	0.812558	0.543214	0.707373	0.380963	0.93	0.424245	0.657961	0.276114077	0.492209	0.592037	0.779145	1	2.305055	1.232187	2.017786	2.780387	3.436782	2.973704	1.479548	1.877254	2.061851
X15	0.423986	0.384459	0.409912	0.522772	0.85376	0.575338	0.440157	0.468844	0.355585	0.465423797	0.423243	0.340734	0.670146	0.433829	1	1.791267	1.724728	1.520088	2.203274	1.764404	0.867365	1.685621	1.732465
X16	0.474436	0.37656	0.478679	0.344616	0.543008	0.419492	0.396522	0.554501	0.345738	0.270136955	0.498228	0.370693	0.684147	0.811565	0.558264	1	1.432937	0.844163	0.974387	1.513112	1.833687	2.163799	2.699683
X17	0.437481	0.421018	0.360535	0.49574	0.361106	0.451843	0.592762	0.881787	0.735861	0.51947516	0.505269	0.473212	0.379469	0.495593	0.579802	0.697867	1	1.028657	2.04383	2.056858	1.974663	1.705931	1.943894
X18	0.445617	0.427904	0.436256	0.520373	0.347045	0.335703	0.556581	0.514087	0.51188	0.440157175	0.5654	0.446085	0.420663	0.359662	0.657857	1.184605	0.972141	1	1.071179	1.242192	1.572746	1.746122	1.88337
X19	0.510488	0.35158	0.550595	0.745137	0.399611	0.375537	0.555702	0.4912	0.536089	0.562497761	0.437611	0.378296	0.597208	0.29097	0.45387	1.026286	0.489277	0.93355	1	1.435414	1.554786	1.532825	1.334243
X20	0.397149	0.403859	2.739119	0.743344	0.4551	0.424112	0.612527	0.525027	0.558569	0.500939912	0.653803	0.407693	0.417504	0.336281	0.566764	0.66089	0.486178	0.805029	0.696663	1	1.477938	1.443586	1.711489
X21	0.310889	0.398561	0.538761	0.506646	0.565868	0.447539	0.506923	0.787493	1.09522	0.427777278	0.82542	0.381363	0.712949	0.675882	1.152918	0.545349	0.506416	0.635831	0.643175	0.676618	1	1.342934	0.901294
X22	0.373615	0.365522	0.390667	0.366903	0.475729	0.603606	0.481547	0.347229	0.792653	0.442131714	1.068201	0.35267	1.349681	0.532693	0.593253	0.46215	0.58619	0.572698	0.65239	0.692719	0.744638	1	1.063366
X23	0.528527	0.374633	0.638092	0.819513	0.418864	0.899464	1.193083	0.367517	1.405172	0.854354981	0.47778	1.03183	0.926524	0.485001	0.577212	0.370414	0.514431	0.530963	0.749489	0.584287	1.109516	0.94041	1
Sum	10.43373	12.15519	17.43046	18.3361	20.61847	21.80191	24.98297	26.3969	31.44865	28.77602431	26.46908	30.68183	32.60295	30.3836	36.82187	40.03667	36.99703	39.6616	40.67945	38.90021	38.90157	42.88736	36.76231

Table 5: The Pairwise Comparison Matrix Between *Alternatives* (Drivers) [**X1, X2, …, X$_i$**] in Terms of Cost of Errors Criterion [**C3**]

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23
X1	1	2.033089	2.266414	2.333761	3.433937	1.997156	1.764159	1.860294	2.824396	3.062977356	1.380463	3.150208	2.321303	1.56149	1.93991	1.781127	2.593986	2.224191	1.857355	2.076641	1.967666	1.869194	2.340121
X2	0.491862	1	1.850363	3.263819	2.450795	2.393917	3.34335	2.625708	2.078362	2.994145841	2.263006	2.350211	2.436619	1.415635	0.530605	1.819345	1.024676	2.070998	1.810682	1.829929	1.766012	1.471977	1.528659
X3	0.441226	0.540434	1	1.768147	1.964217	1.901785	1.877254	2.457473	1.850774	1.783479727	1.91519	0.996681	1.29797	1.483323	1.834589	1.718262	1.977475	2.228372	2.058848	1.767475	1.92041	2.617111	1.245509
X4	0.428493	0.30639	0.565564	1	2.358568	2.144548	2.63703	2.781212	1.936271	3.168142709	3.152866	2.165517	2.440273	2.323741	2.146325	2.736457	3.258933	1.580586	1.66589	1.995124	1.360079	1.391097	0.892736
X5	0.291211	0.408031	0.509109	0.423986	1	1.706883	1.674956	2.721701	2.662485	1.744013943	2.255034	2.363591	1.919839	1.195381	1.598236	1.947767	2.30124	1.982864	1.618577	1.959949	1.714101	1.605127	1.18094
X6	0.500712	0.417725	0.525822	0.466299	0.585863	1	1.303773	2.81606	1.995503	1.948274953	1.132871	1.62661	1.667006	1.94663	2.203274	2.598091	1.067247	2.245973	2.352641	2.313078	2.421186	0.694821	0.826363
X7	0.566842	0.299101	0.532693	0.379215	0.597031	0.767005	1	1.865364	1.852307	2.210942747	1.623893	1.383058	1.569989	1.788139	3.584663	2.17601	1.370072	1.37598	1.429784	2.531418	1.864114	1.339098	1.423448
X8	0.537549	0.38085	0.406922	0.359555	0.367417	0.355106	0.536089	1	1.717111	2.537794786	1.862417	3.245342	1.935926	1.605406	1.706883	1.618676	1.96529	1.742328	2.900242	2.575065	2.093012	2.203274	1.725027
X9	0.354058	0.481148	0.540315	0.516457	0.375589	0.501127	0.539867	0.582374	1	1.337878591	1.403041	1.925071	2.2993	1.980783	2.368249	1.897917	2.022749	2.031657	2.174854	0.871661	1.380987	1.66589	1.338387
X10	0.32648	0.333985	0.560702	0.315642	0.57339	0.513275	0.452296	0.394043	0.747452	1	1.762393	1.207303	1.338387	1.894552	1.859628	1.779934	1.64491	2.116853	0.742935	0.827276	1.680148	1.230462	1.465364
X11	0.724395	0.44189	0.522141	0.317172	0.443452	0.882713	0.615804	0.536937	0.712738	0.56741035	1	1.874431	2.017436	1.753651	2.047673	1.759609	1.305369	1.509209	1.732465	2.203274	1.72179	1.075269	1.686262
X12	0.317439	0.425494	1.00333	0.461784	0.423085	0.614775	0.723036	0.308134	0.519461	0.828292536	0.533495	1	1.900211	2.358568	2.402629	1.813185	2.080116	1.753651	1.699555	1.945197	1.292854	1.544449	0.924767
X13	0.430793	0.410405	0.770434	0.40979	0.520877	0.599878	0.636947	0.516549	0.434915	0.747168099	0.495679	0.526257	1	1.086376	1.307814	1.714101	1.850034	1.988267	1.767196	1.926904	2.149721	1.515151	1.409588
X14	0.640414	0.706397	0.674162	0.430341	0.836553	0.513708	0.55924	0.622896	0.504851	0.527829278	0.570239	0.423986	0.920492	1	2.100629	1.752985	2.060725	1.978569	2.620781	2.051268	1.792432	1.5738	1.610113
X15	0.515488	1.884643	0.545081	0.465913	0.62569	0.45387	0.278966	0.585863	0.422253	0.53774183	0.488359	0.416211	0.764635	0.476048	1	1.325821	1.759887	1.806074	3.171709	1.781291	1.106824	1.456494	1.794946
X16	0.561442	0.549648	0.581984	0.365436	0.513409	0.384898	0.459557	0.617789	0.526894	0.561818654	0.568308	0.551516	0.583396	0.570456	0.75425	1	0.960928	1.59912	1.919839	1.660112	1.393712	1.771093	1.606108
X17	0.385507	0.975919	0.505695	0.306849	0.434548	0.93699	0.729888	0.508831	0.494377	0.607935841	0.766067	0.480743	0.540531	0.485266	0.568218	1.040661	1	0.929212	1.712953	1.670198	1.727579	1.914622	1.589595
X18	0.449602	0.482859	0.448758	0.632677	0.504321	0.445241	0.726755	0.573945	0.492209	0.472399307	0.662599	0.570239	0.502951	0.505416	0.553687	0.625344	1.076181	1	1.530802	1.612527	1.485928	1.33749	1.841593
X19	0.5384	0.552278	0.485708	0.60028	0.617827	0.425054	0.699406	0.344799	0.459801	1.346013019	0.577212	0.588389	0.565868	0.381566	0.315287	0.520877	0.583787	0.653252	1	1.508408	1.061567	1.626273	1.64491
X20	0.481547	0.546469	0.565779	0.501222	0.510217	0.432324	0.395036	0.38834	1.147235	1.208786288	0.45387	0.514087	0.518967	0.487503	0.561391	0.602369	0.598731	0.620145	0.662951	1	1.782382	1.92869	2.06356
X21	0.508216	0.566248	0.520722	0.735252	0.583396	0.413021	0.536448	0.47778	0.72412	0.595185831	0.580791	0.773483	0.465177	0.557901	0.903486	0.717508	0.578845	0.67298	0.942004	0.561047	1	1.223563	1.254955
X22	0.53499	0.679359	0.382101	0.718857	0.623004	1.43922	0.746771	0.45387	0.60028	0.812702901	0.93	0.64748	0.66	0.635405	0.68658	0.564623	0.522296	0.747669	0.614903	0.518487	0.817285	1	0.865821
X23	0.427328	0.654168	0.802884	1.120152	0.846783	1.210122	0.702519	0.579701	0.747168	0.682424384	0.593028	1.081353	0.709427	0.621074	0.55712	0.622623	0.629091	0.543008	0.607936	0.4846	0.796841	1.154973	1
Sum	11.45399	15.07653	16.56668	17.8926	21.18997	22.03262	22.93915	25.61966	26.45096	31.28335897	26.97082	29.86177	30.3757	28.11431	33.53112	34.13329	34.23257	35.40096	38.5949	37.67093	36.29663	35.20992	33.25877

