



# **5th international conference on opportunities & challenges in MANAGEMENT, ECONOMICS & ACCOUNTING**

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## **A Contingency Theory Perspective On the Use of Forecasting Procedures and Methods for Capital Budgeting Decision-Making: Evidence from Libya**

**Ali Alsharif<sup>1</sup> , Collins Ntim<sup>2</sup>, Wayne Fiddler<sup>3</sup>**

Misurata University

### **Abstract:**

This paper highlights the role of cash flow forecasting process in capital budgeting decisions. To achieve this goal, we examine the influence of contingency variables on the use of forecasting procedures & methods, which in turn reflects on the extent of use of capital budgeting techniques (CBT). The descriptive results of this study reported that most manufacturing and oil companies operating in Libya depend on personal estimates for forecasting future cash flow, as well as use the payback period and accounting rate of return to evaluate the investment projects. Statistically, the findings of this research provided robust evidence that the use of forecasting procedures & methods is significantly associated with the extent of CBT usage. In addition, the results of this study proved that the contingency variables have a direct and significant impact on the use of forecasting procedures & methods. In this regard, we found that the influence of the combined contingent variables differs from public to private sector based on PLS multi-group analysis (PLS-MGA), whereas the PLS-MGA exposed opposite result in terms of manufacturing and oil companies. Moreover, the research findings revealed that there is a direct and significant relationship between the use of forecasting procedures & methods and the financial performance of firms (FPFs), but this relationship is consistently negative. On the other hand, the relationship between the extent of use of CBT and the FPFs is not statistically supported.

**Keywords:** forecasting process; contingency theory; capital budgeting techniques; financial performance.



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## **1. Introduction:**

The capital budgeting process has received considerable attention in recent years. Both the finance and accounting literature offer lots of useful contributions in capital budgeting research (Pike, 1986, 1996; Brounen, et al., 2004). Nevertheless, these contributions concentrate on the uses of capital budgeting techniques (CBT) in appraising the investment opportunities, whereas the forecasting process of future cash flow has received less attention in capital budgeting research (Batra and Verma, 2014; Turner & Guilding, 2012).

In previous years, financial analysts focused on the profit methodology as a basis to estimate future earnings, which caused several companies to manipulate earnings through fraudulent reports, as in high-profile cases such as the Enron accounting scandal. As a result, the necessity of cash flow forecasting process (CFFP) has become a vital factor in the majority of organizations, because cash flow information is a useful indicator in appraising the investment opportunities (Krishnan and Largay, 2000). In line with this orientation, the businesses should plan the investment projects based on the CFFP. According to Wilkes (1977), the problems related to the future cash flow generated by the investment opportunities represent a great challenge for organisations and researchers to bridge a gap between the theory and practice of capital budgeting (CB).

Discussing the factors affecting the criteria for selecting investment projects, it can be seen that the CFF is “a significant determinant of investment for all firms and has the highest impact on the large and new firms” (Devereux, 1990, p.138). Moreover, forecasting variables are perceived to be more important factors in improving firms’ performance (Danese and Kalchschmidt, 2011a).

Consequently, this study aims to ascertain the role of CFFP in capital budgeting decisions. In order to attain this aim it seeks to identify the forecasting processes used in estimating future



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cash flow. Besides, the researchers examine the influence of contingency variables on the use of forecasting procedures & methods.

Moreover, we examine the direct and indirect effect of the use of forecasting procedures & methods (FPMs) on the financial performance of firms (FPFs). These variables are formed and incorporated in the research framework as shown in figure 1.

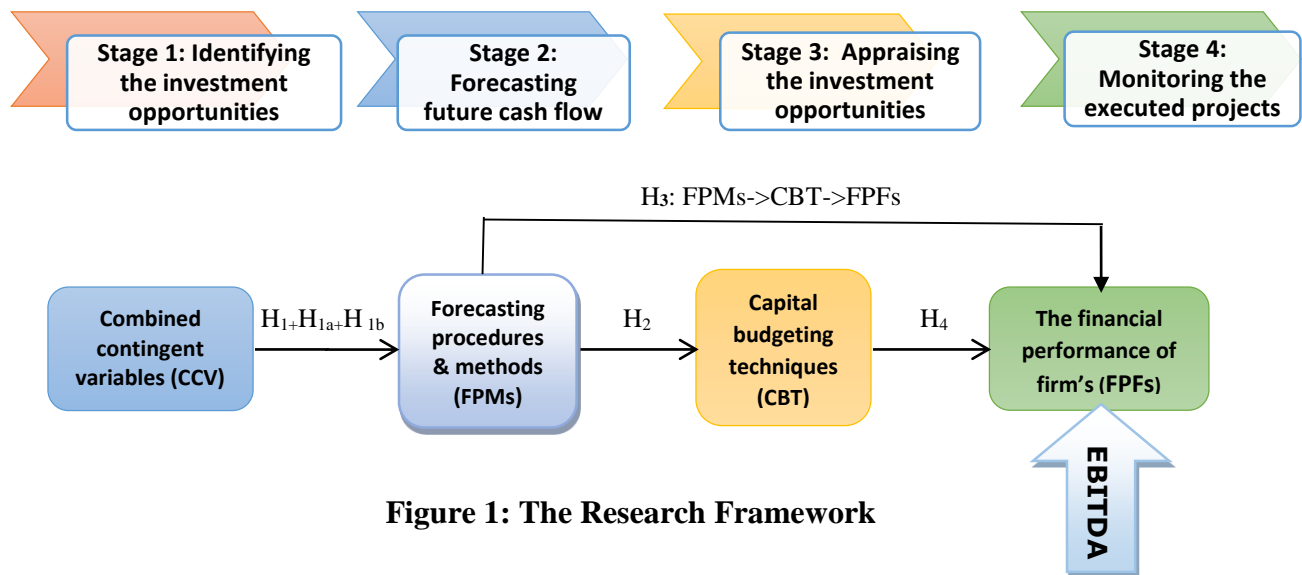


Figure 1: The Research Framework

Where:

**FPMs:** Forecasting procedures and methods.

**CCV:** Combined contingent variables:

- Average of annual sales (AAS).
- Average of investment expenditures (AIE)
- Number of Employees (NEM)
- Type of industry (IND).
- Strategic priorities (SP).
- Perceived environmental uncertainty (PEU).

**CBT:** Capital budgeting techniques.

**FPFs:** Financial performance of firms (AORR, EB..AAS & EB..AIE)

**EBITDA:** Earnings before interest, taxes, depreciation & amortization (control variable).



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Figure 1 illustrates the relationships among the research variables; this research can be divided into seven main sections. As explained in an introduction, this section demonstrated the main objectives, the importance of the study and the research framework.

In the second section, the theoretical approach is determined based on the contingency theory. Third, it offers a closer look into capital budgeting. Fourth, this section addresses the empirical literature and hypotheses development. Next, the research methodology is presented in terms of the survey design, measurement of research variables and multivariate analysis technique. Section six provides the empirical results and discussion. Finally, a conclusion of the study will be addressed in section seven.

## **2. Theoretical approach**

This paper employs the contingency and institutional theories for capital budgeting (CB). First, the contingency theory assumes that there is no optimal technique applied in all management accounting systems; this principle can be applied to the CB process, where there is no universal appraisal technique used in most manufacturing and oil firms. In other words, the application of certain appraisal techniques in CB is dependent on specific contingencies, such as firm size, environmental uncertainty, technology and the competitive strategy (Burkert et al., 2014 and Haka, 1987). According to Otley (1980, p.413), “A contingency theory must identify specific aspects of an accounting system which are associated with certain circumstances and demonstrate an appropriate matching”. The theoretical framework of this paper is based on the contingency theory to explain the differences in using the forecasting processes that may reflect on the extent of CBT usage.

According to Haka (1987), the analytical developments in financial and organizational theories contribute primarily to construct and test the contingency theory for CB. Apparently, most of the management accounting researchers have depended on the contingency theory as the major theory (Burkert et al. 2014; Chenhall, 2003; Franco-Santos et al., 2012).



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In literature, there are two main approaches related to contingency theory: congruence and contingency. A congruence approach considers that the organizational structure depends on the corporate context, without any consideration of the effect on performance (Gerdin and Greve, 2004).

It is applied according to the natural selection mechanism, whereby most companies could be categorized into a relatively small number of groups, each of which has similar structures and processes (Miller et al., 1984). In contrast, the contingency approach is used when “a conditional association of two or more independent variables with a dependent outcome is hypothesized” (Drazin and Van de Ven, 1985, p.514).

### **3. An overview of capital budgeting (CB)**

Capital budgeting (CB) is the process for planning and control of the investment expenditures; CB is one of the important developments in budgeting. Not only the capital budgeting is used for planning and control of investment expenditure, but also it plays an essential role in the optimal allocation of resources among the investment alternatives. In this respect, the philosophy of capital budgeting depends on the modern concept of management accounting, where the administrative functions of both accounting and management complement each other and each of them is a tool to achieve the goals of the corporation. In finance and accounting literature, CB is often used synonymously with “capital investment appraisal” (Drury, 2012; McLaney, 2009). In 1951, Joel Dean presented the first original contribution in capital budgeting which depends on the economic theory as a basis for evaluating the investment opportunities (Dean, 1951). According to Drury (2012), the capital budgeting comprises of the methods used in appraising the investment projects and the procedures employed for financing these projects.

However, investment decisions are extremely important in corporate management, and are the key contributors to a company’s success or failure. Investment expenditure decisions are associated with several factors which affect firms' performance (Pike, 1984). Additionally, the degree of risk and uncertainty associated with these decisions is relatively high, because these





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decisions are required to make long term forecasts. Therefore, most firms plan these decisions in the form of capital budgets (Pike and Dobbins, 1986). The CB decision is concerned only with decisions that have significant future consequences. Hence, the responsibility for making CB decision belongs to the top management.

As has been shown in Figure 1, most of the researchers determined four main stages of capital budgeting process: identifying the investment opportunities, forecasting future cash flow generated by these investments, evaluating the investment opportunities and monitoring the executed projects (Arnold, 2013; Burns & Walker, 2009; Hall and Millard, 2010; Pike et al., 2012). Apparently, prior research has often concentrated on the investment appraisal stage of capital budgeting (Burns and Walker, 2009). In line with this, figure 2 provides a survey of US research related to the CB stages.

