Structural Equation Modelling Approach to Evaluating Capital Budgeting Factors in Oman

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ABSTRACT

Objective – This study aims to critically evaluate capital budgeting factors in Oman's manufacturing sector using the structural equation modelling (SEM) approach.

Methodology – One hundred and twelve managers participated in the pilot survey conducted in different parts of Muscat, Oman, from September 2020 to January 2021. The managers responded to questions set on a 5-Likert scale bordering on aspects of managerial and organisational attributes, the rationale for selecting specific capital budgeting techniques, the impediments to the use of advanced capital budgeting techniques (ACBTs), and the traction of non-financial, environmental, social, and governmental (ESG) factors. IBM SPSS v.23 and analysis of moment structure (AMOS) v.20, descriptive analysis, correlation, and multiple regressions were used. SEM was applied to determine the strength of the relationship between the latent capital budgeting variables tested in the model.

Findings – The results show that the model has an acceptable fit that meets the recommended values. Specifically, the use of advanced capital budgeting methods (ACBMs) relative to financial and non-financial factors in the capital investment decision model is the most influencing path in this SEM model; The rest of the observed relationships are insignificant at a 5% significance level.

Novelty – Using relatively more advanced capital budgeting approaches such as real options could significantly impact financial and non-financial factors, thereby opening the prospects for more integrated project appraisal approaches. Cash flow, net present value (NPV), environmental, social, and governance (ESG) considerations, top management role, and clarity of business policy are among the determinants of sustainable capital budgeting. This is perhaps the first study that has applied the SEM approach to generating more insights into capital budgeting factors than previous studies emphasizing the Omani non-oil sector.

Type of Paper: Empirical

JEL Classification: G11, G31.

Keywords: Advanced capital budgeting methods (ACBMs); Confirmatory factor analysis; Exploratory factor analysis; Investment decisions; Oman, Real options; Structural equation modelling.

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1. Introduction

This study was designed to obtain empirical evidence in Oman's manufacturing sector about the factors that influence sustainable capital budgeting practice, using the structural equation modelling (SEM) or path analysis approach.

The potential findings from an SEM approach to capital budgeting were considered crucial to developing innovative capital budgeting practices with resultant effects on sustainable economic growth. While capital budgeting embraces a broad knowledge and is at the core of investment and project management; investment connotes purchasing an expected future cash flow stream (John, 2012) (Desai, 2019) (Umoh, 1997) (John, 2012); few studies have used the SEM to generate further insights into the capital budgeting factors to improve the industrial capital investment decision-making process under conditions of uncertainty. SEM is an expanding field with increasing application to various areas because SEM-based methods generally lead to superior estimates (Ullman, J. B., and Bentler, 2013) was a significant motivation for the present study. Every nation seeks the highest living standards for its people. This requires a stable macroeconomic environment conducive to sustainable capital investment mainly driven by the private sector. Given the risk and uncertainty conditions under which organizations operate, capital budgeting is the planning process of evaluating a firm's long-term investments for funding using the aggregate set of tools/techniques. Capital budgeting involves a large sum of cash outlay in expectation of n future benefits/income/return and thus plays a critical role in economic growth and development by providing the platform for innovation and mobilizing long-term funds to produce goods and services (Drucker, 2007) (Piketty, 2014) (MOCI, 2014 & 2015; (Desai, 2019) (Hillier et al., 2012)). While the capital budgeting body of knowledge continues to grow across nations, a wide range of issues abound due to its multidisciplinary nature and diversity of practices when distinctions are made between practices in the 'developed' economies versus 'developing' or 'emerging' markets like Oman. For example, a review of the current literature indicates no consensus on an accepted comprehensive model that surmises the capital budgeting processes (Cleland, 1998). The central argument of the present contribution is that an SEM application may provide new perspectives on the nature of capital budgeting practice in Oman to support the country's diversification and modernisation drive, which had begun with its Vision 2040.

The extant capital budgeting research in the Omani context (Al Ani, 2015) (Al-Awaid, 2014) (Chazi et al., 2010) has been somewhat focused more on the country's oil sector; hence, the need to extend what we know about capital investment appraisal to the non-oil, industrial sector of an oil-dependent emerging market like Oman. The outcome of such real-sector studies could help to finetune national diversification strategies and policies of which robust capital investment is imperative.