Table 6: The Pairwise Comparison Matrix Between *Alternatives* (Drivers) [**X1, X2, …, X*i***] in Terms of Cost of Behavioral Effect Criterion [**C4**]

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23
X1	1	3.198725	2.266414	1.911265	3.649158	1.998495	1.325407	1.721492	2.376455	2.441569189	0.818964	2.720965	3.072956	1.06299	1.735062	1.509209	2.224851	1.327919	1.462653	1.759609	2.832541	1.634244	2.404239
X2	0.312625	1	0.911088	1.864114	2.045977	2.43364	2.697651	1.483422	2.053253	2.438215267	1.524527	1.672437	1.99008	1.953584	1.995337	1.851066	1.147596	1.991728	1.662739	1.621462	1.885348	1.020773	1.393299
X3	0.441226	1.097589	1	1.923448	1.689083	1.66809	1.607569	2.15622	1.893321	1.463865197	2.035224	1.582771	2.431626	1.541593	1.511295	0.356741	1.366106	1.209294	1.581614	1.579527	1.506703	0.95328	1.407729
X4	0.523214	0.536448	0.5199	1	2.114632	1.752054	1.475868	1.604841	1.966335	1.642163124	1.376027	1.261288	1.562506	1.631956	1.757449	1.732465	1.771766	1.623893	1.681885	1.593892	1.003079	1.133644	0.835976
X5	0.274036	0.488764	0.592037	0.472896	1	1.650409	1.646842	1.620814	1.666775	1.718465987	1.487891	1.865364	1.693347	1.63683	1.52793	1.933611	1.180034	1.357064	1.760544	1.646638	1.292029	1.170157	0.581441
X6	0.500377	0.410907	0.599488	0.570759	0.605911	1	1.865868	1.352726	1.406251	1.796335109	1.840347	1.494832	1.500625	1.38496	1.805826	1.919839	1.97435	1.836794	2.18194	1.848832	2.083407	1.560596	0.980056
X7	0.754485	0.370693	0.622057	0.677567	0.607223	0.535944	1	1.13895	0.8387	1.807821303	1.395446	1.824108	1.7339	1.664774	1.240937	1.869892	1.488462	1.68879	1.733626	1.120648	1.235988	1.365028	1.32292
X8	0.580892	0.674117	0.463775	0.623115	0.616974	0.739248	0.878001	1	1.048748	0.969385883	1.070335	1.546531	1.40149	1.227185	2.149721	1.744014	1.339284	1.119277	1.331353	1.210669	1.375789	1.244897	1.307434
X9	0.420795	0.487032	0.528173	0.50856	0.599961	0.71111	1.192322	0.953518	1	1.696365957	1.358598	0.852164	1.417876	1.657627	1.388332	1.716601	1.594522	1.724515	1.79248	1.722918	1.580586	0.839331	0.629574
X10	0.409573	0.410136	0.683123	0.608953	0.581914	0.556689	0.553152	1.031581	0.589495	1	1.226363	1.776286	1.598236	1.593322	2.170774	1.851447	1.906402	2.174854	0.693149	1.13895	1.869194	1.422692	0.576507
X11	1.221055	0.655941	0.491346	0.72673	0.672092	0.543376	0.716617	0.934287	0.736053	0.815419457	1	1.815293	1.332641	1.452536	1.91911	2.20145	1.302354	0.885462	1.490976	0.749489	0.943026	0.862329	0.787243
X12	0.367517	0.59793	0.631803	0.79284	0.536089	0.668972	0.548213	0.646609	1.173483	0.562972376	0.550875	1	1.248393	1.317741	1.328624	1.811534	1.366349	1.418826	1.309394	1.772491	1.586578	1.364303	0.831238
X13	0.32542	0.502492	0.411247	0.639998	0.590546	0.666389	0.576734	0.713526	0.705281	0.625689879	0.75039	0.80103	1	1.174416	2.146325	1.781127	2.498647	1.517446	1.254512	1.608145	1.467976	1.265729	1.621462
X14	0.940742	0.51188	0.64868	0.612762	0.610937	0.722042	0.600682	0.814873	0.603272	0.62761953	0.688451	0.758875	0.851487	1	1.565528	1.616697	1.713796	1.793682	1.517153	1.277913	1.68104	1.513292	0.832992
X15	0.576348	0.501168	0.661684	0.569006	0.65448	0.553763	0.805843	0.465177	0.720289	0.460665263	0.521075	0.752658	0.465913	0.638762	1	2.323741	1.423233	1.415215	1.543231	1.363147	1.209591	1.027763	0.893539
X16	0.662599	0.540229	2.803153	0.577212	0.517167	0.520877	0.53479	0.57339	0.582547	0.540118141	0.454246	0.552018	0.561442	0.618545	0.430341	1	1.470432	1.068268	1.27038	1.391874	0.92577	1.319354	1.495567
X17	0.449468	0.871387	0.732008	0.564409	0.847433	0.506496	0.671835	0.746668	0.627147	0.524548464	0.767841	0.731878	0.400217	0.5835	0.702626	0.680072	1	1.121288	2.167491	1.481584	1.268777	1.610113	2.404239
X18	0.753058	0.502077	0.826929	0.615804	0.736885	0.544427	0.59214	0.893434	0.579873	0.459800919	1.129354	0.704808	0.659002	0.557513	0.706606	0.936095	0.891832	1	1.125945	0.750686	1.733626	1.284318	1.391654
X19	0.683689	0.601417	0.632266	0.594571	0.568006	0.458308	0.576826	0.751116	0.557886	1.44269159	0.670702	0.763712	0.797123	0.659129	0.647991	0.787166	0.461363	0.888143	1	0.821378	1.156795	1.079735	0.961287
X20	0.568308	0.616727	0.633101	0.627395	0.607298	0.540882	0.892341	0.825989	0.580411	0.878001294	1.334243	0.564178	0.621835	0.782526	0.733597	0.718456	0.674953	1.332114	1.217467	1	1.173161	1.050939	1.218402
X21	0.35304	0.530406	0.663701	0.99693	0.773976	0.479983	0.80907	0.726856	0.632677	0.534989885	1.060416	0.630287	0.68121	0.59487	0.826726	1.080181	0.788161	0.576826	0.864457	0.852398	1	1.850774	1.476516
X22	0.611904	0.97965	1.04901	0.882111	0.854586	0.640781	0.732586	0.80328	1.191424	0.702892626	1.15965	0.732975	0.790058	0.660811	0.972987	0.757947	0.621074	0.778623	0.926154	0.95153	0.540315	1	1.815616
X23	0.415932	0.717721	0.710364	1.196206	1.719864	1.02035	0.755904	0.764857	1.588376	1.73458417	1.270256	1.203025	0.616727	1.200492	1.119145	0.668643	0.415932	0.71857	1.040273	0.820747	0.67727	0.550777	1
Sum	13.1463	16.80344	19.08135	19.55665	23.20019	20.91232	23.05626	23.72363	25.11805	26.88418061	25.49122	27.60748	28.42869	26.59566	31.38227	32.84799	30.6215	30.56859	32.60941	30.08453	32.02859	28.12407	28.16893

5-3-1-2-1-B. Normalized Pairwise Comparisons [Synthesization]:

The following three-step procedure provides a good approximation of the synthesization result based on (Anderson et al., 2019).

1. Sum the values in each column ***j*** of the pairwise comparison matrix.
2. **Normalized Pairwise Comparison Matrix** by dividing each element into the pairwise comparison matrix by its column ***j*** total to yield its normalized score. The sum of each column is 1. This is done through the following formulas:

$$X_{ij} = \frac{c_{ij}}{\sum_{i=1}^{n} c_{ij}}$$

Where:

C_{ij} : Values of in each column ***j*** of the Pairwise Comparison Matrix

X_{ij} : Normalized scores for each element in the Normalized Pairwise Comparison Matrix

5-3-1-2-1-C. Estimating priorities (Averaging the Raw Values)

To identify the relative priorities (Weights) of each *Alternative* (Driver) in terms of the criteria by averaging the elements in each row ***i*** of the normalized pairwise comparison matrix to determine the priority of each alternative (corresponding rating) based on the following equation:

$$\textit{Relative Peririties for the Criteria (The Average or Normalized Weight)} = \frac{\sum_{j=1}^{n} X_{ij}}{n}$$

Table (7) shows the Normalized pairwise comparison matrix between the *Alternatives* (drivers) in terms of Value Creation Criterion [**C1]**. Also, the Normalized pairwise comparison matrices between the *Alternatives* (drivers) in terms of other criteria, including [Cost of Measurement Criterion **C2**], [Cost of Errors Criterion **C3**] and [Cost of Behavioral Effects Criterion **C4**] are also shown in tables (8), (9) and (10) as follows.