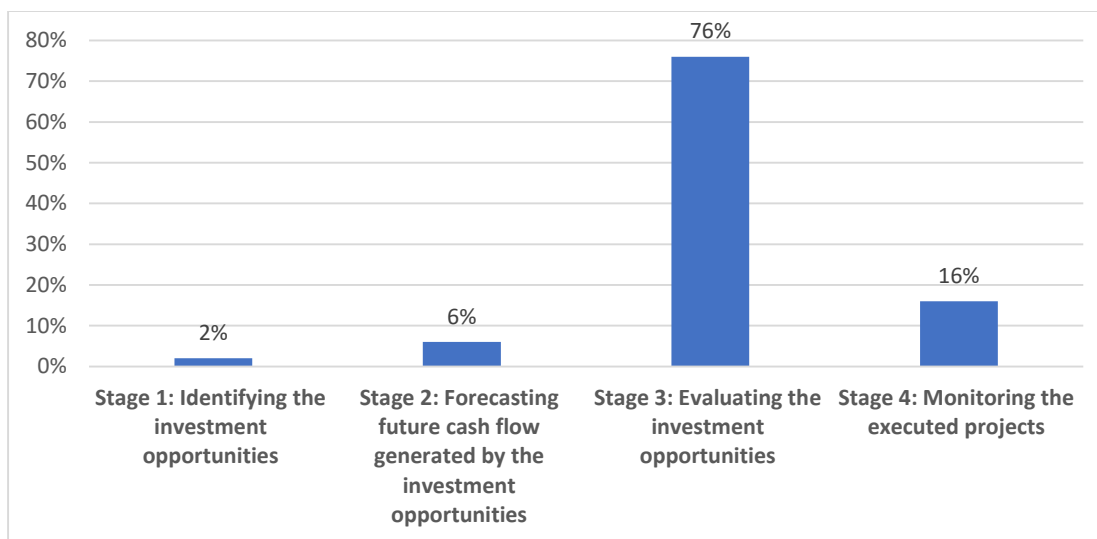


Figure 2: Survey of US studies related to the capital budgeting stages.  
Adapted from Burns and Walker (2009)

To confirm the research gap; the bar chart in figure 2 demonstrates the survey of studies related to the stages of capital budgeting in the USA. Where, we found that 76% of US research



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concentrates on appraisal stage that is related to the extent of CBT usage. While, the cash flow forecasting phase is perceived to be less attention (Turner and Guilding, 2012). This result consistent with prior research confirmed that the main problem in most organizations is how to forecast future cash flows (McIntosh, 1990; Pinches, 1982). Even though, most studies examine the forecasting process in short-term application, such as production and sales planning, whereas CFFP have received little attention in capital investment decisions. Therefore, this study emphasises the role of CFFP in CB decisions.

## **4. Empirical literature and hypotheses development.**

This section can be divided into three main subsections. First, the influence of combined contingent variables on the use of forecasting procedures and methods (FPMs) is investigated. Second, the relationship between the use of FPMs and the extent of use of CBT is addressed. Finally, the relationship between the FPMs, the extent of CBT usage and the financial performance of firms (FPFs) is also discussed.

### **4.1 The influence of combined contingent variables on the use of FPMs**

The CB processes can be analysed as the contingent perspectives (Scapens and Sale, 1981). In this regard, the contingency theory assumes that the adoption of the CB process or the use of sophisticated appraisal techniques does not necessarily reflect on the high financial performance in organizations; this orientation requires the fit between the corporate context and the CB process (Pike, 1986).



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Subsequently, the use of forecasting procedures and methods “may be affected by a number of contingent factors” (Smith and Mentzer, 2010, p. 149); for example, organizational characteristics (firm size, financial position & type of industry), technology, strategy, organization design, decentralization, information system, rewards structure and environmental uncertainty are some of the contingency variables (Baines and Langfield-Smith, 2003; Haka, 1987; Pike, 1986).

In terms of firm size, Verma et al., (2009) revealed that larger Indian companies prefer to use the NPV method more than smaller ones. Pike (1983) stated that sophisticated CBT are only applied

in the largest UK firms. In contrast, the payback period method is more popular among smaller US firms (Block, 1997). The sophistication in CB requires “a clearer understanding of the important relationships between size, organizational structure, commitment and bias in the design and operation of CB processes” (Pike, 1983, p.208). In this regard, the firm size is a vital variable in determining the sophistication of the CB process. The application of contingency theory is perceived as the main support to reduce any misfit between context and the CB process (Pike, 1986).

According to Schall and Sundem (1980), the use of sophisticated CBT is associated with high investment outlays. In respect of this, the payback and NPV techniques in Sudanese companies are commonly used with a high investment size (Eljelly and AbuIdris, 2001). In the USA, the investment projects exceeding \$40,000 require cash flow estimates (Pohlman et al., 1988). Similarly, 45.37% of Greek firms and 55.86% of Cypriot firms require detailed cash flow estimates (Lazaridis, 2002, 2006). Moreover, the use of multiple forecasting methods in large US firms is associated with high capital expenditures (Pohlman et al., 1988). In most cases, the





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investment projects with high capital expenditures and high capital intensity lead to the extensive usage of forecasting methods in large US firms (Ibid). Indeed, the CFFP is “a significant determinant of investment for all firms and has the highest impact on large and new firms” (Devereux, 1990, p. 138).

Kadapakkam et al., (1998) examined the effects of firm size and cash flow on investment in six OECD countries (Canada, France, Germany, Japan, UK and USA), where the market value of equity, total assets and overall sales were used to measure firm size. More simply, Aoun and Hwang (2008) measured the firm size by using the net value of total assets, dividing firms into three groups: small firms, with total assets of less than \$13 M; medium-sized firms with \$13-59.9M; and large firms with over \$60M. Kadapakkam et al., (1998) stated that the highest sensitivity of cash flow-investment is positively related to the large US firms, whereas the smallest sensitivity is associated with the small ones. Moreover, Zotteri and Kalchschmidt (2007) refer to the presence of a relationship between a firm size and its forecasting practice based on the number of employees and overall sales.

However, the most effective factor in CB decisions is environmental uncertainty. According to Haka (1987), environmental uncertainty and centralization in making CB decisions are mitigating factors in utilizing the discounted cash flow techniques (DCFT). Christy (1966), Sundem (1975) and Schall and Sundem (1980) stated that perceived environmental uncertainty is an obstructive variable in the successful use of DCFT.

Apparently, there are two environmental paradigms in the empirical literature: environmental predictability and diversity (Lawrence and Lorsch, 1967; Thompson, 1967; Waterhouse and Tiessen, 1978). The environmental predictability often arises when uncertain events are changed roughly with changes in competitor's actions, financial and technological developments and governmental policies (Miles & Snow, 1978). Environmental diversity is associated with a firm's consumer characteristics, production technologies, raw materials and product markets (Lawrence and Lorsch, 1967; Khandwalla, 1972; Thompson, 1967). Haka (1987) confirmed that financial



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and marketing factors, which are more predictable within a company, are perceived to be more correlated with the use of DCFT. Nevertheless, firms operating in heterogeneous environments have faced difficulty in predicting these factors. At this point, the use of DCFT is “not likely to lead to as a successful result as firms in homogeneous environments” (Haka, 1987, p. 35).

Accordingly, the procedures and methods used in forecasting future cash flow must take into account the uncertainty conditions in order to evaluate the investment opportunities.

The firm’s strategy is the most important contingent factor related to management accounting researches, particularly in the CB process, because the CB decisions are associated with the long-term strategy of the organization. The going concern principle should be considered the fit between the strategic decisions undertaken in organizations and the future benefits resulted from those decisions (Miles and Snow, 1978; Porter, 1980). Subsequently, CB decisions can be implemented in different activities, depending on the type of investment projects. In this regard,

Govindarajan (1988, p.828) recognized that “different business units within the same corporation often pursue different strategies”, using low cost and differentiation strategy in order to measure-organizational strategies including product selling price, percentage of sales spent on research and development, percentage of sales spent on marketing expenses, product quality, brand image and product features. Govindarajan (1988) depended on the contingency approach as a basis of theoretical argument.

Subsequently, Chenhall and Langfield-Smith (1998) used the same measurements mentioned above to measure strategic policies in Australian firms. Similarly, the use of differentiation and low cost strategy was found to be the basis of measuring strategy in the UK and Australian firms (Abdel-Kader and Luther, 2008; King et al., 2010). Haka (1987) determined US firm strategies in three aspects: focusing on the new production lines, selecting the investment projects with high return and risk and emphasising on research and development.



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Concerning the relationship between forecasting processes and firm's strategy (FST), Zotteri and Kalchschmidt (2007, p. 84) examined the "contingency variables such as firm size, type of sector, strategic priorities and demand characteristics (number of products) and their relationship with forecasting practices". It is indicated that forecasting processes in Italian companies are contingent upon their competitive strategies and it can be certain that this factor has a positive correlation with the forecasting horizon (Ibid). In this perspective, McHugh and Sparkes (1983) established that short-term forecast is considered to be more important in firms operating in highly competitive markets.

In general, the CB processes can be applied in different activities and industries. Pohlman et al. (1988: 72) illustrated the types of investment projects requiring cash flow estimates, including: "new equipment, replacement of equipment, facilities expansion, facilities modernization and acquisition of on-going concern". In addition, Sanders (1992) considers that the type of industry is to be more correlated with sophisticated forecasting techniques in manufacturing firms than service ones.

In the same way, Anuar (2005) used the type of industry as similar to the firm's major products. This study examines the relationship between the firm's major products and the use of sophisticated CBT in Malaysian manufacturing companies. According to Verbeeten (2006), the use of sophisticated CB is associated with firm size and type of industry. In terms of firm age, Verma et al. (2009) found that younger companies in India preferred to use the payback period (PB) method rather than DCFT.

Based on the previous discussion, we attempt to assess the influence of contingency variables on the use of forecasting procedures and methods (FPMs). This effect may reflect on the extent of CBT usage in manufacturing and oil companies. In support of the previous discussion, the researcher will test the combined contingent variables (CCV) in one construct. The combined contingent variables (CCV) are determined as:

- Average of annual sales (AAS)



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- Average of investment expenditures (AIE)
- Number of employees (NEM)
- Type of industry (IND)
- Strategic priorities (SP)
- Perceived environmental uncertainty (PEU)

Thus, the researchers adopt the following hypothesis:

*H1: The combined contingent variables (AAS, AIE, NEM, IND, SP & PEU) have a strong effect on the use of forecasting procedures and methods for capital budgeting decisions made by top management in manufacturing & oil firms.*

Furthermore, this study aims to investigate the significance of the contingency theory in explaining the differences between the public and private companies in terms of using the FPMs. In this regard, the researchers attempt to test the role of ownership in enhancing the relationship between contingency variables and the use of forecasting procedures and methods.