As Arab Gulf economies, including Oman, move towards a knowledge-driven, lower-carbon economy, an evidence-based understanding of capital investment is pivotal to robust economic planning, sustained investment, and economic prosperity (Hindle, 2008) (Nagarajan, 2014). However, there is no consensus on a realistic capital budgeting decision-making model, hence the need for continuing CBT research. Any nation's stock of capital investment is a significant part of the GDP (Piketty, 2014). However, much of the capital budgeting literature in the Omani context has focused on the oil sector while focusing on the more basic project appraisal, like the payback period (Al Ani, 2015). Other studies have focused on managers in different jurisdictions such as the Middle East (Chazi et al., 2010), Canada (Bennauna & Meredith, 2010), Nordics (Brunzell et al., 2013), Indi, (Batra & Verma, 2017), Thailand (Yordudum & Suttipun, 2020), and elsewhere (The World Bank, 2018). The present study was designed to provide further insights into the determinants of capital budgeting practice to provide an evidence-based framework for the policy and practice reforms required to support sustainable, more diversified industrialisation.

Oman is a high-income, oil-dependent economy seeking to diversify its economy for sustainable development of human and non-oil resources. The country possesses about 0.3-0.5 percent of the global proven oil and gas stocks and contributes about one percent of total world production. The repeated vagaries of global oil prices have meant a need to switch towards sustainable economic diversification to ensure the expansion of non-oil sectors and make the economy more vibrant. The country is now a leading regional

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center of manufacturing, ICT, innovation, and entrepreneurship excellence. The manufacturing sector is central to this new vision of globally competitive manufacturers making articles on a large-scale using machinery; they are essential in converting raw materials, components, or parts into finished goods that meet customer needs. The country's manufacturing sector is a top priority for the Oman Vision 2040 agenda of the Government towards achieving sustainable economic diversification and post-carbon prosperity (Kamoonpuri, 2016). The Oman government's goal is to reduce the contribution of oil to GDP at current prices from 44 percent in the eight five-year plans to 20 percent by 2040 (currently 34%).

Similarly, the aim is to raise the relative share of non-oil sectors, including natural resources, to 91 percent of the GDP by 2040. It is contended that robust, comprehensive CBT research in the Omani context.to achieve these lofty developmental goals with potentialities for enhancing the manufacturing sector's contribution to the GDP through increased non-oil exports, job creation, and investments. The industrial sector currently provides a range of non-oil products such as food, cement making, engineering/construction, paper, glass, chemicals, tourism, logistics, etc. Non-oil industrial growth towards reducing vulnerability to oil price fluctuations will be driven by manufacturing firms, particularly petrochemicals, fertilizers, metals, and construction sub-sectors.

There are various theoretical postulates thought to surround the CBT behavior of managers. This includes pecking-order theory, risk-return trade-off hypothesis, agency cost theorem, shareholder-stakeholder trade-off, and shareholder wealth maximization. This research project has tried to explore several of these theories to test their integrity in Oman. In this regard, it is apposite that the respected professor of finance. Still, applicability to transition economies like Oman remains to be investigated. Overall, the preliminary literature review points to a need for further CBT research in Oman. As the country moves toward a more sustainable economic development model, adopting a more comprehensive approach to examining the multi-dimensional relationships that characterize capital budgeting practice in a transitional economy like Oman becomes imperative.

This paper is organized as follows: Section 1 above has provided some background information, including the specific objectives of this paper. Section 2 highlights the literature reviewed and develops the study's hypothesis and conceptual framework. The research methodology, including the definitions for the capital budgeting factors and SEM variables that we investigated, is outlined in section 3. Section 4 highlights the study's results, further discussed in section 5. The conclusion, limitations, and scope for future studies are presented in section 6.

2. Literature Review

This study aims to obtain empirical evidence about the factors that influence sustainable capital budgeting practice in an emerging market's industrial sector, using the structural equation modelling (SEM) or path analysis approach. The findings from such research approaches are expected to lead to the development of innovative capital budgeting practices with resultant effects on sustainable economic growth. While capital budgeting embraces a broad knowledge and is at the core of investment and project management; investment connotes purchasing an expected future cash flow stream (John, 2012) (Desai, 2019) (Umoh, 1997) (John, 2012); few studies have deployed the SEM to generate further insights into the capital budgeting factors to improve the industrial capital investment decision-making process under conditions of uncertainty. SEM is an expanding field with increasing application to various areas because SEM-based methods generally lead to superior estimates (Ullman, J. B., and Bentler, 2013). The SEM is a collection of statistical techniques that permits a set of relationships between independent variables and dependent variables to be examined. The SEM approach has the benefits of helping to elucidate complex phenomena like capital budgeting, more excellent measurement reliability, and, unlike other statistical methods, the ability to test construct-level