Table 7: The Normalized Pairwise Comparison Matrix Between the Alternatives (Drivers) in Terms of Value-Creation Criterion **[C1]**

																								Weights	
	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	Priorities	Eigen value
X1	0.099243	0.169927	0.201623	0.134631	0.171505	0.146549	0.080974	0.077273	0.076496	0.081422107	0.04998	0.1372	0.123083	0.072827	0.072544	0.042207	0.060547	0.065505	0.069221	0.047855	0.040268	0.047463	0.059876	0.092531	0.93237
X2	0.049065	0.084011	0.162513	0.137146	0.0829	0.111696	0.100806	0.093776	0.106544	0.070327661	0.077222	0.06009	0.071049	0.05832	0.079309	0.076591	0.064186	0.071636	0.048125	0.041123	0.042734	0.0501	0.060568	0.078254	0.931475
X3	0.033056	0.034716	0.067156	0.182171	0.162919	0.124852	0.114196	0.059026	0.069197	0.070327661	0.095167	0.072487	0.056392	0.055686	0.065746	0.051916	0.058964	0.063125	0.061061	0.053147	0.063975	0.044809	0.044887	0.07413	1.10384
X4	0.048127	0.039993	0.024068	0.065288	0.131099	0.068652	0.124141	0.134923	0.151065	0.137580006	0.126563	0.083879	0.094489	0.09273	0.064932	0.073571	0.060749	0.040635	0.034946	0.061765	0.045683	0.064001	0.040415	0.078665	1.204893
X5	0.030268	0.053007	0.021561	0.026049	0.052306	0.115782	0.080944	0.144236	0.094114	0.093304374	0.123988	0.094622	0.056481	0.049023	0.03797	0.043498	0.062959	0.062631	0.053982	0.053887	0.053638	0.043614	0.055005	0.065342	1.249228
X6	0.030589	0.033974	0.024296	0.042957	0.020406	0.04517	0.120212	0.117643	0.075366	0.062292217	0.059612	0.041812	0.048145	0.047082	0.051412	0.04437	0.060744	0.078976	0.038936	0.039394	0.04413	0.030029	0.045187	0.052293	1.157686
X7	0.056953	0.038727	0.027327	0.024439	0.030028	0.017461	0.046469	0.035132	0.085598	0.100691716	0.098411	0.094136	0.07375	0.094935	0.058676	0.072053	0.030535	0.054804	0.049982	0.070092	0.044778	0.05182	0.047306	0.0567	1.22017
X8	0.046357	0.032335	0.041065	0.017466	0.013089	0.013859	0.047742	0.036094	0.026982	0.055886573	0.062112	0.075192	0.081043	0.081494	0.032545	0.040669	0.038472	0.04102	0.060323	0.043959	0.053885	0.045633	0.044527	0.044859	1.242824
X9	0.047085	0.028617	0.035222	0.015685	0.02017	0.021752	0.019702	0.048549	0.036292	0.073576458	0.031987	0.051911	0.06938	0.068827	0.075924	0.069023	0.056013	0.043129	0.052686	0.030553	0.027999	0.021525	0.048653	0.043229	1.191123
X10	0.044728	0.043836	0.035041	0.017414	0.020572	0.02661	0.016935	0.0237	0.018101	0.036696383	0.048732	0.062223	0.055997	0.084474	0.07778	0.074268	0.104997	0.037674	0.026435	0.038375	0.05008	0.063793	0.052536	0.04613	1.257082
X11	0.067032	0.036725	0.023822	0.017414	0.014241	0.02558	0.01594	0.019617	0.038302	0.025420292	0.033758	0.058647	0.0526	0.048897	0.073055	0.078139	0.046447	0.05805	0.049777	0.035683	0.029935	0.034523	0.059714	0.041014	1.214944
X12	0.021394	0.041351	0.027402	0.023022	0.01635	0.031952	0.0146	0.014198	0.020678	0.017443087	0.017025	0.029577	0.06217	0.066003	0.043037	0.06165	0.064375	0.070941	0.062939	0.069864	0.053408	0.047668	0.032854	0.039561	1.337556
X13	0.020997	0.030791	0.031012	0.017993	0.024116	0.024432	0.016408	0.011598	0.013622	0.017065231	0.016713	0.012389	0.026041	0.051613	0.055319	0.060365	0.044159	0.054142	0.03656	0.036319	0.056022	0.033995	0.044168	0.031993	1.228571
X14	0.036256	0.038326	0.032086	0.018732	0.028388	0.025525	0.013023	0.011784	0.014029	0.011557767	0.018368	0.011923	0.013424	0.026606	0.089832	0.055424	0.039729	0.061062	0.031256	0.060439	0.064649	0.054715	0.059876	0.035522	1.335129
X15	0.03741	0.028967	0.027932	0.027496	0.03767	0.024026	0.021657	0.030328	0.013072	0.012901708	0.012636	0.018793	0.012873	0.008099	0.027346	0.053021	0.063737	0.047337	0.049217	0.057716	0.040201	0.038361	0.06729	0.03296	1.205312
X16	0.061829	0.028842	0.034014	0.023335	0.03162	0.026769	0.016959	0.023338	0.013826	0.012992649	0.01136	0.012615	0.011343	0.012623	0.013562	0.026295	0.051303	0.04767	0.067375	0.054074	0.044274	0.05755	0.043822	0.031626	1.202714
X17	0.039896	0.031858	0.027722	0.026159	0.020222	0.0181	0.037042	0.022836	0.015771	0.008506879	0.01769	0.011183	0.014353	0.0163	0.010443	0.012475	0.02434	0.028596	0.064907	0.079349	0.081018	0.062359	0.028485	0.030418	1.249698
X18	0.037421	0.028967	0.026277	0.039685	0.020628	0.014127	0.020943	0.021734	0.020785	0.024059232	0.014364	0.010298	0.01188	0.010762	0.014269	0.013625	0.021024	0.0247	0.054849	0.043869	0.047688	0.056214	0.054442	0.027505	1.113556
X19	0.031097	0.037863	0.023855	0.040521	0.021016	0.025162	0.020165	0.012978	0.014941	0.030109501	0.014709	0.010193	0.015449	0.018463	0.012051	0.008465	0.008134	0.009767	0.02169	0.031165	0.02167	0.02574	0.027088	0.020969	0.966786
X20	0.036731	0.036183	0.02238	0.018722	0.017192	0.020309	0.011742	0.014543	0.021039	0.016936785	0.016756	0.007498	0.012699	0.007797	0.008392	0.008613	0.005433	0.009972	0.012326	0.017712	0.034638	0.040171	0.026339	0.01844	1.041136
X21	0.044031	0.035122	0.018754	0.025533	0.017422	0.018287	0.01854	0.011967	0.023158	0.013091184	0.020147	0.009894	0.008304	0.007352	0.012153	0.010611	0.005367	0.009253	0.017882	0.009135	0.017866	0.043802	0.012554	0.017836	0.998332
X22	0.041604	0.033365	0.02982	0.020297	0.023862	0.02993	0.017843	0.015738	0.033548	0.011445677	0.019456	0.012346	0.015242	0.009675	0.014184	0.009091	0.007766	0.008743	0.016766	0.008773	0.008115	0.019897	0.02098	0.01863	0.936308
X23	0.038832	0.032497	0.035052	0.037847	0.022279	0.02342	0.023014	0.018992	0.017476	0.016364852	0.013245	0.021092	0.013813	0.01041	0.009521	0.014058	0.02002	0.010629	0.018759	0.015755	0.033343	0.02222	0.023429	0.021394	0.913166
sum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**26.2339**

Table 8: The Normalized Pairwise Comparison Matrix Between *Alternatives* (Drivers) in Terms of Cost of Measurement Criterion [**C2**]