In a causality theory, the relationship between the independent and dependent variable is implemented by the mediating variable. On the other hand, the moderating effect indicates that the relationship between two variables depends on the levels of another variable (Hair et al., 2014; Lowry and Gaskin, 2014).

In empirical literature, Eljelly and AbuIdris (2001) surveyed the differences between the Sudanese public and private enterprises in terms of the applications of CBT and sought to determine the possible factors that may have an impact on the choice of CBT. They found that public sector managers were more active on CB than their private sector peers, and that the NPV method was perceived to be more important in the public sector, while PB was the most widely used in both sectors (Ibid). Similarly, Al-Ani (2015) examined the influence of specific contingencies on the use of the payback period method in the two groups working in the Omani



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energy and oil sectors. Al-Ani's study revealed that the use of the PB methods by both managers and investors is not significantly different according to the specific contingent variables of "risk, liquidity, profitability, market obstacles, management compensation and firm size". In line with this, the discounted cash flow methods are more commonly used in foreign-owned firms' production than Malaysian-owned firms (Sri-International, 1994, cited in Anuar, 2005).

In terms of multi-group analysis, the influence of the contingency variables on the use of forecasting procedures and methods may differ from the public to the private companies.

Therefore, we formulated the following hypothesis:

*H1<sub>a</sub>: The effect of combined contingency variables (AAS, AIE, NEM, IND, SP & PEU) on the use of forecasting procedures and methods is significantly stronger in public firms than in private ones.*

This research also offers another case for multi-group analysis to investigate the significance of contingency theory in explaining the differences between manufacturing and oil companies in terms of the use of FPMs. In this case, industry type (IND) has been excluded from the combined contingent variables, which are AAS, AIE, NEM, SP and PEU.

Therefore, the influence of the contingency variables on the use of forecasting procedures and methods may differ between manufacturing and oil companies. In doing so, we formulated the following hypothesis:

*H1<sub>b</sub>: The effect of combined contingency variables (AAS, AIE, NEM, SP & PEU) on the use of forecasting procedures and methods (FPMs) is significantly stronger in manufacturing firms than in oil ones.*





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## **4.2      The relationships between the forecasting procedures and methods (FPMs) and the extent of CBT\* usage**

This study focuses on the cash flow forecasting process (CFFP) and its impact on the use of investment appraisal techniques in CB decisions. The forecasting process in capital investment decision depends on the forecasting procedures and methods used to estimate the components of cash flow. This philosophy depends on the hierarchy of the role of CFF in CB decisions. In general, the CFFP in CB decisions starts with identifying the procedures and methods used in forecasting and ends by exposing the components of cash flow. Therefore, this study concentrates on the first stage of the forecasting process, FPMs, because this phase is authorized to generate the components of cash flow in CB decisions.

The forecasting procedures and methods (FPMs) are segmented into three categories. Firstly, forecasting procedures include personal estimates, standard procedures for estimating cash flow (CF) and the official forms/worksheets used to collect CF data. Secondly, the forecasting methods consist of judgmental and quantitative methods. Thirdly, the software package used in forecasting is determined in terms of software developed by firms and the commercial software package (e.g. Excel). In terms of the procedures used in forecasting, Pohlman et al. (1988) and Lazaridis (2002, 2006) surveyed the standard procedures and official forms used by US, Greek & Cypriot firms for forecasting future cash flow.

In addition, these studies surveyed seven methods used in estimating future cash flow, where the majority of respondents rely on the judgmental methods used in the cash flow forecasting process in CB decisions (Ibid). These methods have been developed from subjective estimates for the use of computer and sophisticated mathematical models. In line with this, the mathematical, sensitivity analysis and computer simulation techniques have received more attention in the US firms than in Greek & Cypriot ones (Ibid).

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\* We used the capital budgeting techniques as the same meaning of investment appraisal techniques used in CB decisions.



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This has led to a variety of methods being used by businesses. Theoretically, the differences between these techniques depend on the methodology used in forecasting, whether subjective or objective (Turner, 1974). Quantitative methods are commonly used in business when there is sufficient information regarding the past, which can be applied in planning. Accordingly, the application of forecasting methods varies from one activity to another and relies on the firm's objectives. However, since the mid-1970s, there has been marked progression towards judgmental techniques in forecasting (Lawrence et al., 2006). Where, judgmental methods are commonly used in Australian, US and UK firms (Dalrymple, 1987; Lim and O'Connor, 1996; Sanders and Manrodt, 1994; Sparkes and McHugh, 1984).

Empirical literature pays little attention to the software used in forecasting. Sanders (1997, p. 33) surveyed the applications of computer software in forecasting and revealed that “69.9% and 14.2% of US manufacturing companies used software developed by their own company and commercial software packages”, respectively. Certainly, the software used by US manufacturing firms is commercially available, particularly Microsoft Excel; even so, 6.5% of US manufacturing firms did not use a computer for forecasting (Ibid).

Consequently, the researchers aim to identify and recognize the forecasting practices in manufacturing and oil firms, but it is not responsible for evaluating the procedures and methods used in forecasting. It aims to examine the role of forecasting procedures and methods in the selection and use of CBT. In doing so, we suggest the following hypothesis:

*H2: The use of forecasting procedures and methods (FPMs) is positively associated with the extent of CBT usage in manufacturing and oil firms.*

## **4.3      The relationship between the forecasting procedures and methods (FPMs) and the financial performance of firms (FPFs)**

This part of the study investigates the relationship between forecasting processes, in particular the forecasting procedures and methods, and firms' financial performance. Danese and



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Kalchschmidt (2008, 2011a, 2011b) examined the impact of the forecasting process on the organisational performance. According to Liu et al. (2010), the forecast accuracy of CF strengthens confidence in the use of discounted cash flow methods in CB decisions.

Several studies investigated the relationship between forecasting practices and performance. According to Kalchschmidt et al. (2010), the forecasting process consists of forecasting techniques and information collected from different sources. Danese and Kalchschmidt (2011a, 2011b) examined the influence of forecasting process variables on operational performance through forecast errors. In terms of forecasting methods, the use of sophisticated methods did not increase forecast accuracy (Dalrymple, 1987; Lawrence et al., 2000; Mentzer and Cox, 1984; Sanders, 1997; Sanders and Manrodt, 1994). In fact, the reason for utilizing qualitative or quantitative methods in forecasting is to limit personal judgments or bias (Makridakis et al., 1998). There is also consistency between the aims of forecasting and the methods used in forecasting, whereby the purpose of the forecasting process is to minimize production and delivery costs instead of focusing on forecast accuracy (Danese and Kalchschmidt, 2008). According to this review, forecasting accuracy can be improved by combining forecasting methods, which can then improve firms' performance (Armstrong, 1989; Clemen, 1989; Sanders and Ritzman, 2001).

Danese and Kalchschmidt (2011b) examined the impact of forecasting variables on firms' performance. The findings indicated that there is no statistical significance between forecasting process variables and forecast accuracy. Conversely, there is a direct relationship between forecasting variables and cost and delivery performance (Danese and Kalchschmidt, 2011a). In this regard, interaction effects among forecasting process variables occur when the effect of forecasting variable(s) depends on the levels of contingent variables.

Similarly, Zotteri and Kalchschmidt (2007) examined the relationship between forecasting practices and performance; the factors in this study are divided into three main categories: forecasting practices, and structural and contingent factors, where forecasting practices consist of



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forecasting aims and methods. In this case, forecasting practices were considered as the mediating variable affecting Italian firms' performance (Ibid). Results showed that Italian firms' performance is affected by forecasting practices, depending on their aims and utilization. These findings suggest that there must be homogeneous or matching between the forecasting process and the organizational structure to improve firms' performance (Ibid).

Eventually, the effectiveness of forecasting methods with particular attention to forecasting accuracy is contingent upon contextual factors. Consequently, future research should address the potential contingent factors relating to the forecasting process (Danese and Kalchschmidt, 2011b, p.467).

In finance and accounting literature, some studies examine the relationship between CFF errors in CB decisions and their impact on organizational performance. Soares et al. (2007) investigated the CFF errors in CB; they examined the differences between investment projects both before and after implementation to evaluate the CFFP in Portuguese enterprises. In this regard, the forecasting errors are associated with operational cash flow, investment expenditures, and working capital (Ibid). The findings of Soares et al.'s study (2007) revealed that issues affecting cash flow in CB are significantly correlated with forecast accuracy, whereby forecasting errors in CB are perceived to be more volatile than sales and operating activities.

However, the mediating role of CBT between forecasting processes and firms' financial performance is more appropriate in this case. As discussed in the first section, the gap in the existing literature is such that existing research has not addressed the relationship between the forecasting process and the extent to which CBT are used. This relationship represents the second and third stages of the CB process, respectively. That is the reason for which CBT mediate the relationship between the use of FPMs and financial performance of firms (FPFs).

Having examined the forecasting process variables and hypotheses in the previous section, this section provides further discussion regarding the influence of the use of forecasting procedures and methods (FPMs) on the financial performance of firms. The purpose of this study is to



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investigate the mediating role of CBT between the use of forecasting procedures and methods (FPMs), and the financial performance of firms. To test this effect, the following hypothesis was formulated:

*H3: The relationship between the use of forecasting procedures & methods (FPMs) and the financial performance is mediated by the extent of CBT usage in manufacturing and oil firms.*

## **4.4 The direct relationship between the extent of use of CBT and the financial performance of firms**

In empirical literature, there is a tendency towards the examination of the relationship between CBT and corporate performance (Haka, 1987; Pike, 1984, 1986). Klammer (1973) studied the relationship between the use of CBT and firm performance, where he found that the use of sophisticated CBT may not lead to better performance of firms. This does not mean that the use of sophisticated CBT is not beneficial. Klammer's study (1973) suggested a number of factors which enhance the fit between the CBT usage and FPFs, including creating effective investment opportunities, and real estimates of cash flow resulting from those opportunities, in addition to management ability to effectively use of quantitative techniques, particularly operations research models.

Haka et al. (1985, p. 652) examined the influence of the use of financial appraisal techniques on corporate performance "switching from naive to sophisticated CB selection procedures". They found that the adoption of sophisticated CBT is a strategy used to improve performance, and several policies affect the latter, particularly contextual factors. Therefore, sophisticated techniques should be combined with other policies to improve economic growth within companies. Thus, DCF methods need to be developed and extended beyond the direct application of the net present value (NPV) and IRR. In terms of sophistication, Pike (1984, p.92) stated that sophistication in CBT "refers to the use of theoretical superior methods". Therefore, sophistication does not mean effectiveness of CB. Pike (1986) used a scoring method to measure





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the degree of sophistication in the CB process for each firm. No evidence was found that sophisticated CB processes leads to higher levels of performance (Farragher et al., 2001; Pike, 1984, 1986). This finding corroborates the pioneering work of Klammer (1973, p.359), who observed that “the more sophisticated techniques generally have negative signs”.