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hypotheses at a construct level. The central question asked by SEM is whether the model produces an estimated population variance matrix consistent with the sample covariance matrix (Ullman, J. B., and Bentler, 2013). Thus, as a knowledge-based approach beneficial to strategic planners, the present contribution is inspired by the technological interdependence theory (TIT) of technology and innovation advanced by (Butler, 1988), (Gopalakrishnan & Bierly, 2001) and (Choe, 2014), among others. TIT is one of the three interrelated theories of technological innovation (the others being the product-process concept and meta-learning concept) as valuable tools for corporate strategy. (Butler, 1988) argues that the innovation rate depends on various factors, notably, the stage of organization-wide learning and interdependence between technologies.

Capital budgeting practice has attracted high and increasing research interest among researchers in several jurisdictions as a management decision-making technique. Still, there is no consensus on its strategic constituents; hence this study represents an attempt to fill this knowledge gap. The SEM approach has been extended to various fields in management science, but the methodology has not gained traction among capital budgeting researchers. The SEM methodology has been applied to deepen our understanding of infrastructure development (Shaaban et al., 2021), human capital development (Schaap & Olckers, 2020) (Balcerzak & Pietrzak, 2016a) (Balcerzak & Pietrzak, 2016b), and construction project management (Al Maktoumi et al., 2020) (Doloi et al., 2011). Research has been conducted in various places such as Spain, Sri Lanka, Europe, Africa, and elsewhere. Perhaps one of the most comprehensive studies using the questionnaire approach (Mubashar & Tariq, 2018) examined the CB decision-making practices among Pakistan-listed firms and analyzed the responses related to corporate demographics and management attributes. The study evaluated emerging trends in CBTs such as discount rates and risk assessment methods, discounted cash flow, net present value, internal rate of return, modified internal rate of return, the weighted average cost of capital, capital asset pricing model (DCF, NPV, IRR, MIRR, WACC, CAPM,) and sensitivity/scenario analysis. The study found that Pakistani firms favoured the DCF/NPV technique rather than IRR. In the same vein, (AlKulaib et al., 2016) used a structured questionnaire to examine CBPs in Kuwait and found that, generally, Kuwaiti companies preferred simple CBTs over complex CBTs. However, unlike previous studies, non-financial considerations such as age, educational qualification, management levels, years of experience, and company size play influential CBT roles in the Kuwaiti complex. Similar studies from the US (Gitman & Forrester Jr, 1977) had focused on this qualitative angle of CBPs. This is an instructive finding considering that Kuwait is GCC like Oman, the study area of the present contribution. This underscores the need for a SEM-based contextual study to ascertain what obtains in the Oman business environment.

The research to date also appears to have been primarily limited to the use of the survey technique and descriptive statistics as in the study that analysed large Brazilian firms' capital budgeting practices, comprising 51 companies traded on the stock exchange (Souza & Lunkes, 2016). The researchers found that PBP, NPV, and IRR were the most prominent CBTs in Brazil and that there is a general trend toward using more sophisticated CBTs. This is consistent with the findings of (Bennouna et al., 2010) findings from the Canadian business perspective, suggesting that most firms use NPV and IRR techniques; only some percent use the more advanced ROV method. Similarly, looking at the phenomenon from the South African perspective, (Correia & Cramer, 2008) observed some correlation between the CBT approaches of South African firms and their US counterparts in terms of the use of advanced CBTs such as EVA, Monte Carlo simulation, and low target debt-equity ratios. Nevertheless, using such traditional techniques as the DCF/NPV methods, IRR, and CAPM remains widespread among South African corporates. (Brunzell et al., 2013) Used Nordic firms listed on the NASDAQ OMX (Norway) to investigate the determinants for the choice of CBTs and the setting of WACC in five Nordic countries. The researchers found that NPV, firm and CFO attributes were pivotal to the will of CBTs. The Nordic findings appear to be like the outcome of recent Indian CBT research where, based on an analysis of a sample of 77 Indian BSE firms, NPV, IRR, WACC

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hurdle rates, sensitivity analysis, and CEO education were found to be the most relevant to capital investment appraisal (Batra & Verma, 2017).