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	Priorities	Eigen value
X1	0.095843	0.238728	0.096391	0.164892	0.17838	0.160858	0.084368	0.089735	0.079848	0.067414121	0.062101	0.08307	0.093213	0.05837	0.064053	0.052646	0.061784	0.056581	0.048155	0.064728	0.082685	0.062409	0.051467	0.091205	0.95161
X2	0.033029	0.082269	0.158277	0.12673	0.082484	0.157243	0.136069	0.126619	0.096833	0.084199726	0.082634	0.066093	0.078233	0.082292	0.070639	0.06633	0.0642	0.058923	0.06992	0.063653	0.064497	0.063791	0.072609	0.086416	1.050401
X3	0.057044	0.02982	0.057371	0.171804	0.108666	0.086163	0.072872	0.058488	0.07393	0.076174488	0.083397	0.095272	0.066421	0.040505	0.066253	0.052179	0.07497	0.057795	0.044647	0.009385	0.047713	0.059685	0.04263	0.06666	1.161918
X4	0.0317	0.035404	0.018212	0.054537	0.159711	0.124336	0.113251	0.10457	0.10077	0.145710285	0.088399	0.078213	0.069081	0.060588	0.05195	0.072478	0.054523	0.048452	0.03299	0.034583	0.050737	0.063551	0.033193	0.070736	1.297032
X5	0.026059	0.048374	0.025606	0.016562	0.0485	0.067991	0.09533	0.111786	0.074935	0.105266506	0.105416	0.061806	0.060703	0.046528	0.03181	0.045998	0.074851	0.072651	0.061516	0.056486	0.045427	0.049013	0.064942	0.060763	1.252847
X6	0.027329	0.023998	0.030541	0.020119	0.032719	0.045868	0.060092	0.079237	0.101205	0.094714869	0.085314	0.105774	0.100486	0.086393	0.047203	0.059541	0.05982	0.075106	0.065459	0.060613	0.057438	0.038629	0.030242	0.060341	1.315548
X7	0.045471	0.024201	0.031513	0.019275	0.020364	0.030552	0.040027	0.055801	0.062932	0.064823534	0.04566	0.064959	0.048862	0.03539	0.0617	0.06299	0.045599	0.0453	0.044237	0.041968	0.05071	0.048421	0.0228	0.044068	1.100941
X8	0.040462	0.024614	0.03716	0.019758	0.016436	0.021929	0.027175	0.037883	0.036502	0.068202284	0.040416	0.056657	0.049989	0.077579	0.057925	0.045044	0.030653	0.049045	0.050046	0.048963	0.032643	0.067151	0.074015	0.043924	1.159451
X9	0.038168	0.027016	0.024676	0.017209	0.02058	0.014411	0.020225	0.033001	0.031798	0.040357168	0.028389	0.037369	0.045576	0.050022	0.076375	0.072243	0.036731	0.049256	0.045855	0.046023	0.023471	0.029416	0.019358	0.035979	1.131503
X10	0.049406	0.033954	0.026173	0.013007	0.016011	0.016829	0.021458	0.019303	0.027381	0.034751152	0.068902	0.085553	0.051464	0.119199	0.058351	0.092461	0.052032	0.057283	0.043702	0.051317	0.060092	0.052737	0.031839	0.047096	1.355231
X11	0.058307	0.037613	0.02599	0.023308	0.017382	0.020312	0.033119	0.035413	0.042317	0.019054662	0.03778	0.043199	0.062959	0.066867	0.064166	0.050132	0.053495	0.044594	0.056174	0.039319	0.031143	0.021828	0.056934	0.040931	1.083396
X12	0.037604	0.04057	0.019627	0.022726	0.025576	0.014133	0.020083	0.021793	0.027734	0.013238896	0.028504	0.032593	0.029554	0.055592	0.079704	0.06738	0.057119	0.056521	0.064982	0.063054	0.067405	0.066115	0.026363	0.040781	1.251245
X13	0.031537	0.032255	0.026493	0.024215	0.024506	0.014	0.025126	0.023244	0.021399	0.02071127	0.018406	0.033826	0.030672	0.042242	0.040525	0.036508	0.071229	0.059937	0.041162	0.061573	0.036056	0.017276	0.029359	0.033142	1.080514
X14	0.054042	0.032904	0.046617	0.029625	0.034308	0.017474	0.037225	0.016072	0.020922	0.009595282	0.018596	0.019296	0.023898	0.032912	0.0626	0.030776	0.054539	0.070103	0.084484	0.076444	0.038033	0.043772	0.056086	0.039579	1.202562
X15	0.040636	0.031629	0.023517	0.028511	0.041408	0.026389	0.017618	0.017761	0.011307	0.016174013	0.01599	0.011105	0.020555	0.014278	0.027158	0.044741	0.046618	0.038326	0.054162	0.045357	0.022296	0.039303	0.047126	0.029651	1.091795
X16	0.045471	0.030979	0.027462	0.018794	0.026336	0.019241	0.015872	0.021006	0.010994	0.00938757	0.018823	0.012082	0.020984	0.026711	0.015161	0.024977	0.038731	0.021284	0.023953	0.038897	0.047137	0.050453	0.073436	0.027747	1.110883
X17	0.04193	0.034637	0.020684	0.027036	0.017514	0.020725	0.023727	0.033405	0.023399	0.01805236	0.019089	0.015423	0.011639	0.016311	0.015746	0.017431	0.027029	0.025936	0.050242	0.052875	0.05076	0.039777	0.052877	0.028532	1.055614
X18	0.042709	0.035203	0.025028	0.02838	0.016832	0.015398	0.022278	0.019475	0.016277	0.015295969	0.021361	0.014539	0.012903	0.011837	0.017866	0.029588	0.026276	0.025213	0.026332	0.031933	0.040429	0.040714	0.051231	0.025526	1.012404
X19	0.048927	0.028924	0.031588	0.040638	0.019381	0.017225	0.022243	0.018608	0.017046	0.019547445	0.016533	0.01233	0.018318	0.009577	0.012326	0.025634	0.013225	0.023538	0.024582	0.0369	0.039967	0.035741	0.036294	0.024743	1.006536
X20	0.038064	0.033225	0.157146	0.04054	0.022072	0.019453	0.024518	0.01989	0.017761	0.017408239	0.024701	0.013288	0.012806	0.011068	0.015392	0.016507	0.013141	0.020297	0.017126	0.025707	0.037992	0.03366	0.046556	0.029492	1.147246
X21	0.029797	0.032789	0.030909	0.027631	0.027445	0.020527	0.020291	0.029833	0.034826	0.014865753	0.031184	0.01243	0.021868	0.022245	0.031311	0.013621	0.013688	0.016031	0.015811	0.017394	0.025706	0.031313	0.024517	0.02374	0.923543
X22	0.035808	0.030071	0.022413	0.02001	0.023073	0.027686	0.019275	0.013154	0.025205	0.015364586	0.040357	0.011494	0.041398	0.017532	0.016111	0.011543	0.015844	0.01444	0.016037	0.017808	0.019142	0.023317	0.028925	0.022	0.943536
X23	0.050656	0.030821	0.036608	0.044694	0.020315	0.041256	0.047756	0.013923	0.044681	0.02968982	0.018051	0.03363	0.028418	0.015963	0.015676	0.009252	0.013905	0.013387	0.018424	0.01502	0.028521	0.021927	0.027202	0.026947	0.990625
sum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**25.67638**

Table 9: The Normalized Pairwise Comparison Matrix Between *Alternatives* (Drivers) in Terms of Cost of Errors Criterion [**C3**]

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	Priorities	Eigen value
X1	0.087306	0.134851	0.136806	0.130432	0.162055	0.090645	0.076906	0.072612	0.106779	0.097910757	0.051184	0.105493	0.07642	0.055541	0.057854	0.052182	0.075775	0.062829	0.048124	0.055126	0.054211	0.053087	0.070361	0.083239	0.953414
X2	0.042942	0.066328	0.111692	0.182412	0.115658	0.108653	0.145749	0.102488	0.078574	0.095710497	0.083906	0.078703	0.080216	0.050353	0.015824	0.053301	0.029933	0.058501	0.046915	0.048577	0.048655	0.041806	0.045963	0.075342	1.135891
X3	0.038522	0.035846	0.060362	0.09882	0.092696	0.086317	0.081836	0.095921	0.06997	0.057010493	0.07101	0.033376	0.042731	0.05276	0.054713	0.05034	0.057766	0.062947	0.053345	0.046919	0.052909	0.074329	0.037449	0.061213	1.014092
X4	0.03741	0.020322	0.034139	0.055889	0.111306	0.097335	0.114958	0.108558	0.073202	0.10127246	0.116899	0.072518	0.080336	0.082653	0.06401	0.08017	0.0952	0.044648	0.043163	0.052962	0.037471	0.039509	0.026842	0.069164	1.237525
X5	0.025424	0.027064	0.030731	0.023696	0.047192	0.077471	0.073017	0.106235	0.100657	0.055748935	0.08361	0.079151	0.063203	0.042519	0.047664	0.057064	0.067224	0.056012	0.041938	0.052028	0.047225	0.045587	0.035508	0.055912	1.184767
X6	0.043715	0.027707	0.03174	0.026061	0.027648	0.045387	0.056836	0.109918	0.075442	0.062278317	0.042004	0.054471	0.05488	0.06924	0.065708	0.076116	0.031176	0.063444	0.060957	0.061402	0.066706	0.019734	0.024846	0.052062	1.147053
X7	0.049489	0.019839	0.032154	0.021194	0.028175	0.034812	0.043594	0.07281	0.070028	0.070674724	0.060209	0.046315	0.051686	0.063602	0.106906	0.06375	0.040022	0.038868	0.037046	0.067198	0.051358	0.038032	0.042799	0.050024	1.147518
X8	0.046931	0.025261	0.024563	0.020095	0.017339	0.016117	0.02337	0.039033	0.064917	0.081122836	0.069053	0.108679	0.063733	0.057103	0.050904	0.047422	0.05741	0.049217	0.075146	0.068357	0.057664	0.062575	0.051867	0.051212	1.312037
X9	0.030911	0.031914	0.032615	0.028864	0.017725	0.022745	0.023535	0.022732	0.037806	0.042766462	0.052021	0.064466	0.075695	0.070455	0.070628	0.055603	0.059088	0.05739	0.056351	0.023139	0.038047	0.047313	0.040242	0.043567	1.152399
X10	0.028504	0.022153	0.033845	0.017641	0.027059	0.023296	0.019717	0.01538	0.028258	0.031965877	0.065344	0.04043	0.044061	0.067387	0.05546	0.052147	0.048051	0.059796	0.01925	0.021961	0.046289	0.034946	0.044059	0.036826	1.152046
X11	0.063244	0.02931	0.031518	0.017726	0.020927	0.040064	0.026845	0.020958	0.026946	0.018137769	0.037077	0.06277	0.066416	0.062376	0.061068	0.051551	0.038132	0.042632	0.044888	0.058487	0.047437	0.030539	0.050701	0.041293	1.113719
X12	0.027714	0.028222	0.060563	0.025809	0.019966	0.027903	0.03152	0.012027	0.019639	0.026477097	0.01978	0.033488	0.062557	0.083892	0.071654	0.053121	0.060764	0.049537	0.044036	0.051637	0.035619	0.043864	0.027805	0.039895	1.191346
X13	0.037611	0.027221	0.046505	0.022903	0.024581	0.027227	0.027767	0.020162	0.016442	0.023883883	0.018378	0.017623	0.032921	0.038641	0.039003	0.050218	0.054043	0.056164	0.045788	0.051151	0.059226	0.043032	0.042382	0.035777	1.086757
X14	0.055912	0.046854	0.040694	0.024051	0.039479	0.023316	0.024379	0.024313	0.019086	0.016872526	0.021143	0.014198	0.030304	0.035569	0.062647	0.051357	0.060198	0.05589	0.067905	0.054452	0.049383	0.044698	0.048412	0.039614	1.113708
X15	0.045005	0.125005	0.032902	0.026039	0.029528	0.0206	0.012161	0.022868	0.015964	0.017189389	0.018107	0.013938	0.025173	0.016933	0.029823	0.038842	0.05141	0.051018	0.082179	0.047286	0.030494	0.041366	0.053969	0.036861	1.235984
X16	0.049017	0.036457	0.03513	0.020424	0.024229	0.017469	0.020034	0.024114	0.01992	0.017959026	0.021071	0.018469	0.019206	0.020291	0.022494	0.029297	0.028071	0.045172	0.049743	0.044069	0.038398	0.050301	0.048291	0.030418	1.038282
X17	0.033657	0.064731	0.030525	0.017149	0.020507	0.042527	0.031818	0.019861	0.01869	0.019433202	0.028404	0.016099	0.017795	0.01726	0.016946	0.030488	0.029212	0.026248	0.044383	0.044337	0.047596	0.054377	0.047795	0.031297	1.07139
X18	0.039253	0.032027	0.027088	0.03536	0.0238	0.020208	0.031682	0.022403	0.018608	0.015100658	0.024567	0.019096	0.016558	0.017977	0.016513	0.018321	0.031437	0.028248	0.039663	0.042806	0.040938	0.037986	0.055372	0.028479	1.008175
X19	0.047005	0.036632	0.029318	0.033549	0.029157	0.019292	0.03049	0.013458	0.017383	0.043026486	0.021401	0.019704	0.018629	0.013572	0.009403	0.01526	0.017054	0.018453	0.02591	0.040042	0.029247	0.046188	0.049458	0.027114	1.046477
X20	0.042042	0.036246	0.034152	0.028013	0.024078	0.019622	0.017221	0.015158	0.043372	0.038639914	0.016828	0.017216	0.017085	0.01734	0.016742	0.017648	0.01749	0.017518	0.017177	0.026546	0.049106	0.054777	0.062046	0.02809	1.058163
X21	0.04437	0.037558	0.031432	0.041092	0.027532	0.018746	0.023386	0.018649	0.027376	0.019025637	0.021534	0.025902	0.015314	0.019844	0.026945	0.021021	0.016909	0.01901	0.024407	0.014893	0.027551	0.034751	0.037733	0.025869	0.938948
X22	0.046708	0.045061	0.023064	0.040176	0.029401	0.065322	0.032554	0.017716	0.022694	0.025978761	0.034482	0.021683	0.021728	0.022601	0.020476	0.016542	0.015257	0.02112	0.015932	0.013764	0.022517	0.028401	0.026033	0.027357	0.963236
X23	0.037308	0.04339	0.048464	0.062604	0.039962	0.054924	0.030625	0.022627	0.028247	0.021814294	0.021988	0.036212	0.023355	0.022091	0.016615	0.018241	0.018377	0.015339	0.015752	0.012864	0.021954	0.032802	0.030067	0.029375	0.976973
sum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**25.2799**