Jakovicka et al. (2003) and Alzoubi and Alazawi (2010) also asserted that the application of sophisticated CBT is not necessarily linked to optimum performance. This was reiterated by (Irungu, 2014). Nevertheless, such outcomes are not static, and the use of CBT is related to the structural and contextual factors, such as firm size and uncertainty (Klammer, 1973). In line with this, senior finance executives have confidence in the use of sophisticated CBT, which play an important role in improving the effective implementation of large investment projects (Pike, 1988). Therefore, a closer fit between the CB process, structural characteristics and contextual factors may lead to better performance (Klammer, 1973; Pike 1984, 1986).

Ultimately, this study attempts to investigate the direct relationship between the extent of use of CBT and the financial performance of firms. Therefore, the following hypothesis is posited:

*H4: There is a positive relationship between the extent of use of capital budgeting techniques (CBT) and the financial performance of manufacturing and oil firms.*

## **5. Research methodology:**

### **5.1 Survey design**

This study adopted the questionnaire survey as a data collection tool, where the questionnaires were distributed to the financial directors (CFOs) and other officials who participated in preparing the capital budgeting process in manufacturing and oil firms operating in Libya. To achieve the research objectives, different types of questions were constructed to measure the main research variables.



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The population of the study involved 257 Libyan manufacturing and oil companies excluding foreign companies, and we determined 100 companies as the sample size, due to a convenience sampling method used in this research. The usable questionnaires are 69 including two questionnaires collected from foreign oil companies and excluding two unusable questionnaires; while, 31 questionnaires could not be distributed / completed for critical reasons. Accordingly, the response rate for this study is 31%.

However, the respondents participated to complete the questionnaire survey are determined in terms of their position and qualifications (see Tables 1 and 2).

*Table 1: Respondent's job title*

<i>Job title</i>	<i>Frequency</i>	<i>Percentage</i>
Financial director	37	53.65
General manager or executives	23	33.30
Production/operational manager	1	1.45
Planning manager	1	1.45
Accounting manager	4	5.80
Vice president or president	1	1.45
Chartered accountant	1	1.45
Others	1	1.45
Total	69	100

*Table 2: Respondent's qualification*

<i>Qualification</i>	<i>Frequency</i>	<i>Percentage</i>
PhD	1	1.45
MA/MSc	20	29.0
BA/BSc	36	52.2
Professional qualification	1	1.45
High School or College	11	15.9
Total	69	100.0

From Tables 1 and 2, it can be observed that more 50% of respondents are financial directors and held a Bachelor degree, as well as studying accountancy as the main area of their study.



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## **5.2 Measuring the research variables**

The main research variables are the forecasting process variables (FPMs & FMPF), key factors related to forecasting process (DS, QUA & POS), contingency variables, CBT and the financial performance of firms. Different types of measurement were used in this research to measure independent, mediated and independent variables. Categorical, ordinal, numerical and dichotomous scales are the main measurements used to measure the items of the research variables. In this regard, most of the indicators used to measure the research variables are selected based on previous research that have employed the same measures, where the majority of measures is consistent with the Likert scale system.

However, accurate measurements leads to effective analysis of relationships among the research variables. Hence, inferential statistical analysis can be reliable and valid. In this regard, the statistical criteria used to assess the formative indicators are different from reflective indicators (Hair et al., 2014).

The assessment of reflective indicators can be divided into four elements. Firstly, internal consistency can be assessed by its composite reliability (CR). Secondly, the indicators' outer loadings will be used to assess the reliability of reflective indicators. Thirdly, the convergent validity of reflective constructs can be evaluated by using the average variance extracted (AVE).

Finally, the Heterotrait-monotrait (HTMT) ratio is employed to assess discriminant validity (Henseler et al., 2015). Therefore, this study used the criteria as addressed in previous studies to assess the reflective indicators. SmartPLS 3 and ADANCO 2.0 software were used to assess the reliability of reflective indicators and their constructs.

As per the criteria adopted in this study, we found that most reflective indicators attained the minimum outer loading benchmark of 0.40, and their outer loadings are significant. In addition, the CR values of research variables (constructs) are also above the accepted benchmark of 0.60. Although the AVE values of most research variables are less than 0.50, the exclusion criterion



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requires that variables with AVE of less than 0.50 should be retained if their CR values are greater than 0.60 (Huang et al., 2013). Moreover, the findings related to discriminant validity stated that all HTMT ratios are significant under the P values ( $p < 0.001$ ;  $p < 0.01$ ;  $p < 0.05$ ;  $p < 0.10$ ). As a result, all constructs have established discriminant validity (see the Appendix A).

In terms of the assessment of formative indicators, this research adopted two main criteria used to assess the reliability and validity of formative indicators: collinearity issues among the formative indicators and the significance of formative indicator's outer weight and loading (OW/L). In this regard, we can confirm that all financial performance (PERF) indicators should remain in the PLS path model, because the variance inflation factor (VIF) for each PERF indicator is less than five. Therefore, the formative indicators do not have collinearity issues. Moreover, the outer weights and loadings of the formative indicators are significant (see Appendix B).

## **5.3 Multivariate analysis technique:**

This study adopted the mediated causal model which belongs to path analysis models (Hair et al., 2014). In empirical literature, path analysis models are sequential and causally-focused, allowing testing of the relationships between the research variables and examining direct and indirect effects on outcomes or dependent variables (Hair et al., 2014; Hair et al., 2011a, 2011b).

Accordingly, we used partial least squares structural equation modelling (PLS-SEM) as a statistical technique, which is a combination of multiple regression, path analysis and factor analysis (Hair et al., 2014).

However, partial least squares (PLS) is one of the statistical multivariate techniques suggested in this research for the following reasons (Hair et al., 2014; Lowry and Gaskin, 2014):

- PLS is used in specific situations where the measurement of observed variables is required to employ different measures, such as nominal, interval, categorical and ordinal scales.



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- PLS is used when the sample size is small, involving approximately 50-100 respondents.
- The application of PLS is essential when the research path model includes reflective and formative constructs.
- PLS is applied in this study because of the non-normal distribution of data.

## **6. Results and discussion:**

The findings and discussion of this study can be divided into four main tasks. First, we attempt to compare the findings of the descriptive statistics of this study with the results of previous studies in terms of the extent of use of CBT and the forecasting procedures and methods. Second, the findings relating to the forecasting process are represented as the forecasting procedures and methods and the components of cash flow, particularly the financial, marketing and production factors associated with CB process. Third, the findings related to the contingency variables affecting the use of forecasting procedures and methods are addressed. In the fourth place, the findings related to the financial performance of firms (FPFs) are discussed in two ways: the indirect relationship between the use of FPMs & FPFs, and the direct relationship between the extent of use of CBT & FPFs.

### **6.1 The findings of the descriptive statistics:**

#### **6.1.1 The extent of CBT usage**

This part compares the findings of this study with prior studies relating to CBT. In literature, there are three categories of capital budgeting techniques (CBT): financial appraisal, risk analysis and operations research techniques (Pike, 1996; Pike and Sharp, 1989). Most of researchers concentrate on the financial appraisal techniques used as criteria for making CB decisions (Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001; Holmen and Pramborg, 2009; Mohammed, 2013).





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First, the empirical evidence gathered in this research states that the financial appraisal techniques (FAT) have been widely used in developed and developing countries alike as summarized in Table 3; this can be confirmed by the subsequent narrative.

It can be seen from Table 3 that the PB method is the most common method used amongst UK, Indian, Malaysian, Chinese, South African, Sudanese and Libyan firms. On the other hand, discounted cash flow (DCF) methods are perceived as being of more interest in the US, Swedish, Dutch and Australian firms. PB and ARR methods are applied based on the concept of traditional income, whereas DCF methods have been based on the concept of the time value of money.

In terms of non-discounted cash flow methods, 58% and 57% of manufacturing and oil companies operating in Libya considered the PB and ARR to have high priority in the process of CB (respectively).

On the other hand, Libyan companies have not paid attention to the use of discounted cash flow methods, with only 19% and 10% of manufacturing and oil firms using NPV and IRR, respectively. Conversely, 85% of US firms and 94% of Canadian firms always or often used the NPV in CB decisions (Bennouna et al. 2010; Ryan and Ryan, 2002). Similarly, 89% of Dutch firms and 84% of the largest UK firms employed the IRR method in their capital budgets (Arnold and Hatzopoulos, 2000; Hermes et al., 2007)



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Table 3: Percentage of using the financial appraisal techniques by businesses

No	Firm size/ details	Year and country of survey	The sample	The type of answer	% The use of the financial appraisal techniques				
					PB	ARR	NPV	IRR	PI
Current study (2016)									
1	Small, medium and large firms.	2008-2010 Libya	69 firms	An essential and high priority	58	57	19	10	4
Drury et al. (1993)									
2	Small, medium and large firms.	1993 UK	278 firms	Always/often used	63	41	43	57	NA
Pike (1996)									
3	Large	1992 UK	100 firms	Used	94	50	74	81	NA
Arnold and Hatzopoulos (2000)									
4	Small firms	1997 UK	100 firms	Used	71	62	62	76	NA
	Medium firms		100 firms		75	50	79	83	
	Large firms		100 firms		66	55	97	84	
Ryan and Ryan (2002)									
5		USA	205 firms	Always/often used	52.6	14.7	85	76.7	NA
Graham and Harvey (2001)									
6		2001. USA and Canada	392 CFOs	Always/almost always used	57	20	75	75.7	12
Bennouna et al. (2010)									
7		2010 Canada	88 firms	Used	NA	NA	94	87.7	NA
Holmen and Pramborg (2009)									
8		2009 Sweden	143 firms FDI	Always/almost always	57	38	49	34	NA
Daunfeldt and Hartwig (2014)									
9		2005-2008 Sweden	193 listed firms	Frequently or always	54.4	46	61	30	12.4
Hermes et al., (2007)									
10	- Dutch CFOs	2007 Netherlands	42 firms	Always/ almost always used	79	2	89	74	NA
	- Chinese CFOs		45 firms		84	9	49	89	NA
Truong et al. (2008)									
11		2004 Australia	87 firms	Moderately important and very important	79	50	82	70	NA
Verma et al. (2009)									
12		2009 India	30 firms	Often/ always used	80	26.7	63	76.7	NA
Chan et al. (2001)									
13		2001	54 firms	Primary use	13	66.7	89	40.7	46.3
Anuar (2005)									
14		2005 Malaysia	88 firms	Very often and often used	69.4	25	60	61.4	NA
Brijlal and Quesada (2009)									
15		2009 South Africa	211 interviews	Used	39	22	36	28	28



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Table 3: "Continued"

Eljelley and AbuIdris (2001)									
16	-Private firms -Public firms	2001 Sudan	31 37	Used	52 38	5 14	12 24	14 19	6 8
Obi and Adeyemo (2014)									
17		Nigeria	228 firms	Used	39.5	17.5	20.2	13.2	8.8
Mohammed (2013)									
18	Industrial firms	2013 Libya	45 firms	Importance of use	98%	69%	80%	73%	56%

\* PB: Payback period; ARR: Accounting rate of return; NPV: Net present value; IRR: Internal rate of return; PI: Profitability index; DCFM: Discounted cash flow methods (including NPV, IRR and PI); SML: small, medium and large firms; NA: Not applicable.