The empirical literature on the Oman context is relatively sparse, and the available contributions so far point to the enormous research opportunities in the field. For example, while (Al Ani, 2015) found the use of payback period (PBP) to be widespread in Oman, it is noteworthy that the researcher did not find any significant difference between the managers' and investors' viewpoints on the use of PBP for capital budgeting in the country. Some studies like (Chazi et al., 2010), have also examined CBPs in the Arab Gulf region and found CBPs comparable with Europe and North America. It was noted from previous studies in Omani, Bahraini, and UAE contexts that cost of capital, profitability, and firm value were among the determinants of capital budgeting techniques to adopt project appraisal. The earlier findings from (Chazi et al., 2010) would seem to contradict those of (Al Ani, 2015), hence the need to undertake comprehensive SEM-based research to generate more insights that may help design evidence-based policies and reforms in furtherance of national income diversification strategy. To this end, the null hypothesis guiding the present study was framed to test the model fit:

Null hypothesis (Ho): *The hypothesized model has a good fit.*

3. Research Methodology

The study aimed to identify the critical components of sustainable capital budgeting practice in the context of an emerging market's industrial sector, using the structural equation modelling (SEM) approach. Bearing in the correlational posture of the research, the present study has adopted an analytical approach in dealing with the research questions and testing the related SEM hypothesis (Kothari, 2004) (Sidhu, 2006). The study population was the number of specialist managers in capital budgeting engaged in Oman's finance, insurance, real estate, and related sectors. To the National Centre for Statistics and Information (NCSI) (2020), Oman had a total of 30 610 workers in these sectors; an estimated 10% (3,061) of these were reckoned to be involved in capital budgeting activities. The sample size formula for the qualitative variable (Charan & Biswas, 2013) was thus given as follows:

$$\frac{Z_{1-\alpha/2}{}^2 p(1-p)}{d^2}$$

Where $Z_{1-\alpha/2}{}^2$ = the standard normal variate, where, as in most studies, P values are considered significant below .05; hence 1.96 was used in the formula to obtain a sample size of approximately one hundred and thirty-eight. P is the expected proportion of the population based on previous studies, while d is the absolute error or precision decided by the researcher. The study area was Muscat, the capital of the Sultanate of Oman, the country's commercial nerve center, where many significant corporates are headquartered. Muscat is also the most populous region in the Sultanate. Given the specialised nature of the subject matter, the purposive sampling method was used. One hundred and twelve managers participated in the survey conducted in different parts of Muscat, Oman, from September 2020 to January 2021, and targeted managers in publicly listed companies on the Muscat Stock Exchange, MSX30. The managers responded to questions set on a 5-Likert scale bordering on aspects of managerial and organisational attributes, the rationale for selecting specific capital budgeting techniques, the impediments to the use of advanced capital budgeting methods, and the traction of non-financial, environmental, social, and governmental (ESG) factors.

The factor I: Management and Business Profile: The indicators include age, education, working experience, the industrial sector, company's age, size, source of project idea, financing source, project type,

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and the underlying rationale for choosing a CBT. Factor II: Commonly Used Capital Budgeting Techniques (CBTs): The indicators include a wide range of CBTs, including heuristic, the average rate of return (ARR), the Payback Period (PBP), the discounted payback period (DPBP), net present value (NPV), and profitability index (PI). Other capital budgeting methods investigated include the internal rate of return (IRR) and the relatively more advanced capital budgeting techniques (ACBTs) such as the adjusted present value (APV) technique, linear programming models (LPM), the accurate options valuation (ROV) / decision tree analysis (DTA), sensitivity analysis (SA), and simulation / (Monte Carlo) scenario analysis. Factor III: Challenges of Advanced Capital Budgeting Techniques (ACBTs): The aspects investigated include the recognised NPV and IRR's weaknesses, the emerging benefits of the real options approach, availability of training in advanced capital budgeting methods (ACBMs), ACBMs reported complexity, costliness, and time-consuming nature, availability of top management support for the adoption of ACBMs, whether data-driven corporate culture exists, and willingness to adopt new technologies (e.g., artificial intelligence (AI), Big Data, robotics, etc.). Factor IV: Capital Budgeting Financial Factors: The indicators investigated include the NPV, IRR, the weighted average cost of capital (WACC), Capital Asset Pricing Model (CAPM)'s, the cost of equity capital, and government subsidy, and cash flows, and salvage/ residual value. Factor V: Capital Budgeting Nonfinancial Factors: The investigated indicators include the environmental, social, and governance (ESG) considerations, human resources (HR) issues (notably, occupational expertise, health, and safety - OEHS), corporate image management, the CEO's tenure, the opinions of various stakeholders such as the board, the managers, the salesforce, the external experts, and the use of linguistic variables. Factor VI Sustainable Capital Budgeting Policy and Procedures: The indicators investigated include the role of capital budgeting in project planning, availability of clear capital budgeting policy, recognition of a 5-phase capital budgeting system (Project identification, estimation, evaluation, authorisation, and control/monitoring - IEEAC), availability of capital budgeting management information system, and post-audit process policy.