Table 10: The Normalized Pairwise Comparison Matrix Between *Alternatives* (Drivers) in Terms of Cost of Behavioral Effects Criterion [**C4**]

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	Priorities	Eigen value
X1	0.076067	0.190361	0.118776	0.09773	0.15729	0.095565	0.057486	0.072564	0.094611	0.090818062	0.032127	0.098559	0.108093	0.039969	0.055288	0.045945	0.072657	0.043441	0.044854	0.058489	0.088438	0.058108	0.085351	0.081852	1.076046
X2	0.02378	0.059512	0.047748	0.095319	0.088188	0.116374	0.117003	0.062529	0.081744	0.090693308	0.059806	0.060579	0.070003	0.073455	0.063582	0.056352	0.037477	0.065156	0.05099	0.053897	0.058865	0.036295	0.049462	0.066035	1.109617
X3	0.033563	0.065319	0.052407	0.098353	0.072805	0.079766	0.069724	0.090889	0.075377	0.054450802	0.07984	0.057331	0.085534	0.057964	0.048158	0.01086	0.044613	0.03956	0.048502	0.052503	0.047042	0.033896	0.049975	0.058627	1.11869
X4	0.039799	0.031925	0.027246	0.051133	0.091147	0.083781	0.064012	0.067647	0.078284	0.061082878	0.05398	0.045686	0.054962	0.061362	0.056001	0.052742	0.05786	0.053123	0.051577	0.05298	0.031318	0.040309	0.029677	0.05381	1.052349
X5	0.020845	0.029087	0.031027	0.024181	0.043103	0.07892	0.071427	0.068321	0.066358	0.063921085	0.058369	0.067567	0.059565	0.061545	0.048688	0.058865	0.038536	0.044394	0.053989	0.054734	0.04034	0.041607	0.020641	0.049827	1.156005
X6	0.038062	0.024454	0.031417	0.029185	0.026117	0.047819	0.080927	0.05702	0.055986	0.066817551	0.072195	0.054146	0.052786	0.052075	0.057543	0.058446	0.064476	0.060088	0.066911	0.061455	0.065048	0.05549	0.034792	0.05275	1.103129
X7	0.057391	0.022061	0.0326	0.034646	0.026173	0.025628	0.043372	0.048009	0.03339	0.067244798	0.054742	0.066073	0.060991	0.062596	0.039543	0.056926	0.048608	0.055246	0.053163	0.03725	0.03859	0.048536	0.046964	0.046076	1.062336
X8	0.044187	0.040118	0.024305	0.031862	0.026593	0.03535	0.038081	0.042152	0.041753	0.036057855	0.041988	0.056019	0.049298	0.046142	0.068501	0.053093	0.043737	0.036615	0.040827	0.040242	0.042955	0.044264	0.046414	0.042198	1.001091
X9	0.032009	0.028984	0.02768	0.026004	0.02586	0.034004	0.051714	0.040193	0.039812	0.063099039	0.053297	0.030867	0.049875	0.062327	0.044239	0.052259	0.052072	0.056415	0.054968	0.057269	0.049349	0.029844	0.02235	0.042804	1.075151
X10	0.031155	0.024408	0.035801	0.031138	0.025082	0.02662	0.023991	0.043483	0.023469	0.037196596	0.048109	0.064341	0.056219	0.059909	0.069172	0.056364	0.062257	0.071147	0.021256	0.037858	0.05836	0.050586	0.020466	0.042539	1.143617
X11	0.092882	0.039036	0.02575	0.03716	0.028969	0.025984	0.031081	0.039382	0.029304	0.030330828	0.039229	0.065754	0.046877	0.054616	0.061153	0.067019	0.042531	0.028966	0.045722	0.024913	0.029443	0.030662	0.027947	0.041074	1.047036
X12	0.027956	0.035584	0.033111	0.040541	0.023107	0.031989	0.023777	0.027256	0.046719	0.020940656	0.02161	0.036222	0.043913	0.049547	0.042337	0.055149	0.044621	0.046414	0.040154	0.058917	0.049536	0.04851	0.029509	0.038149	1.05319
X13	0.024754	0.029904	0.021552	0.032725	0.025454	0.031866	0.025014	0.030077	0.028079	0.023273534	0.029437	0.029015	0.035176	0.044158	0.068393	0.054223	0.081598	0.049641	0.038471	0.053454	0.045833	0.045005	0.057562	0.039333	1.118193
X14	0.071559	0.030463	0.033995	0.031333	0.026333	0.034527	0.026053	0.034349	0.024017	0.02334531	0.027007	0.027488	0.029952	0.0376	0.049886	0.049218	0.055967	0.058677	0.046525	0.042477	0.052486	0.053808	0.029571	0.038984	1.036811
X15	0.043841	0.029825	0.034677	0.029095	0.02821	0.02648	0.034951	0.019608	0.028676	0.01713518	0.020441	0.027263	0.016389	0.024018	0.031865	0.070742	0.046478	0.046296	0.047325	0.045311	0.037766	0.036544	0.031721	0.033681	1.05698
X16	0.050402	0.03215	0.146905	0.029515	0.022292	0.024908	0.023195	0.02417	0.023192	0.020090556	0.01782	0.019995	0.019749	0.023257	0.013713	0.030443	0.04802	0.034947	0.038957	0.046265	0.028905	0.046912	0.053093	0.035604	1.169524
X17	0.03419	0.051858	0.038362	0.02886	0.036527	0.02422	0.029139	0.031474	0.024968	0.019511417	0.030122	0.02651	0.014078	0.02194	0.022389	0.020704	0.032657	0.036681	0.066468	0.049247	0.039614	0.05725	0.085351	0.035744	1.094545
X18	0.057283	0.029879	0.043337	0.031488	0.031762	0.026034	0.025682	0.03766	0.023086	0.017103029	0.044304	0.02553	0.023181	0.020963	0.022516	0.028498	0.029124	0.032713	0.034528	0.024953	0.054127	0.045666	0.049404	0.032992	1.008526
X19	0.052006	0.035791	0.033135	0.030402	0.024483	0.021916	0.025018	0.031661	0.022211	0.053663216	0.026311	0.027663	0.028039	0.024783	0.020648	0.023964	0.015067	0.029054	0.030666	0.027302	0.036118	0.038392	0.034126	0.030105	0.981714
X20	0.04323	0.036702	0.033179	0.032081	0.026176	0.025864	0.038703	0.034817	0.023107	0.032658659	0.052341	0.020436	0.021873	0.029423	0.023376	0.021872	0.022042	0.043578	0.037335	0.03324	0.036629	0.037368	0.043253	0.032578	0.980081
X21	0.026855	0.031565	0.034783	0.050977	0.033361	0.022952	0.035091	0.030638	0.025188	0.019899803	0.041599	0.02283	0.023962	0.022367	0.026344	0.032884	0.025739	0.01887	0.026509	0.028333	0.031222	0.065807	0.052416	0.031748	1.01683
X22	0.046546	0.058301	0.054976	0.045105	0.036835	0.030641	0.031774	0.03386	0.047433	0.026145213	0.045492	0.02655	0.027791	0.024847	0.031004	0.023074	0.020282	0.025471	0.028401	0.031629	0.01687	0.035557	0.064455	0.03535	0.994172
X23	0.031639	0.042713	0.037228	0.061166	0.074131	0.048792	0.032785	0.03224	0.063236	0.064520626	0.049831	0.043576	0.021694	0.045139	0.035662	0.020356	0.013583	0.023507	0.031901	0.027281	0.021146	0.019584	0.0355	0.03814	1.074351
sum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**24.52998**

5-3-1-2-2. Pairwise Comparison Matrices Between Criteria in Terms of the Overall Goal

Now, the researchers evaluated the Alternatives (Drivers) with respect to their strength in meeting the Criteria. Similarly, the same procedures were applied to estimate the relative priorities of each Criterion [C1, C2, …, C*i*] in terms of the Overall Goal.

5-3-1-2-2-A. Pairwise Comparison Matrix Between the Criteria in Terms of the Overall Goal:

Table 11 shows the pairwise comparison matrix between criteria in terms of the overall goal:

Table 11: The Pairwise Comparison Matrix Between Criteria in Terms of the Overall Goal

	C1	C2	C3	C4
C1	**1**	2.4250172	2.6692776	2.8320926
C2	0.4123682	**1**	2.5667028	2.439548
C3	0.3746332	0.3896049	**1**	2.5179455
C4	0.3530958	0.409912	0.3971492	**1**
Sum	2.1400972	4.2245341	6.6331296	8.7895862

5-3-1-2-2-B. Normalized Pairwise Comparisons [Synthesization]:

Also, the researchers applied the three-step procedure used above that provides a good approximation of the synthesization result. The normalized pairwise comparison matrix between the *criteria* in terms of the overall goal is shown in table 12 as follows.