In contrast to the findings of this study, it seems that CB practices in the Asia-Pacific region (China and India) applied DCF methods combined with non-discounted cash flow methods to evaluate the investment projects. In this regard, Indian firms were interested in using the non-DCF and DCF methods; in particular, 80%, 63.3% and 76.7% of these firms often/always used the PB, NPV and IRR respectively (Verma et al., 2009).

In a survey of CB practices, NPV, IRR and PB are the most popular techniques used in evaluating the investment projects by the North American, Western European and Australian firms (Graham and Harvey, 2001; Brounen et al., 2004; Truong et al., 2008). In line with this, Drury et al. (1993) and Pike (1996) confirmed that the UK firms employ the payback period (PB) and discounted cash flow techniques (DCFT) in appraising the investment opportunities. In a similar way, NPV method is widely used by Dutch CFOs. On the contrary, the Swedish companies preferred the use of the PB period method in the case of unsystematic risks leading to high deliberation costs (Holmen and Pramborg, 2009).

In developing countries, the extent of using the FAT is ranged from simple (PB & ARR) to sophisticated techniques (DCFT). According to Eljelley and AbuIdris (2001), the payback period (PB) method is commonly used in Sudanese companies. In line with this respect, most



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companies in Libya, Malaysia and Sudan primarily used non-discounted cash flow methods (PB and ARR) in CB decisions.

For more expansion, PB, IRR and net present value (NPV) are the most important techniques used by Malaysian, South African, Indian and Libyan firms (Anuar, 2005; Brijlal & Quesada, 2009; Verma et al., 2009; Mohammed, 2013). On the one hand, Chinese CFOs prefer the accounting rate of return (ARR) method to evaluate the investment opportunities (Hermes et al., 2007). On the other hand, Chan et al. (2001) stated that ARR and NPV were primarily employed by Chinese companies (66.7% and 88.9%, respectively). Similarly, the Singaporean firms apply the PB and IRR to evaluate the capital investment projects (Kester & Tsui, 1998).

Second, risk appraisal techniques were divided into six categories: subjective assessment (SAS), cost-volume-profit (CVP) analysis, sensitivity analysis (SA), scenario analysis (SCA), shortening the PB period (SPB) and raising the discount rate (RDR). Table 4 shows the percentage of using the risk appraisal techniques by businesses



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Table 4: Percentage of using the risk appraisal techniques by businesses

No	Author	Country & year of survey	The sample	The type of response	% use of the risk appraisal techniques*					
					SAS	CVP	SA	SCA	SPB	RDR
1	Current study (2016)	Libya 2008-2010	69 SML* firms	An essential & high priority	68.1	42	5.8	5.8	5.8	1.5
2	Drury et al. (1993). SML firms	UK 1993	278 firms	Often/always used	NA	NA	51	NA	37	18
3	Pike(1996):large firms	UK 1992	100 firms	Used	NA	NA	88	NA	60	65
4	Arnold & Hatzopoulos, 2000 - Small firms - Medium firms - Large firms	UK 1997	100 100 100	Used	44 33 55	NA NA NA	82 83 89	**	15 42 11	42 71 50
5	Ryan and Ryan (2002)	USA	205 firms	Always or often used	NA	NA	65.1	41.6	NA	NA
6	Graham and Harvey (2001)	USA & Canada2001	392 CFOs	Always/almost always used	NA	NA	52	NA	NA	NA
7	Singh et al. (2012)	India2010	166 firms	Used	NA	NA	96	7.69	11.5	11.5
8	Daunfeldt and Hartwig (2014)	Sweden 2005-2008	193listed firms	Frequently or always used	NA	NA	45	NA	NA	NA

\*SAS: Subjective assessment; CVP: Cost-volume-profit analysis; SA: Sensitivity analysis; SCA: Scenario analysis; SPB: Shorten the PB period; RDR: Raise the discount rate; SML: Small, medium and large firms; NA: Not applicable; \*\* Arnold and Hatzopoulos, 2000 used the SA and SCA as a combination method

Table 4 shows that 68.1% of the manufacturing and oil companies operating in Libya depended on subjective assessment (SAS) in appraising the project risk inherent in CB decision, while the majority of US, UK, Canadian and Indian firms applied SA, SPB and RDR, which were commonly used in large firms in the UK – 88%, 60% and 65% respectively (Pike, 1996).

Subsequently, Graham and Harvey (2001) found that more than 50% of US and Canadian firms employ sensitivity analysis (SA) to assess the risk surrounding their international projects. In support of this result, sensitivity analysis was the dominant assessment technique used to assess the project risk in multinational enterprises (Shao and Shao, 1996).

Similarly, scenario and sensitivity analyses are perceived to be the two most important techniques used in CB practices in Singaporean firms (Kester and Tsui, 1998). Nevertheless, “there is such low usage of sophisticated risk analysis methods such as the sensitivity, scenario





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and Monte Carlo analyses” (Burns and Walker, 2009, p. 85). According to Graham and Harvey (2001), the largest US firms are more likely to use risk-adjusted discount rate, while small firms prefer Monte Carlo simulation for risk adjustment.

Third, operations research techniques are often referred to as management science techniques (Pike, 1996), and are often used when firms have limited funds. According to Beraldi et al. (2012), capital rationing is a special case of the CB that exists whenever the firm's capital budget is not adequate to fund all profitable projects. In accountancy and finance literature, several mathematical models are suggested for solving capital rationing problems. The purpose of capital rationing is to maximize the net present value of owners' wealth under the available funds (Manalo & Manalo, 2010). In this case, it is preferred to use the quantitative analysis techniques, especially operations research models, to solve the capital rationing problem in CB decisions (Render and Stair, 2000). In accountancy and finance literature, several mathematical models have been suggested to solve the capital rationing problems.

In this study, we determined three techniques commonly used to solve the capital rationing problem in CB decision. These are the mathematical programming (MAP), decision trees (DT) and program evaluation & review technique (PERT) / critical path analysis (CPA). The descriptive findings stated that Libyan firms had little interest in the uses of mathematical programming (MAP), decision trees (DT), program evaluation and review techniques (PERT) or critical path analysis (CPA) in CB decisions. A much larger percentage of UK firms (32%) and US firms (31%) used PERT or CPA (Pike and Sharp, 1989; Ryan and Ryan, 2002).

In empirical literature, the use of MAP has received extensive attention in CB research, albeit usually for specific CB problems (Benjamin, 1985; Bhaskar, 1978; Keown and Taylor, 1980). In this regard, Khan (2008) stated that the mathematical programming models used in solving CB problems are perceived to be more common in the private sector. Indeed, the capital rationing problem in the public sector occurs due to limited funds, legal constraints of borrowing, limitation of public expenditures and the concentration of sample projects rather than complex



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projects requiring large budget allocations (Ibid). In line with this, the NOC subsidiary Company, Ras Lanuf, used linear programming (LP) in appraising the oil investment projects (Linsley & Fotouh, 1979).

## **6.1.2 The use of forecasting procedures and methods (FPMs)**

The findings relating to the forecasting process are represented as the procedures and methods used in forecasting the components of cash flow, in particular, the financial, marketing and production factors (FMPF) associated with CB decisions. In empirical literature, there is little interest in the procedures and methods used in forecasting future cash flow generated by investment projects (Batra & Verma, 2014). Despite this, there are three studies that address the CFF estimates in CB decisions, therefore, the researchers present a comparison between the results of this study and those of Lazaridis (2002, 2006) and Pohlman et al. (1988) as shown in table 5.



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Table 5: Comparison of the current research findings with Pohlman and Lazaridis's research results (FPMs)

<i>The forecasting procedures and methods (FPMs)</i>	<i>Symbol</i>	<i>The current study (2008 -2010) *</i>	<i>Pohlman et al. 1988 (1986)**</i>	<i>Lazaridis, 2002 (2002)**</i>	<i>Lazaridis, 2006 (2002)**</i>
		<i>Libya/ %</i>	<i>USA/ %</i>	<i>Cyprus/ %</i>	<i>Greece/ %</i>
Procedures used in forecasting (PUF):					
Personal estimates	PUF1	70	NA	NA	NA
Standard procedures	PUF2	41	85.3	36.27	37.52
Official or standard forms	PUF3	35	78	18.63	24.02
Judgmental or Qualitative methods used in forecasting:					
Executives' opinions	JM1	78.26	90.5*	59.17	48.17
Delphi method	JM2	7	67.2*	15.00	17.07
Sales force composite	JM3	43	NA	NA	NA
Quantitative methods used in forecasting:					
Time-series models	QM1	28	NA	NA	NA
Regression analysis models	QM2	7	48.3*	3.33	3.51
Software package used in forecasting:					
Software developed by a company	SUF1	4	52.2*	6.67	13.72
Commercial software packages (Excel)	SUF2	52	NA	NA	NA
Sensitivity Analysis	SA	N.A	69*	3.33	3.20
Probability Theory	PT	N.A	43.1	2.50	2.59

\*1- The executives' opinions are often referred to as the Management's Subjective Estimates. 2- Delphi method is often referred to as the consensus of experts' opinion. 3- Regression analysis models are similar to the sophisticated mathematical models. 4- The software developed by a company is similar to the computer simulation mentioned by Pohlman and Lazaridis. 5- Sensitivity analysis is applied as one of the risk appraisal techniques in capital budgeting as mentioned in this survey. 6- NA: Not applicable. 7- The current study/type of answer: Always and often used. \*\*8-The type of answer: Used

The findings shown in Table 5 enable a comparison between the USA, Cyprus, Greece and Libya. This comparison presents relevant empirical evidence on the application of forecasting procedures and methods in an industrial sector.