Primary data were obtained using structured questionnaires fillable online; most (84%) of the filled responses were collected physically, while the remainders were submitted online. As mentioned earlier, one hundred and twelve managers (81% of the target sample size) participated in the capital budgeting practices in the Oman manufacturing sector (CBPOMS) survey. This sample size is consistent with Bentler and Yuan (1999)'s suggestions regarding the potential value of a small sample size where SEM is applied.

Confidentiality, busy time schedules, and commercial sensitivity were considered for effective follow-up by emails and physical follow-ups to ensure that the response rate was reasonable and adequate. The data processing procedure followed the procedure for quantitative analysis detailed in Curwin and Slater (2008). Using the IBM SPSS v.23 and analysis of moment structure (AMOS) v.20, descriptive analysis, correlation, and multiple regressions, the SEM approach was applied to determine the strength of the relationship between the latent capital budgeting variables tested in the model. An examination of significance was conducted at a 95% confidence interval. AMOS software was engaged to perform the SEM analysis. The pre-survey model framework is depicted in Fig. 1. The diagram reflects the six broad factors involved in the capital budgeting ecosystem, as established from the review of the extant literature. The model shows the possible interrelationships among notable capital budgeting (CB) factors, including management and business attributes, commonly used and advanced capital budgeting techniques (CBTs and ACBTs), financial and non-financial factors (FFs and BFFs), and sustainable capital budgeting practice (CBP)

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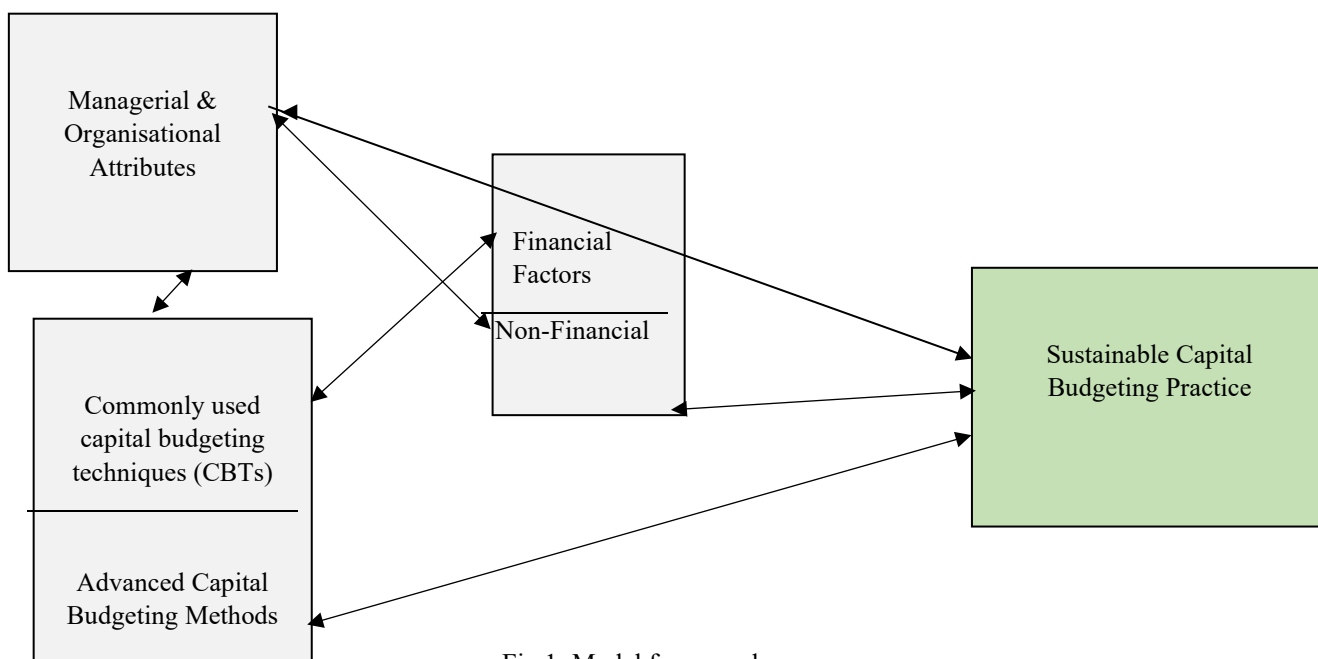J. Fin. Bank. Review 7(2) 107– 121 (2022)