Table 12: the Normalized Pairwise Comparison Matrix Between Criteria in Terms of the Overall Goal

	C1	C2	C3	C4	Priorities (Weights)	Eigen Value
C1	0.4672	0.57403	0.4024	0.322	0.4414816	0.944813532
C2	0.1926	0.23671	0.3869	0.27754	0.2734752	1.155305507
C3	0.1750	0.09222	0.15075	0.28646	0.1761266	1.168270259
C4	0.1649	0.09703	0.05987	0.1137	0.1089166	0.957331855
Sum	1	1	1	1	1	4.225721152

5-3-1-3. Step Three: Consistency Analysis (Confirming Reliability)

To evaluate and check the consistency of judgements, this step involves calculating the consistency ratio and checking its value. This is being done to ensure that the original preference ratings and weights of each alternative in terms of criteria were consistent. The researchers conducted three procedures to arrive at the CR and it will be also repeated to make sure that the original preference ratings and weights of each criterion in terms of the overall goal were consistent.

5-3-1-3-1. Consistency Analysis for the Pairwise Comparison Matrices Between Alternatives in Terms of Each Criterion

5-3-1-3-1-A. First, the researchers estimated the Eigen Values λ

For each Alternative by multiplying the relative priorities of each alternative in terms of criteria by the Alternative`s column total in the pairwise comparison matrix. And sum the values in the Eigen Values` column to get the total of all eigen values $\boldsymbol{\lambda max}$.

5-*3-1-3-1-B. Second, the Consistency Index (CI)*

Reflects the consistency of one's judgement**. CI** was estimated by using the following equation:

$$\boldsymbol{CI = \frac{\lambda max - n}{n - 1}}$$

Where:

- $\boldsymbol{\lambda max}$: Maximum eigen value (the sum the values in the Eigen Values` column)
- ***n:*** is the total number of alternatives (drivers) used in the study.

5-3-1-3-1-C. Third, The Random Consistency Index (RI)

RI is the consistency index of a randomly generated pairwise comparison matrix. The value of RI depends on the number ***n*** of items being compared. and is given in the following Random Consistency Indices table as follows.(Hayrapetyan, 2019)

Random Indices

Matrix Size	3	4	5	6	7	8	9	10
RI	0.52	0.89	1.13	1.25	1.35	1.43	1.47	1.5
Matrix Size	11	12	13	14	15	16	17	18
RI	1.53	1.54	1.56	1.57	1.59	1.6	1.61	1.61
Matrix Size	19	20	21	22	23	24	25	26
RI	1.62	1.63	1.63	1.64	1.65	1.65	1.66	1.66
Matrix Size	27	28	29	30	31	32	33	34
RI	1.66	1.67	1.67	1.67	1.67	1.68	1.68	1.68
Matrix Size	35	36	37	38	39	40	41	42
RI	1.68	1.69	1.69	1.69	1.69	1.69	1.70	1.70
Matrix Size	43	44	45	46	47	48	49	50
RI	1.70	1.70	1.70	1.70	1.70	1.70	1.71	1.71

Thus, for the best drivers` selection problem with *n* = 23, we have *RI* = 1.65

5-3-1-3-1-D. Calculating the Consistency Ratio (CR). The consistency Ratio was estimated using the following equation:

$$\boldsymbol{CR = \frac{CI}{RI}}$$

Where: A consistency ratio of 0.10 or less is considered acceptable. The following table 13 shows the ***CI, RI and CR*** of all Alternatives **[X1, X2, …, X*n*]** pairwise comparisons Matrices used in the study in terms of each Criteria.

Table 13: The Consistency Ratios of Alternatives (Drivers) pairwise comparisons Matrices used in the study in terms of each Criteria				
Consistence Analysis Elements	Alternatives` pairwise comparisons Matrices in terms of Value-Creation Criterion	Alternatives` pairwise comparisons Matrices in terms of Cost of Measurement Criterion	Alternatives` pairwise comparisons Matrices in terms of Cost of Errors Criterion	Alternative`s pairwise comparisons Matrices in terms of Cost of Behavioral Effects Criterion
CI	**0.146996**	**0.103632**	**0.121654**	**0.069545**
RI (Matrix 23)	1.65	1.65	1.65	1.65
CR	**0.089088**	**0.062807**	**0.073729**	**0.042148**

From table 7 above, the degrees of Consistency Ratios of Alternatives (Drivers) pairwise comparisons Matrices used in the study in terms of each Criteria are deemed acceptable, as they are less than 0.10 (10%).

5-3-1-3-2. Consistency Analysis for the Pairwise Comparison Matrices Between Criteria in Terms of the Overall Goal

The researchers applied the three steps conducted above to arrive at the CR. Table 14 shows the ***CI, RI and CR*** of all *Criteria* **[C1, C2, …, C*i*]** pairwise comparisons Matrices used in the study in terms of the Overall Goal and the results can be summarized as follows:

Table 14: The Consistency Ratios of Criteria pairwise comparisons Matrices used in the study in terms of the Overall Goal [Source: The Researchers]

Consistence Analysis Elements	Criteria Pairwise Comparisons Matrices in Terms of the Overall Goal
CI	**0.07524**
RI (Matrix 4)	0.89
CR	**0.08454**

From table 8 above, the degree of Consistency Ratios of Criteria pairwise comparisons Matrices used in the study in terms of the Overall Goal is deemed acceptable, as they are less than 0.10 (10%).

5-3-1-4. Step Four: Develop an Overall Priority Ranking (Identifying the Best Drivers Ranking for National Bank of Egypt)

The researchers estimated the relative priorities of each alternative in terms of the overall goal by multiplying the relative priorities (Weights) of each alternative in terms of the *Criteria* by the relative priorities (Weights) of each criterion in terms of the *Overall Goal*. So that, the results were summed for each row to determine the final overall priority weights for each driver and develop the overall priority ranking for the Drivers of the NBE`s selected branches as shown in table 15 below:

Table 15: The Overall Relative Priority Ranking (Weights) of Alternatives (Drivers) in Terms of the Overall Goal

	Value Creation	Cost of Measurement	Cost of Errors	Cost of Behavioral Effects		C1	C2	C3	C4	Weights (Sum)
X1	0.092531286	0.091205156	0.083238581	0.081851646	X1	0.04085086	0.024942352	0.014660524	0.008915003	**0.08936874**
X2	0.078253735	0.086415888	0.075341701	0.066035116	X2	0.034547584	0.023632606	0.013269674	0.00719232	**0.078642185**
X3	0.074129544	0.06666017	0.06121275	0.058627418	X3	0.03272683	0.018229906	0.010781191	0.006385499	**0.068123426**
X4	0.078664945	0.070736493	0.069164032	0.053810281	X4	0.034729126	0.01934468	0.012181623	0.005860833	**0.072116261**
X5	0.065342167	0.06076335	0.055911671	0.049827382	X5	0.028847364	0.016617272	0.00984753	0.005427029	**0.060739195**
X6	0.052292909	0.060340949	0.052061574	0.052750171	X6	0.023086357	0.016501756	0.009169426	0.005745369	**0.054502908**
X7	0.056700093	0.044067641	0.050024431	0.046075834	X7	0.025032048	0.012051409	0.008810631	0.005018423	**0.050912511**
X8	0.044858694	0.043923754	0.051212113	0.042198077	X8	0.019804288	0.012012059	0.009019813	0.004596071	**0.045432231**
X9	0.043228631	0.035979384	0.043567398	0.042803917	X9	0.019084645	0.009839471	0.007673376	0.004662057	**0.041259549**
X10	0.046130364	0.047095834	0.036826154	0.042538648	X10	0.020365707	0.012879545	0.006486064	0.004633165	**0.04436448**
X11	0.04101385	0.040930615	0.041293498	0.041074365	X11	0.01810686	0.01119351	0.007272882	0.00447368	**0.041046932**
X12	0.039560825	0.040781305	0.039895371	0.038148711	X12	0.017465376	0.011152677	0.007026634	0.004155028	**0.039799716**
X13	0.031992939	0.033141612	0.035777192	0.039333266	X13	0.014124294	0.00906341	0.006301313	0.004284046	**0.033773064**
X14	0.035522168	0.039579327	0.039613572	0.038984215	X14	0.015682383	0.010823966	0.006977002	0.004246028	**0.03772938**
X15	0.032960208	0.029650728	0.03686079	0.033680788	X15	0.014551325	0.00810874	0.006492164	0.003668397	**0.032820626**
X16	0.031625682	0.027746648	0.030418466	0.035604115	X16	0.013962157	0.007588021	0.0053575	0.003877879	**0.030785557**
X17	0.03041794	0.028532399	0.031297375	0.035744334	X17	0.013428961	0.007802905	0.005512299	0.003893151	**0.030637316**
X18	0.027504751	0.025526045	0.028478743	0.032992226	X18	0.012142841	0.006980741	0.005015863	0.003593401	**0.027732847**
X19	0.020969213	0.02474311	0.027114388	0.030105233	X19	0.009257522	0.006766628	0.004775564	0.00327896	**0.024078673**
X20	0.018440089	0.029492016	0.028089635	0.032577584	X20	0.00814096	0.008065336	0.004947331	0.00354824	**0.024701866**
X21	0.01783587	0.023740495	0.025868738	0.03174757	X21	0.007874209	0.006492438	0.004556172	0.003457837	**0.022380655**
X22	0.018629804	0.022000337	0.027356937	0.035349512	X22	0.008224716	0.006016548	0.004818283	0.003850149	**0.022909695**
X23	0.021394295	0.026946746	0.02937489	0.038139591	X23	0.009445187	0.007369268	0.005173698	0.004154035	**0.026142188**
Sum	1	1	1	1	Sum	0.4414816	0.273475245	0.176126554	0.108916602	1
						1				

5-3-2. Conclusion and Results

Our AHP analysis was conducted meticulously, ensuring consistency in decision matrices and eigenvalues, further reinforcing the robustness of our findings. Based on the application of AHP for analyzing the NBE drivers, we can conclude that. First, from the results of the pairwise comparison matrices between Drivers in terms of the criteria we can conclude that:

- According to the responses of respondents set in table4, the normalized pairwise comparison matrix between the alternatives in terms of value creation criterion, AHP determines that **X1(**Adopting Al-Ahly net and other digital banking services) with a priority weight of 0.09253**,** is the best driver in terms of value creation criterion.
- According to the responses of respondents set in **Appendix D**, the normalized pairwise comparison matrix between the alternatives in terms of cost of measurement criterion, AHP determines that **X1 (**Adopting Al-Ahly net and other NBE`s digital banking services) with a priority weight of 0.09121**,** is the best driver in terms of cost of measurement criterion.
- According to the responses of respondents set in in **Appendix D**, the normalized pairwise comparison matrix between the alternatives in terms of cost of errors criterion, AHP determines that **X1**(Adopting Al-Ahly net and other NBE`s digital banking services) with a priority weight of 0.083239, is the best driver in terms of cost of errors criterion.
- According to the responses of respondents set in in **Appendix D**, the normalized pairwise comparison matrix between the alternatives in terms of cost of behavioral effect criterion, AHP determines that **X1** (Adopting Al-Ahly net and other NBE`s digital banking services) with a priority weight of 0.081852, is the best driver in terms of cost of behavioral effect criterion.