Beginning with the procedures used in forecasting, 70% of manufacturing and oil companies in Libya applied personal estimates (PUF1) to forecast future cash flow in CB decisions. This procedure (PUF1) does not relate to the executives' opinions, because it is based only on personality. This is different from US, Cypriot and Greek firms, which did not indicate that they utilised this procedure (PUF1). In addition, the standard procedures used in Libya, Cyprus and Greece are similar (41%, 36.27% and 37.52%, respectively), while 85.3% of US manufacturing firms used the standard procedures in CFF.



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Moreover, 35% of the manufacturing and oil companies operating in Libya used official forms to collect cash flow data relating to the investment projects. This procedure is similar to those used by Cypriot and Greek firms (18.63% and 24%, respectively), whereas 78% of US manufacturing firms employed official forms.

Secondly, it involves some of the qualitative methods used in forecasting. In this regard, the executives' opinions are identical to management's subjective estimates and are used as a qualitative method in forecasting. Where, there are similarities in using the management's subjective estimates amongst US and Libyan firms (78.26% in Libya and 90.5% in the USA), while 59.17 of Cypriot firms and 48.17 % of Greek firms used the management's subjective estimates in CB decisions.

Oil and manufacturing companies in Libya did not pay attention to the use of the Delphi method in forecasting (only 7% used this technique, even less than 15% of Cypriot and 17% of Greek firms utilizing it). In contrast, 67.2% of respondents in US firms applied the consensus of experts' opinion (Delphi method) to forecast future cash flow in investment decisions. With regard to the sales force composite method, the research results of Lazaridis (2002, 2006) and Pohlman et al. (1988) do not refer to this technique, whereas 43% of the manufacturing and oil firms in Libya used the sales force composite method as one of their qualitative methods.

Thirdly, the mathematical models used in forecasting were perceived as being of less interest in Libya; where 7% and 28% of the manufacturing and oil firms applied regression analysis and time-series models respectively. Similarly, Cypriot and Greek firms have not paid attention to the use of mathematical models in forecasting, with less than 4% of respondents using these models. Conversely, 48.3% of US manufacturing firms applied sophisticated mathematical models to forecast future cash flow in CB decisions.



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However, most researchers in businesses focus on the application of forecasting methods in marketing areas or operational activities (Klassen and Flores, 2001; Lawrence et al., 2000; Watson, 1996).

In this regard, Klassen and Flores (2001) stated that the use of forecasting methods in US firms is similar to the Canadian firms, although only 57% of the latter (n=66) used the forecasting process in capital investment decisions.

For more detail, the comparison of the forecasting methods used in Libya and the UK was undertaken by Watson (1996) and Fildes and Hastings (1994), although these studies applied forecasting methods in the marketing field. In terms of the executives' opinions, both this study and Watson (1996) found that this technique was used by the majority of firms for forecasting, but in different ways. About 78% of Libyan manufacturing and oil firms always use executives' opinions in CB cash flow forecasts and 68% of the UK firms used this technique in sales forecasting. In contrast, Fildes and Hastings (1994) confirmed that only 24% of UK firms employed the executives' opinions in sales forecast.

With regard to Delphi method, UK firms certainly paid greater attention to its use than Libyan ones. The use of sales force composite in UK firms (Fildes and Hastings, 1994) was similar to that of Libyan companies, which was close to 40%. Watson (1996) stated that 82% of UK firms used the sales force composite method in sales forecasting. Time-series and regression analysis models were perceived to be more common in UK firms than in Libyan ones.

## **6.2 Findings related to the contingency variables affecting the use of FPMs**

A contingency theory was widely applied in CB research (Afonso and Cunha, 2009; Haka, 1987; Pike, 1984, 1986). Accordingly, this study adopted the combined effect of contingency variables on one dependent variable (Otley, 2016). A PLS path model examines the influence of combined contingent variables on the use of forecasting procedures and methods (FPMs), which in turn reflects on the extent of CBT usage in manufacturing and oil companies (see figure 3) .





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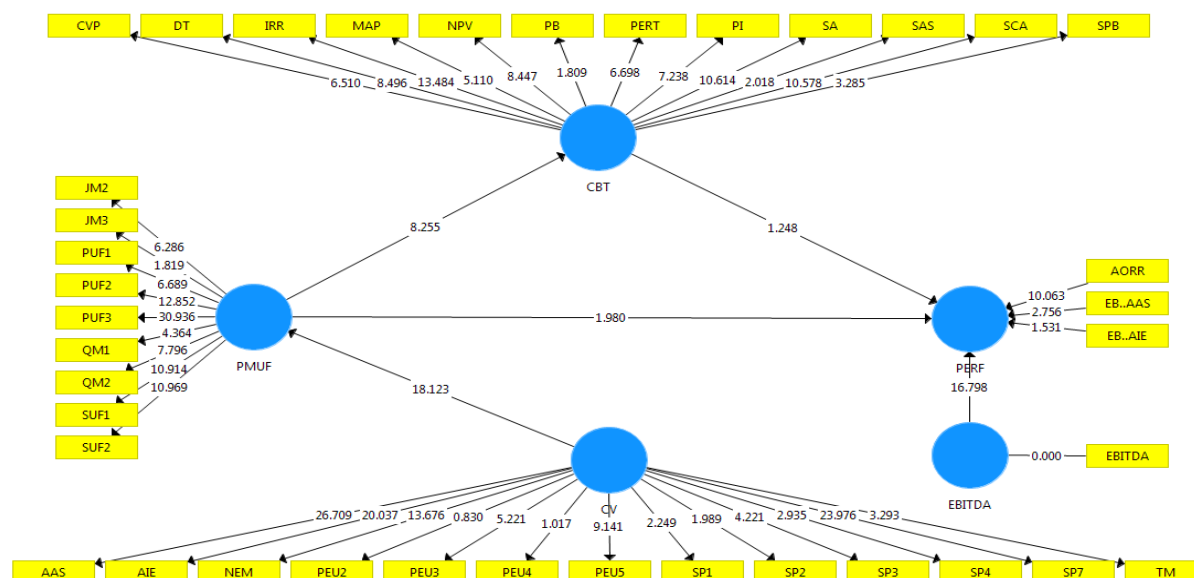


Figure 3: PLS path model (Bootstrapping 500)

Where:

CCV: Combined contingent variables

FPMs: Forecasting procedures and methods

CBT: Capital budgeting techniques.

FPPs: Financial performance of firms.

EBITDA: Earnings before interest, taxes, depreciation and amortization (control variable).

Figure 3 illustrates the causal relationships among the five main research variables. These variables can be measured by the observed variables which are highlighted as the yellow rectangles in PLS path model, where the values attached to the arrows are the T-test values calculated based on P values.

In the first hypothesis, the statistical results established that there is a significant and positive relationship between the combined contingent variables (CCV) and the use of forecasting procedures and methods (FPMs) at the level of p value 0.001. The contingency variables tested are the firm size, the type of industry, firm strategy and perceived environmental uncertainty. In



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this regard, the researchers used an average of annual sales (AAS), average of investment expenditures (AIE) and number of employees (NEM) as represented the firm size.

The findings presented strong evidence that the predictability of cash flow (PEU5), changes in the financial position strategy (PEU3), depending on the feasibility studies (SP3), training the human resource (SP7), AAS, AIE, NEM and the type of industry (IND) are significantly associated with the use of FPMs ( $p < 0.001$ ).

The strategic priorities relating to the existing main activity (SP1), supporting investments with high return (SP2) and focusing on general economic considerations (SP4) are slightly significant at the level of 0.05. In contrast, the predictability of competitors' actions (PEU3) and demand for existing products (PEU4) are insignificant. Likewise, strategic priorities relating to competitive positions (SP5) and the application of flexible manufacturing systems (SP6) are also not significant. Therefore, the SP5 and SP6 were cancelled from PLS path model.

In comparison with the descriptive statistics of this study, it can be observed that 59% of respondents strongly agree or agree that competitive position (SP5) represents an essential priority in the strategic decisions of manufacturing and oil firms operating in Libya.

Consistent with the results of prior studies, Pike (1984) asserted that there is a statistically significant and positive relationship between firm size, capital intensity, level of risk (1975-79) and the sophistication of CB processes ( $p < 0.001$  and  $p < 0.05$ ). Pike (1986) enhanced his previous model to encompass manager's attitude to CB and the firms' financial position, demonstrating that the firm size, manager's attitude and the level of risk (environmental uncertainty) are significantly and positively associated with the sophistication of CB ( $p < 0.001$  and  $p < 0.05$ ). Conversely, the financial position (profitability ratio) is negatively related to the sophistication of CB; even so, this relationship is significant at the level of 0.05 (Ibid).

In line with the contingency theory, Haka (1987) stated that the predictability of financial markets and competitors' actions and the decentralization of CB decisions are significantly and



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positively associated with the effectiveness of discounted cash flow techniques (DCFT) ( $p < 0.10$ ). Although environmental diversity and firm strategy are insignificantly related to the use of DCFT, this relationship has a positive coefficient (Ibid).

Accordingly, Haka's study (1987) presented strong evidence that the effectiveness of using DCFT depends on each firm's characteristics.

Afonso and Cunha (2009) established that contingency variables are associated with the use of capital investment appraisal methods (CIAM), whereby the internal and external variables related to the firm's work were tested as the determinants of the use of capital investment appraisal techniques. Contingent variables, such as firm size, environmental uncertainty, competition, strategy and technology play an essential role in whether CBT is used or not (Ibid). Anuar (2005) tested the influence of contingent variables on the extent of use of CBT employing firm-specific contingencies to explain Malaysian firms' decision to use sophisticated or naive CBT. Statistically, the results of Anuar's study (2005) revealed that the relationship between the firm's contingent variables and the use of sophisticated capital budgeting techniques is partially supported.

In line with the results related to the use of sophisticated CBT, Brunzell et al. (2013) asserted that the use of sophisticated CB methods in Scandinavian countries is significantly and positively associated with firm size, but negatively related to the return on assets (ROA).

The results of previous studies considered environmental uncertainty to be the dominant contingent variable affecting the extent of CBT and forecasting methods usage. This perspective is consistent with the studies in the period of time (1966-1980), whereby the use of CBT is contingent on simulated environments surrounding the organisation's operations (Schall and Sundem, 1980; Sundem, 1975).