Fig 1: Model framework

The six factors appear in boxes connected by lines with arrows that indicate a covariance among the variables. When this model was tested in the SEM analysis, the absence of a line implied no direct relationship. A moment was taken to confirm that the diagram relationships match the study data. These relationships were directly translated into equations or matrices, and the model was then estimated. Thus, as earlier indicated, the null hypothesis for the test was:

Ho: $\gamma = 0$

Where γ is the symbol for the path coefficient between a dependent variable and an independent variable, the parameter was evaluated with a z test.

4. Results

This study was designed to critically evaluate capital budgeting factors in Oman's manufacturing sector using the structural equation modelling (SEM) approach. To this end, the study examined aspects of organisational and management attributes known from the literature to play a significant role in influencing the choice of capital budgeting techniques and related procedures and policies. In this regard, the analysis of the respondents' profiles showed attributes consistent with the country's national demographics (NCSI, 2020). For example, approximately 89% of the surveyed managers were aged up to 50. Similarly, there is no significant difference between the age groups regarding the investigated capital budgeting factors. Hence, a post hoc test (Duncan) is not necessary. The majority (92%) were well-educated, either university graduates or postgraduates. One out of every three respondents worked in the manufacturing sector; the majority were found to be bankers and financial management professionals. Most (86.6%) managers work with medium-large companies that have operated for between 10 and 30 years. Specifically, 45.5% was recorded for companies used for more than 30 years. About half (51.8%) of the respondents work for companies classified as "large" in their total assets or sales.

An interesting finding from the present study is that the pecking order theory (Hillier et al., 2012) seems to be reflected in the Omani data showing that the top two sources of project financing are equity capital

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(39.3%) and government sources (25%). The business owners themselves represent the most frequent (61.6%) source of the funded projects, followed by the executive management (25%) and thirdly by the finance and marketing departments (tied at 13.4% respectively). Similarly, based on the mean score of 4.0, complying with government rules and regulations represents the critical rationale for selecting a CBT. Surprisingly, the capital structure is considered the least important (3.54); this may be attributed to the developmental stage of the Omani capital market (Al-Awaid, 2014) (Butler, 1988) (Al Ani, 2015).

Appendix 1 displays the descriptive results from the statistical analysis of the six capital budgeting factors identified in the financial management literature, notably the mean scores. Concerning selecting CBTs under Q10, compliance with government rules and regulations (4.0) is the most crucial factor, while capital structure (3.54) is the least important to the managers in Oman. This regulatory factor aligns with the growing influence of ESG issues in financial management (Ajayi, 2009; (Goldman Sachs, 2019) (Goss & Roberts, 2011) Candelon, 2021). Furthermore, the results show the top management's willingness to implement the advanced capital project appraisal methods such as the real options valuation (ROV) approach and AI (3.95), the level of a data-driven corporate culture (3.91), and the level of corporate knowledge regarding the benefits of advanced capital budgeting methods (3.86) are major factors for sustainable capital budgeting practice, while together posing as significant challenges the use of more advanced capital budgeting techniques (Q12). This result validates the observations in previous studies such as those of (Nagarajan, 2014), (Minhaj 2015), (Mahidhar & Davenport, 2018), and (Nieto-Rodriguez, 2021), among others. The corollary results have demonstrated that the commonly used CBTs remain the likes of ARR (3.95) and NPV (3.84), as observed in previous research in the Omani context (Al Ani, 2015) (Al-Awaid, 2014). Thus, the relatively more sophisticated capital budgeting techniques, notably the real options (3.18) and linear programming models (3.14) have not yet gained footing in the Omani capital market. The relatively low level of usage of more advanced capital budgeting techniques in an emerging market like Oman is thus not significantly different from previous findings from a survey of capital budgeting techniques used by Major US firms and other more developed markets around the world (Gitman & Forrester Jr, 1977) (Mahidhar & Davenport, 2018).