From the pairwise comparison matrices between alternatives (Drivers) in terms of the criteria, the following can also be noted about the NBE drivers.

- Some drivers are among the best cost drivers, that best explain changes in cost/unit better than the others and at the same time they better contribute to creation of value for clients better than the others, they take the same ranking taken under each criterion. Ex. Adopting Al-Ahly net and other NBE`s digital banking services **X1** and No. of NBE`s ATMs **X2**.
- Some drivers are among the best cost drivers, that best explain changes in cost/unit better than the others but at the same time they did not contribute to the creation of value for clients better than the others. Ex. Types and No. of services provided by NBE **X10** are better cost drivers compared to Types and No. of advertising media and media channels **X7**, although driver **X7** contribute to clients` value creation better than the driver **X10**.

Second, from the results of the pairwise comparison matrices between criteria in terms of the overall goal we can conclude that. According to the responses of respondents set in table (5-9), the normalized pairwise comparison matrix between the criteria in terms of the overall goal, AHP determines that **Value creation Criterion (C1)** with a priority weight of 0.4414816, is the most important criterion in the drivers` analysis and selection process. **Cost of Measurement (C2)** with a priority weight of 0.273475245, ranks second in importance and is closely followed by **Cost of Errors (C3),** with a priority of 0.176126554. **Cost of Behavioral Effects (C4**) is the least important criterion, with a priority of 0.108916602.

To accomplish, based on the researchers` choice of decision criteria, on the respondents (NBE`s expert officials) judgments about the relative importance of each, and on their judgments about each alternative (Drivers) with respect to each of the criteria, table 16 shows the AHP overall priority ranking and weights of the NBE`s selected drivers from the most suitable and preferred drivers that could lead to the maximization of value creation to client at lower costs, to the least suitable and less preferred drivers as follows:

Table 16: The AHP overall priority ranking and weights of the NBE`s selected drivers.

Code NO.	The NBE`s Selected Drivers	AHP Overall Weights	AHP Overall Priority Ranking
X1	Adopting Al-Ahly net and other NBE`s digital banking services	0.08936874	1
X2	No. of NBE`s ATMs	0.078642185	2
X3	No. of NBE`s Branches Including NBE`s flagship digital branches	0.068123426	4
X4	No. of front office employees, tellers and other NBE`s staff using IT in their work and Types of staff skills & capabilities	0.072116261	3
X5	No. of NBE`s products and services that achieved its success in their first time issuing (No. of design changes)	0.060739195	5
X6	No. of training hours provided by NBE`s to its staff	0.054502908	6
X7	Types and No. of services provided by NBE	0.050912511	7
X8	No. of POS digital machines	0.045432231	8
X9	No. of new saving programs and other financial services	0.041259549	10
X10	Types and No. of advertising media and media channels	0.04436448	9
X11	No. of up-to-date certificates issued by the NBE	0.041046932	11
X12	No. of platforms and websites available for NBE`s clients	0.039799716	12
X13	No. current saving programs and other financial services	0.033773064	14
X14	Quality problems due to software failure	0.03772938	13
X15	Time of product development cycle	0.032820626	15
X16	Virtual wait line systems	0.030785557	16
X17	Percentage change in credit limits provided for NBE`s clients	0.030637316	17

X18	**No. of awareness sessions and conferences provided by NBE**	**0.027732847**	**18**
X19	**No. of NBE`s financial literacy workshops**	**0.024078673**	**21**
X20	**Data management and analytics**	**0.024701866**	**20**
X21	**Average resolution time for client Queries in the NBE branches**	**0.022380655**	**23**
X22	**Average Call handling time**	**0.022909695**	**22**
X23	**Staff salaries and benefits**	**0.026142188**	**19**

5-3-3. Utilizing Drivers` Analysis Results to Develop a Modified Value-Based BSC and a Customized Strategy Map for the National Bank of Egypt

Utilizing Drivers` Analysis Results to Develop a Modified Value-Based BSC and a Customized Strategy Map for the National Bank of Egypt. Based on the concept of customized strategy map, the researchers` effort was to develop a cause-effect relationship between the selected measures of the NBE`s Value-BSC. The cause-and-effect relationships between V-BSC measures is crucial and gives great analysis on how to utilize the relevant measures according to the best combination of relevant cost drivers and relevant value drivers. This ensures relating the bank's objectives to its SCM` goal of enhancing the unique value a firm seeks to offer to its clients at the lower cost and to support the NBE`s competitive position based on its distinctive strategy and CSFs that differentiate themselves from competitors and thus contributing to measuring the extent of progress towards achieving the strategic orientation of cost management

With the help of the data available about the NBE performance, the data on NBE` Web sites, the interviews, and the results of AHP, the researchers were able to identify the BSC's objectives and proposed measures for the four perspectives of the Value-BSC. Figure 15 below illustrates the proposed Customized Strategy Map for NBE. Also, table 17 below represents the proposed value-BSC for the NBE based on the results of the NBE`s drivers` analysis results.

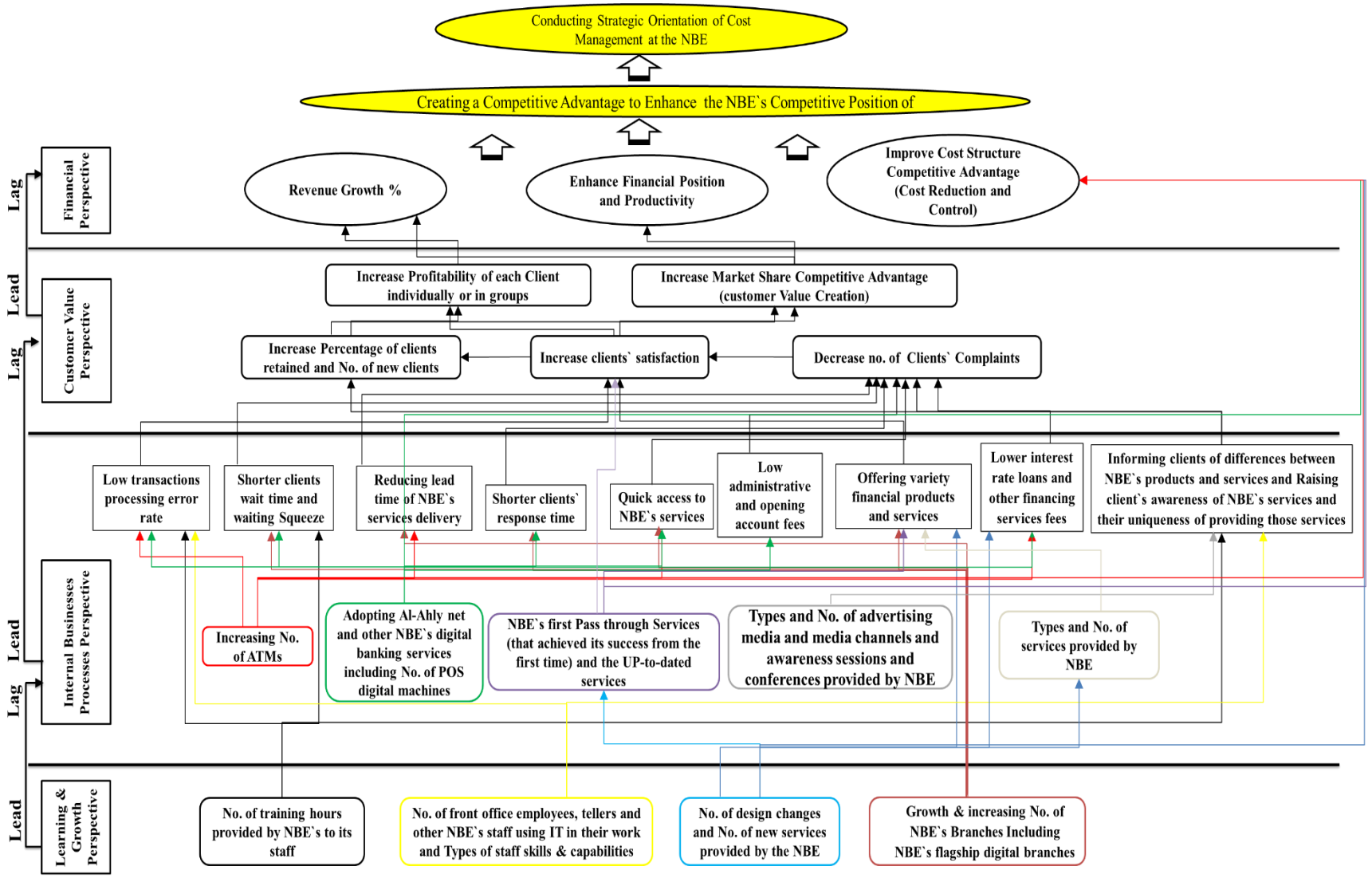

Figure 15: Customized Strategy Map for NBE Utilizing the Results of Drivers`s Analysis for Conducting Strategic Orientation of CM