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In terms of the forecasting processes in CB decisions, Zotteri and Kalchschmidt (2007) reported that there is a relationship between a firm's size and its forecasting practices. They used a number of employees and annual sales in measuring the firm size.

In addition to this, the forecasting processes in Italian companies are contingent upon their competitive strategies, which have a positive correlation with the forecasting horizon (Ibid). Apparently, it can be observed that smaller Italian companies have devoted more attention to adopting the forecasting processes than larger ones (Ibid). In this regard, Pohlman et al. (1988) asserted that the use of multiple forecasting methods in large US firms is significantly associated with higher capital expenditures.

In a similar vein, Turner and Guilding (2012, p.520) examined the “factors affecting biasing of capital budgeting cash flow forecasts (CBCFFs) in hotels mediated by a management contract”; they observed that highlighting financial factors rather than non-financial factors in CB are significantly associated with increased bias of CBCFFs ( $p < 0.01$ ), but this relationship has a negative coefficient. In this regard, non-financial factors are the strategic, political and intuitive factors.

Subsequently, Yenilmez-Dramali (2013) asserted that there was a positive and significant relationship between environmental turbulence and the effectiveness of export sales forecasting ( $p < 0.001$ ). Similarly, managerial characteristics had a positive and significant impact on export market performance depending on the firm's characteristics (Ibid).

In dealing with the results of management accounting research applied the contingency theory, Abdel-Kader and Luther (2008) found that the application of sophisticated management accounting practices (MAPs) is significantly and positively related to UK firms that have faced highly uncertain environments ( $P \text{ value} < 0.05$ ). In contrast, Al-Sayed and Dugdale (2016) revealed that the adoption of activity-based innovations in the UK manufacturing sector is not affected by perceived environmental uncertainty (PEU).



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Ibrahim (2007) emphasised the role of the contingency theory in management accounting systems when the study reported that the level of cognitive and organizational capacity have a significant impact on the extent of use of standard costing systems (SCS) in Syrian manufacturing public companies.

In the same way, sophisticated management accounting systems are significantly applied in large firms with powerful customers, decentralised systems, advanced manufacturing technology (AMT), total quality management (TQM) and just-in-time (JIT) production systems (Jayaram, et al., 2010).

As has been discussed in empirical literature section, the firm size is a vital factor in explaining the differences in the CB processes/techniques applied in organisations. In support of this orientation, Ntim (2009) revealed that the relationship between the South African corporate governance index (SACGI) and firm size is statistically significant ( $p < 0.01$ ), based both on ROA and Q-ratio, but this relationship has a negative coefficient. Similarly, the SACGI is statistically significant and positively associated with capital expenditure based on ROA at the level of 0.05 (Ibid). In contrast, there is no significant relationship between the SACGI, capital structure and technology based both on the ROA and Q-ratio, whereas the relationship between the SACGI and sales growth is significant based on the Q-ratio (Ibid).

## **6.3 Findings related to PLS multi-group analysis (PLS-MGA)**

Multi-group analysis is used to test the relationship between the research variables of the PLS path model depending on the two groups. Firstly, the researchers examined the influence of the type of ownership on the relationship between the research variables in both state-owned and private companies. Secondly, this study also explores the impact of the type of industry on the relationship between research variables in both manufacturing and oil companies. In this part of the study, the researchers aim to test the influence of contingent variables on the forecasting





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procedures and methods (FPMs) to explain the differences between public and private companies, as well as the differences between manufacturing and oil companies. Using the SmartPLS 3 software, the multi-group analysis can be used for all relations as shown in PLS path model, provided that the number of observations (participants) is greater than the number of indicators.

After testing the first research hypothesis, the researcher modified H1 based on the specific data collected from public & private companies (H1<sub>a</sub>), as well as manufacturing & oil companies (H1<sub>b</sub>).

In this case, this study utilizes the multi-group analysis to test the relationship between the combined contingent variables (CCV) and the use of forecasting procedures and methods (FPMs) based on the data collected from two groups: 1) public and private companies, 2) manufacturing and oil companies. The researchers attempt to answer the following question:

- 1) Are there significant differences between public and private companies in accordance with the first hypothesis (H1a)?*
- 2) Are there significant differences between manufacturing and oil companies in accordance with the first hypothesis (H1b)?*

Firstly, the results derived from PLS-MGA determined the relationships among the research variables of PLS path model based on the specific data collected from the public and private companies. Statistically, the results of this study confirmed that the influence of combined contingency variables (CCV) on the use of forecasting procedures and methods (FPMs) is significantly stronger for public companies than for private ones. Hence, the coefficient effect of public companies ( $PC^*=0.838$ ) is stronger than in private ones ( $PC=0.711$ ). Moreover, there are several relationships among the research variables based on the multi-group analysis, and the

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\* PC is path coefficient.



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researcher only selected the first research hypothesis in order to expose the significance of contingency theory.

Secondly, the results derived from PLS-MGA elaborate the relationships among the research variables of PLS path model based on the specific data collected from the manufacturing and oil companies. We proved that the impact of combined contingency variables (CCV) on the use of forecasting procedures and methods (FPMs) is not significantly stronger for manufacturing companies than for oil ones.

For that reason, the modified first hypothesis (H1<sub>b</sub>) is rejected. This means that contingency theory may not interpret the differences in using the forecasting procedures and methods between manufacturing and oil companies.

## **6.4 The findings related to the relationship between the use of FPMs and the extent of CBT usage.**

As discussed in empirical literature section, previous studies have not addressed the relationship between the use of forecasting procedures and methods and the extent of CBT usage. In the second hypothesis, the statistical results reported that the use of forecasting procedures and methods is positively and significantly associated with the extent of CBT usage ( $p < 0.001$ ). Consistent with the results of previous studies, Lazaridis (2002 and 2006) and Pohlman et al. (1988) addressed the role of forecasting techniques in estimating future cash flow in CB decisions. Even though, Pohlman et al. (1988) and Lazaridis (2002, 2006) only concentrated on the CFF stage in CB and did not examine the relationship between the CFFP and the evaluation stage (the extent of CBT usage). In terms of financial appraisal techniques, the use of forecasting procedures and methods is perceived to be more highly associated with the extent of use of discounted cash flow methods (NPV, IRR and PI) instead of using the accounting rate of return method.



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Similarly, the use of forecasting procedures and methods is significantly linked with the extent of use of CVP, sensitivity and scenario analysis techniques ( $p < 0.001$ ). In contrast, shortening the PB period (SPB) and raising the discount rate (RDR) were widely applied in UK firms (Pike, 1989, 1996). Moreover, the extent of use of the operations research techniques (MAP, DT and PERT/CPA) is considerably associated with the use of forecasting procedures and methods, especially the regression analysis models, Delphi method and the formal and standard procedures (significant at  $p < 0.001$ ). Consistent with the results of prior studies, Pohlman et al. (1988) and Lazaridis (2002, 2006) confirmed that forecasting methods play an important role in forecasting future cash flow in CB decisions.

## **6.5 Findings related to the financial performance of firms (FPFs)**

This study addressed the relationship between the use of forecasting procedures and methods, the extent of use of CBT and the financial performance of firms (FPFs). Theoretically, the cash flow forecasting process is a vital stage of CB decision (Pinches, 1982). Where, the investment appraisal stage in CB process depends on the cash flow forecasting stage in selecting the investment projects. For this reason, the third hypothesis assumes that the relationship between the use of the forecasting procedures and methods (FPMs) and the financial performance of firms (FPFs) is mediated by the extent of use of CBT (see figure 3).

Testing the third hypothesis, the results derived from the PLS path model asserted that the indirect relationship between the use of forecasting procedures and methods and the financial performance of firms (FPFs) is slightly positive, but this relationship is not statistically supported ( $p\text{-value} > 0.10$ ). Therefore, this assumption (H3) is rejected. Nevertheless, we found that the use of forecasting procedures and methods has a direct and significant effect on the financial performance of firms (FPFs) at the level of  $p\text{-value}$  ( $p < 0.05$ ). Even though, this effect has a negative path coefficient.



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In comparison with prior studies, Danese and Kalchschmidt (2011a) found that the relationship between forecasting methods and firm performance is not due to forecast error (mediated variable). This result is consistent with the results of this study where the researchers indicated that the mediating role of CBT in the relationship between forecasting techniques and the firms' financial performance is not statistically supported. Even though, a direct relationship is strengthened. According to Danese and Kalchschmidt (2011a), the use of forecasting techniques has a significant and direct impact on cost and delivery performance at the level of 0.01. This result is compatible with the results of the prior study (Kalchschmidt et al., 2010).

In any case, the use of sophisticated forecasting methods may not increase forecast accuracy (Dalrymple, 1987; Lawrence et al., 2000; Mentzer and Cox, 1984; Sanders, 1997; Sanders and Manrodt, 1994).

Accordingly, the efficacy of forecasting techniques depends on the fit between the type of techniques adopted and the contextual factors surrounding the organization's operations (Makridakis et al., 1998; Sanders and Manrodt, 2003).

Moreover, the fourth hypothesis tests the direct relationship between the extent of use of CBT and the financial performance of firms (FPFs). The findings of this study confirmed that there is a slightly positive relationship between the extent of use of CBT and the financial performance of firms (FPFs), but this relationship is not statistically supported ( $p. value > 10\%$ ).

Consistent with previous studies, Klammer (1973) found that the use of sophisticated CBT is negatively correlated with performance (PERF). This is similar to the findings indicating that there is no evidence that sophistication in CB processes leads to higher levels of performance (Farragher et al., 2001; Pike, 1984, 1986). Irungu (2014) asserted that the relationship between the use of CBT and the financial performance of firms listed in Nairobi is not significant. In line with these results, achieving the best performance is not necessarily linked with the use of sophisticated CBT (Alzoubi and Alazawi, 2010; Jakovicka et al., 2003).



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Based on the financial theory, the use of sophisticated CBT leads to an improvement in firm performance (Copeland and Weston 1988). To support this orientation, the use of sophisticated CBT play an important role in improving the effectiveness of large investment projects (Pike, 1988). This is required a fit between the CB process and structural and contextual factors which in turn reflects on a firm's performance (Klammer, 1973; Pike, 1984, 1986). In this regard, Haka (1987) reported that the use of DCFT leads to an improvement in firm performance.