In terms of financial and non-financial factors (Q13 & Q14) that the managers consider crucial to sustainable capital budgeting, the three topmost economic factors are cash flows (3.95), followed by NPV (3.96), WACC (3.87), which follow established capital-income theory well documented in the literature (Friedman, 2007) (Hillier et al., 2012) (Desai, 2019) (Damodaran, 2013) (Palepu & Healy, 2016). Interestingly, government subsidy was rated the least crucial financial factor (3.54) in the emerging market context, unlike what may be obtainable in more developed markets. Consistent with the growing sustainability concerns of global researchers (Cornell & Damodaran, 2020) (Goss & Roberts, 2011), the two most cited non-financial factors are HR issues (4.04) followed by ESG issues (3.99). Lastly, in terms of the critical elements for assuring sustainable capital budgeting policies and procedures, the two topmost aspects include clarity of business policy or blueprint (4.10), followed lowed by recognition of a 5-phase capital budgeting system (project identification, estimation, evaluation, authorization, and control/monitoring – IEEAC (4.09). These results appear to be in sync with what we know from several contributions to national economic management policy development literature (Cleland, 1998) (Dornbusch & Fischer, 1990) (Yew, 2011) (Kamoopuri, 2016; (Heagney, 2016) MoCI, 2014) .

Table 1 shows the result of reliability analysis across the six investigated capital budgeting practice dimensions. The findings show that Cronbach's alpha for each size is above 0.70, indicating a high internal consistency for the Likert-type scales used in the research (Renganathan et al., 2012). The Cronbach's alpha values for the perceptions are 0.733, 0.914, 0.814, 0.808, 0.854, and 0.820 for managerial and organization profiles challenges for using ACBTs, financial factors, non-financial factors, and quality of capital budgeting practices, respectively.

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Table 1: Reliability analysis results

S/No	Dimensions	Number of attributes	Cronbach's alpha
I	Managerial and organizational profile	10	0.733 Acceptable
II	Commonly used capital budgeting techniques (CBTs)	12	0.914 Excellent
III	Challenges of using advanced capital budgeting techniques (ACBTs)	10	0.814 Good
IV	Financial factors	7	0.808 Good
V	Non-financial factors	9	0.854 Good
VI	Quality of capital budgeting practices	5	0.820 Good
		No. of items	53

Appendix 2 shows the result of the correlations of the capital budgeting practice dimensions. The results have shown that the correlation between all the factors is highly significant at a 1% level. The regression analysis has the following parameters. Dependent Variable: Quality / Sustainability of CBPs (Q15). Independent Variables: (Constant), Non-Financial factors in CIDM (Q14), Managerial and Organisational Profile / Attributes (Q10), Usage Perception (Q11), Challenges (Q12), Financial factors in CIDM (Q13). The estimated regression values are indicated below:

R = 0.675

R square = 0.456

F = 17.75

P value = 0.000

The p-value at .000 indicates that the R Square is highly significant at a 1% significance level. The regression equation is given as Y = 1.996 + 0.134 (Q10) + 0.061(Q11) + 0.126(Q12) +0.135 (Q13) + 0.063 (Q14), and this equation is highly significant regarding Q10 (managerial and organisational profile), Q11 (commonly used CBTs), and Q12 (challenges of using ACBTs). As a multivariate analytical technique, SEM aims to explain the model of a sequence of interrelated dependent relationships simultaneously among a set of dormant (unobserved) constructs, each measured by one or more manifest or observed variables. The observed endogenous variables used in the structural equation model are (i) Quality / Sustainability of CBPs (Q15), (ii) Financial factors in CIDM (Q13), and (iii) non-financial factors (Q14). The observed, exogenous variables comprise CBTs (Q11) usage and challenges of using ACBTs (Q12). The unobserved, exogenous variables include:

1. e_1 Error term for Financial factors in CIDM (Q13)
2. e_2 Error term for Non Financial factors (Q14)
3. e_3 Error term for Quality / Sustainability of CBPs (Q15)

Hence several variables in the SEM are made up of:
Several variables in this model   :   8
Several observed variables   :   5

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Several unobserved variables	:	3
Several exogenous variables	:	5
Several endogenous variables	:	3