Table 17: A Value-Balanced Scorecard for NBE`s Branches [Source: The Researchers]

Learning & Growth Perspective	• Enhancing Employee Skills, Capabilities and Morale • Increasing Employees` Satisfaction • Improving Use of Technology and Ability of Innovation and expansions	❖ **No. of training hours provided by NBE`s to its staff** ❖ **No. of front office employees, tellers and other NBE`s staff using IT in their work and Types of staff skills & capabilities** ❖ **No. of design changes and No. of new services provided by the NBE** ❖ **Growth & increasing No. of NBE`s Branches Including NBE`s flagship digital branches**
Business Processes Perspective	• Increase Innovations • Improve Operational Capabilities and Efficiency • Growth of banking services • Faster and secured delivery • Higher quality • Shorter time • Optimal NBE`s services mix • Lower costs and competitive prices • Financial literacy Suitable advertising and media channel	❖ **Increasing No. of ATMs** ❖ **Adopting Al-Ahly net and other NBE`s digital banking services including No. of POS digital machines** ❖ **NBE`s first Pass through Services (that achieved its success from the first time) and the UP-to-dated services** ❖ **Types and No. of advertising media and media channels and awareness sessions and conferences provided by NBE** ❖ **Types and No. of services provided by NBE** ❖ **Low transactions processing error rate** ❖ **Shorter clients wait time and waiting Squeeze** ❖ **Reducing lead time of NBE`s services delivery** ❖ **Shorter clients` response time** ❖ **Quick access to NBE`s services** ❖ **Low administrative and opening account fees** ❖ **Offering variety financial products and services** ❖ **Lower interest rate loans and other financing services fees** ❖ **informing clients of differences between NBE`s products and services and Raising client`s awareness of NBE`s services and their uniqueness of providing those services**
Client Perspective	• Attract New Clients • Increase Clients` Satisfaction • Market share growth	❖ **No. of Client Complaints** ❖ **Clients` satisfaction** ❖ **Percentage of Clients retained and No. of new clients** ❖ **Increase Market Share**
Financial Perspective	• Improve return • Survival and growth • Cost reduction and control • Good financial position	❖ **Revenue Growth %** ❖ **Enhance Financial Position and Productivity** ❖ **Improve Cost Structure**

6. Conclusion, Recommendations and Opportunities for Future Research

6-1. Conclusion

This study proposed a new framework for conducting the strategic orientation of cost management: based drivers analysis approach which takes into consideration value-creation, the CSFs, value drivers within the heart of the drivers` analysis. This improves the conduction of the strategic orientation of cost management to enhance the firms` competitive position and contribute to the existing literature in the following ways:

- First: This analysis considers the external environment. The scope of this analysis extends beyond the firm`s boundaries by studying and giving quantitative values of the effects of the drivers on the total value chain.
- It is related to the future. It represents one of the Ex-ante control approaches of cost and value through controlling their drivers and thus using it in building strategies and making strategic decisions that ensure the achievement of desired state in the future.
- It provides a better approach to study the trade-off between functionality (value creation/value drivers) and costs (cost drivers).
- The results of this analysis can be used in deriving measures for BSC that are not only best cost drivers-related but also best value drivers-related measures, to be merged with the four perspectives of BSC to attain all aspects of SCM. These measures should be tailored to each firm, resulting in developing a Modified Value-Based BSC and a Customized strategy Map. This indeed can enable the firm to identify areas of weaknesses within its performance in adopting SCM initiatives to improve its performance and succeed in creating and maximizing value for customers at the lowest possible cost green initiative. Eventually, this will be reflected in a better image, creating competitive advantages and an improved performance and value of the firm in the market and support the competitive position. Thus, the strategic orientation of cost management is conducted.

6-2. Recommendations

6-2-1. For All Business

For firms that seek to achieve competitive advantages to strengthen their competitive position by conducting strategic orientation in their cost management practices. Drivers` analysis provides an efficient initiative or input to SCM. This approach provides effective Ex-ante control on both sides of SCM, cost and value. In addition to focusing only on selecting the best cost drivers, this approach deals with value creation for customers to select best value drivers based on firm`s CSFs. The results of this analysis could be used to identify the best customer value creation paths and best cost roots that can be incurred to achieve that value and rely on that information in strategic planning and strategic decision-making to ensure achieving the desired results and maximizing the customer's value at lower cost and thus conducting the strategic orientation of cost management.

6-2-2. Recommendations for the National Bank of Egypt

- It is advised that to support its competitive position in the market, the NBE should pay more attention to strategic orientation in its strategic cost management practices and strive

to achieve effective ex-ante control over its cost and value simultaneously. Also, it should pay more attention to client value creation when utilizing its limited resources. And develop more convenient CSFs compared to its competitors. Accordingly, it is suggested that by applying drivers` analysis framework to select best value drivers and best cost drivers, it would be capable of succeeding in achieving these objectives.

- Emphasizing the importance of value creation, the researchers recommended that, NBE should place more emphasis on drivers with top priority that causes the maximum value for clients at lower costs such as (No. of NBE`s ATMs, Adopting Al-Ahly net and other NBE`s digital banking services, No. of NBE`s Branches Including NBE`s flagship digital branches and so on.). and not wasting its limited resources on drivers that lead to creating less value for clients, regardless of the cost generated.
- NBE should search for the best 20% of drivers that cause 80% of value creation based on value drivers for clients. Having the results of drivers` analysis, NBE's management will be able to identify the potential areas for modification, improvement, and areas of inefficiencies regarding clients` value creation.

6-3. Opportunities for Future Research

The following issues have been suggested by the researchers for future research:

- Future research should be carried out to enrich knowledge by using the current research idea in developing the Cost Estimation Concept, from merely using it to determine the best cost driver to developing it by adding another aspect regarding value and using the same cost estimation criteria to estimate value and search for the best value driver. From 'Cost Estimation' to 'Estimation of Drivers'
- A study can be conducted to integrate this analysis with VBM, to analysis and select best drivers of the value and cost of each stakeholder under VBM.
- Future studies can explore advanced decision-making techniques beyond AHP. Zero One Goal Programing, Machine learning algorithms, artificial intelligence can provide more accurate, efficient solutions to complex drivers` selection problems.
- A study can be conducted to use this analysis for Extended Enterprise concept, suppliers` selection and optimal customer mix by identifying their best drivers.
- Given the increasing emphasis on sustainability. A future study can be conducted to include economic, social, and environmental factors within the drivers` analysis.

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المستخلص

خلفية عن البحث: نظراً للضغوط التنافسية، يجب إجراء الكثير من التغييرات لمواكبة التطورات السريعة ومتطلبات البيئة الحديثة التي يجب أن ترتبط باستراتيجية الشركة لخلق المزايا التنافسية وتحقيق أهدافها طويلة الأجل. لذلك أصبح من الضروري أن تركز الشركات على إجراء التوجه الاستراتيجي في ممارسات إدارة التكاليف الخاصة بها وتحقيق رقابة قبلية أفضل على عملية خلق القيمة والتكلفة على مدار سلسلة القيمة الكلية, لتحسين الأداء بشكل مستمر نحو خلق أقصى قيمة للعميل بأقل تكلفة ممكنة. يعتبر مدخل تحليل المسببات أحد الأساليب أو المداخل القيمة والفعالة للإدارة الاستراتيجية للتكلفة (SCM) .كما أنه يعتبر من بين الأساليب المهمة للرقابة القبلية على كل من القيمة والتكلفة من خلال الرقابة على مسببات حدوث كل منهم. حيث يمثل هذا التحليل نهجا متميزا لدراسة المفاضلة بين عملية خلق القيمة متمثلة في مسببات القيمة والتكلفة متمثلة في مسببات التكلفة وذلك بغرض اختيار وتوفير معلومات عن أفضل المسببات.

هدف البحث: يتمثل الهدف الرئيسي للبحث في تقديم إطار مقترح لتحليل المسببات كأحد مداخل الرقابة القبلية بغرض تحقيق التوجه الاستراتيجي لإدارة التكلفة.

تصميم/منهجية البحث: تبنى البحث أحد مداخل حل المشكلات وهو المنهج البنائي؛ من أجل وضع إطار مقترح يخدم هدف البحث، وإستخدم دراسة الحالة كوسيلة بحثية على قطاع البنك الأهلي بالغربية. وإعتمد الباحث على المقابلات، والملاحظات، وتحليل الوثائق، وقائمة الإستقصاء في جمع البيانات اللازمة لدراسة الحالة, بالإضافة الى أستخدام منهج التحليل الدرجى (AHP) كأداة للمفاضلة بين المسببات الخاصة بالبنك لتحديد أفضل المسببات بالإعتماد على مجموعه من المعايير المقترحة والمستحدثة لتطبيق منهج تحليل المسببات.

نتائج البحث:تم إقتراح بعض التوصيات لتحسين إستغلال موارد البنك الأهلى بما يؤدي إلى تعظيم قيمة عملائه بأقل التكاليف الممكنة وتوجيه وتحسين الأداء الإستراتيجي للبنك الأهلي المصري نحو تحقيق مزايا تنافسية مستدامة وتعزيز مركزه التنافسي فى القطاع المصرفى فى مصر.

الاصالة/القيمة:يقدم هذا البحث رؤى جوهرية وجديدة حول أهمية تحليل المسببات وكيفية تطبيقه –بشكل أفضل وجديد– من خلال التعامل مع مجال خلق القيمة لتحقيق المزايا التنافسية. فبالإضافة إلى تحليل مسببات التكلفة، تناول البحث تحليل مسببات القيمة بناءً على عوامل النجاح الحاسمة (CSFs) لإختيار أفضل مسببات القيمة وأفضل مسببات التكلفة بإستخدام منهج التحليل الدرجى (AHP).

كلمات مفتاحية: الإدارة الإستراتيجية للتكلفة (SCM)؛ الرقابة القبلية؛ تحليل المسببات؛ سلسلة القيمة الكلية؛ عوامل النجاح الحاسمة (CSFs)؛ تحليل مسببات القيمة؛ تحليل مسببات التكلفة, منهج التحليل الهرمى (AHP).