Conversely, the use of payback period and accounting rate of return has a negative coefficient on the effectiveness of CB (Pike, 1989). Similarly, the research findings stated that the use of the accounting rate of return method has an insignificant link with the CBT construct and a weak coefficient ( $p \text{ value} > 0.10$  and  $PC < 0.10$ ). While the use of the payback period method is significantly associated with the CBT construct ( $p < 0.10$ ), but this relationship has a negative path coefficient.

Several studies are related to measuring firm performance when utilizing the CB process. Klammer (1973) and Pike (1984, 1986) utilized operating rate of return (ORR) to measure the financial performance of US and UK firms using CBT. Proponents consider that ROI is not a reliable measure of a firm's ability to reward its shareholders (Bernstein, 1993), because its use depends on traditional income concepts.

The results from this study offer strong evidence that the average operating rate of return (AORR) is the best ratio compared to return on sales (EB..AAS) and return on investment (EB..AIE) ratios. It can be seen that the results of this study generally corroborate the findings of previous studies. In terms of using AORR to measure the FPFs, it can be certain that the AORR is strongly significant ( $p < 0.001$ ) and has a positive coefficient on the FPFs construct ( $PC > 0.70$ ). The AORR is ranked as the best ratio followed by the return on sales (EB..AAS). This result is consistent with the findings of prior studies (Klammer, 1973; Pike, 1984, 1986). On the other hand, this study asserts that the return on investment (EB..AIE) is not appropriate to use in measuring the financial performance of firms. Accordingly, the use of ROI based on the





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traditional concept of profitability may not be an appropriate method to fit with the views held by firm's shareholders and owners (Bernstein, 1993). That is required to maintain their available resources for making decisions on the basis of cash flow rather than on an accrual basis.

Furthermore, this research used earnings before interest, taxes, depreciation and amortization (EBITDA) as a control variable, which is considered the most important factor directly affecting the profitability ratios. The results provided robust evidence that EBITDA is statistically significant and has a positive coefficient on the FPFs.

## **7. Conclusions and recommendations**

This study examined the cash flow forecasting process (CFFP) and its impact on the extent of CBT usage. We specified a description of the forecasting procedures and methods and the CBT practiced in manufacturing and oil companies operating in Libya. It can be certain that most of the Libyan manufacturing and oil companies depended on the subjective/personal estimates to forecast future cash flow.

Regarding the extent of CBT usage, most Libyan companies used the PB and ARR as the main techniques for evaluating and selecting the investment opportunities. Statistically, this research reinforces the role of cash flow forecasting process in capital budgeting (hypothesis H2).

It is evident that no specific forecasting and appraisal technique can be applied universally among all manufacturing and oil companies, because the choice of technique to be adopted will be affected by environmental circumstances surrounding the company's work. Therefore, the contingency theory is appropriate for explaining why forecasting methods and CBT may differ from one company to another. To support this fact, this study stated that the combined contingent variables have a positive impact on the use of forecasting procedures and methods at the level of 0.001 (hypothesis H1). Findings revealed that the influence of the contingent variables differs between public and private sectors. In terms of multi-group analysis, the results of this thesis stated that the relationship between the combined contingency variables (CCV) and the use of forecasting procedures and methods is significantly stronger for public companies than for



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private ones (hypothesis H1a). Conversely, there are no significant differences between the manufacturing and oil companies in accordance with the fourth hypothesis (hypothesis H1b).

In terms of the financial performance of firms, the results revealed that the indirect relationship between the use of forecasting procedures and methods and the financial performance of firms (FPFs) is not statistically significant. Nevertheless, there is a direct and significant relationship between the use of FPMs and FPFs; even so the coefficient on the FPFs is consistently negative. On the one hand, we found that the extent of use of CBT is slightly associated with the financial performance of firms (FPFs). However, this relationship is not statistically supported, because the p value is above 10%. This is consistent with the findings from previous studies, which found no evidence that the use of sophisticated CBT leads to high levels of performance (Klammer, 1973; Farragher et al., 2001; Pike, 1984, 1986). On the other hand, the results of this study provide strong evidence that the operating rate of return (ORR) is an appropriate ratio to measure the financial performance of firms using CBT.

However, this study produced a number of contributions to existing knowledge. First, it is a unique study for exploring the relationship between the FPMs and the extent of use of CBT. Second, it builds a causal sequence model based on the interrelated parts of the research framework (independent, mediated and dependent variables). Most previous studies related to CB research in Libya depended on descriptive and classical models. Consequently, this is the first study in Libya, as a developing country, to explore the cash flow forecasting processes used by the manufacturing and oil companies. Third, this research reinforced and strengthened the importance of contingency theory for explaining why forecasting procedures and methods may differ from one company to another.

The findings of this study have practical implications in improving the ability of financial directors, accountants and analysts to build effective capital budgets based on optimal plans of future cash flow forecasts. Additionally, this study also provides useful information about cash



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flow forecasting processes that can be used as a practical guide for decision makers in Libyan firms.

Based on the potential contributions of this research, the suggestions and recommendations for further research addressed various issues, such as the application of forecasting models in CB research, diversity of data sources used in forecasting, the criteria used for evaluating the forecasting processes, the influence of demographical characteristics of forecasters on the forecasting procedures and methods (FPMs), the influence of institutional factors on the FPMs and the impact of forecast accuracy on performance and CB decisions.

## *Appendix A: Assessing the reflective constructs and their indicators*

### *I. Internal consistency reliability of reflective measures – Indicators of forecasting process variables*

No	A construct and its measures (indicators)	Symbol	Outer loadings	T values	$\alpha^*$	CR*
	Forecasting procedures & methods (9 indicators):	FPMs*			0.799	0.800
1	Personal estimates	PUF1	-0.657*	7.117		
2	Standard procedures	PUF2	0.762	11.914		
3	Official forms/worksheets	PUF3	0.878	31.788		
4	Delphi method (panel of experts' opinions)	JM2	0.631	6.918		
5	Sales force composite	JM3	0.299*	1.909		
6	Time-series models	QM1	0.521	3.833		
7	Regression analysis models	QM2	0.657	6.806		
8	Software developed by company	SUF1	0.686	11.159		
9	Commercial software packages (Excel)	SUF2	0.705	9.335		

\*  $\alpha$ : Cronbach's alpha; CR: Composite Reliability; FPMs is often used as a synonym of the procedures and methods used in forecasting (PMUF); PUF1 indicator is significant ( $P < 0.001$ ); JM3 and PF1 indicators are significant ( $P < 0.10$ ).



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## II. Internal consistency reliability of reflective measures: Contingency variables

No	A construct and its measures (indicators)	Symbol	Outer loadings	T values	<i>a</i>	CR
	<b>Combined contingent variables (13 indicators):</b>	CCV			0.785	0.835
1	Average of annual sales	AAS	0.894	26.709		
2	Average of investment expenditures	AIE	0.851	20.037		
3	Number of employees	NEM	0.798	13.676		
4	Type of industry	IND	0.421	3.293		
5	Competitors' actions	PEU2	0.131	0.830		
6	The changes in financial position	PEU3	0.552	5.221		
7	Demand for existing products	PEU4	0.138	1.017		
8	Expected cash flows ....	PEU5	0.654	9.141		
9	Protecting and promoting the existing main activity...	SP1	0.289*	2.249		
10	Focusing on the investments associated with high return	SP2	0.274*	1.989		
11	Implementing feasibility studies...	SP3	0.433	4.221		
12	Depending on general economic considerations...	SP4	0.384	2.935		
13	Supporting the training of human resources....	SP7	0.825	23.976		

\* SP1&SP2 indicators are significant ( $p < 0.05$ ).



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## Appendix A: (continued)

### III. Internal consistency reliability of reflective measures: Capital budgeting techniques (CBT).

No	A construct and its measures (indicators)	Symbol	Outer loadings	T values	$\alpha^*$	CR*
	<b>Capital budgeting techniques (12 indicators):</b>	CBT			0.734	0.795
1	Payback period	PB	-0.268	1.771*		
2	Net present value	NPV	0.732	8.429		
3	Profitability index	PI	0.655	7.241		
4	Internal rate of return	IRR	0.819	15.300		
5	Subjective Assessment	SAS	-0.334	1.987*		
6	Cost-Volume-Profit Analysis	CVP	0.547	7.043		
7	Sensitivity analysis.	SA	0.716	9.759		
8	Scenario Analysis	SCA	0.777	10.304		
9	Shorten the PB period	SPB	0.427	3.143		
10	Mathematical Programming	MAP	0.675	5.178		
11	Decision Tree/Theory	DT	0.740	9.861		
12	PERT/CPA analysis	PERT	0.642	6.740		

\* PB indicator is significant ( $p < 0.10$ ).      \* SAS Indicator is significant ( $p < 0.05$ ).

### IV. Convergent validity – average variance extracted (AVE) statistics

No	The main reflective variables	Symbol	No. of indicators	AVE*	$\sqrt{AVE}$
1	Forecasting Procedures and methods	FPMs	9	0.438	0.662
2	Capital budgeting techniques	CBT	12	0.403	0.635
3	Combined contingent variables	CCV	13	0.329	0.574

## Appendix B: Assessing the formative construct and its indicators

### I. The financial performance of firms (FPFs) and its indicators – Multi-collinearity analysis

The indicators of FPFs	Symbol	Multi-collinearity statistics	
		Tolerance	VIF
Average operating rate of return	AORR	.726	1.379
EBITDA/ average of investment expenditures	EB..AIE	.753	1.328
EBITDA/ average of annual sales	EB..AAS	.646	1.548





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## II. *The significance of formative indicators*

Indicators	The significant outer weights		The significant outer loadings	
	Outer weights	T Statistics	Outer loadings	T Statistics
AORR	0.755	8.328	0.946	26.782
EB..AAS	0.228	2.043	0.709	8.741
EB..AIE	0.209	1.701	0.592	4.673
EBITDA*	1.000	-----	1.000	-----

\*EBITDA: Single latent variable

## Appendix C: Abbreviations

ARR	Accounting rate of return
CB	Capital Budgeting
CBT	capital budgeting techniques
CCV	Combined contingent variables
CFF	Cash flow forecasting
CFFP	Cash flow forecasting process
CPA	Critical path analysis
DCF	Discount cash flow
DT	Decision tree
EBITDA	Earnings before interest, tax, depreciation & amortization
FMPF	Financial, marketing and production factors
FPFs	Financial performance of firms
FPMs	Forecasting procedures and methods
IRR	Internal rate of return
MAP	Mathematical programming
NPV	Net present value
ORR	Operating rate of return
PB	Payback period



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PERT	Program evaluation & review technique
PLS-MGA	PLS multi-group analysis
PLS-SEM	Partial least squares structural equation modelling



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