The confirmatory factor analysis (CFA) is believed to provide a more accurate interpretation of dimensionality than the exploratory factor analysis (EFA) technique (Renganathan et al., 2012); hence the CFA (Fig. 2) was used to test the construct validity of the developed instrument.
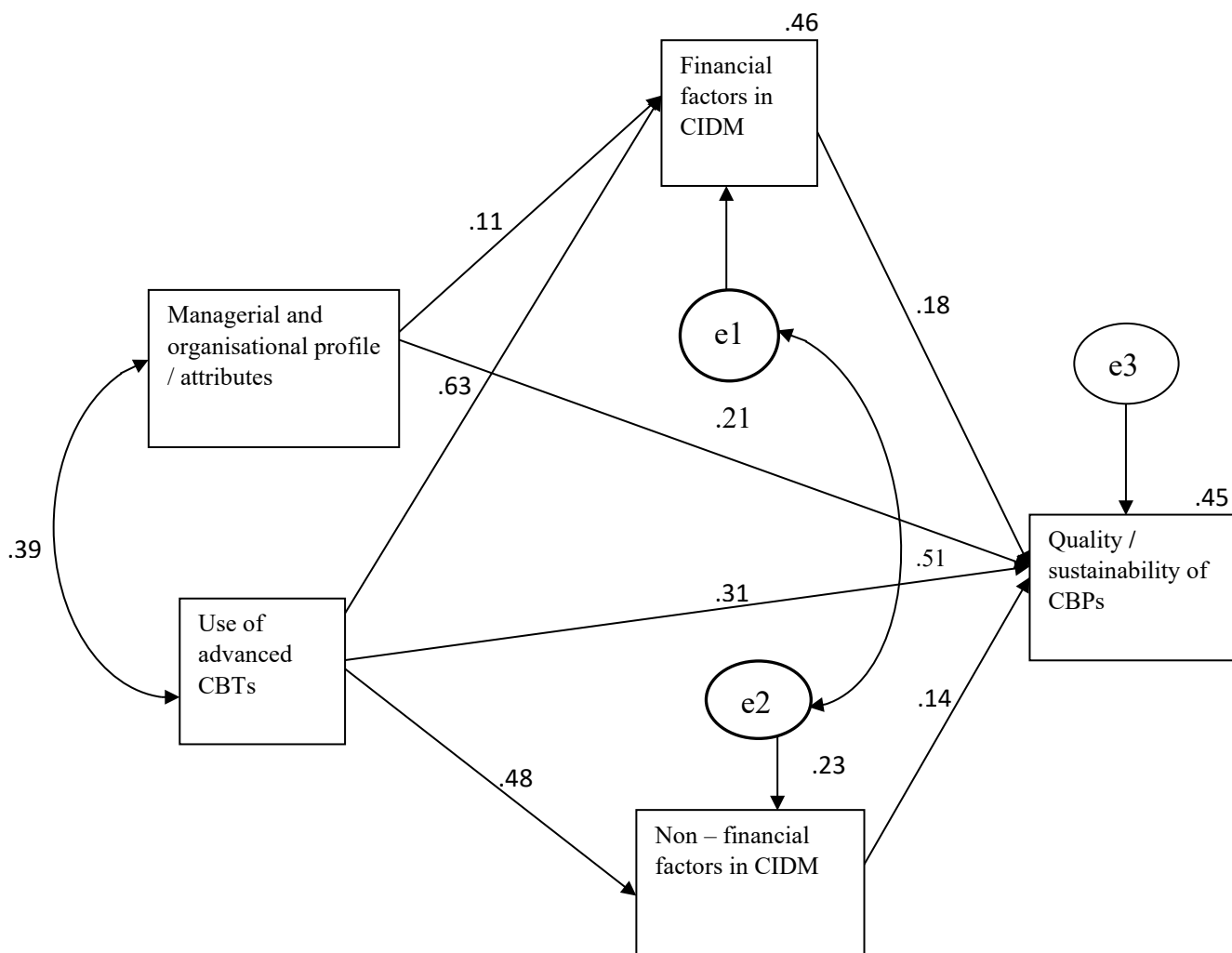

Fig 2: SEM Based on Standardised Coefficient On The CBPOMS Pilot Survey Data, 2020/2021

Appendix 3 shows the Structural Equation Model analysis variables. From Appendix 3, the unstandardized coefficient of Managerial and Organisational Profile / Attributes on Quality of sustainable capital budgeting practice is 0.096 representing the partial effect of managerial and organizational profile/attributes on financial factors, holding the other path variables as constant. The estimated positive sign means that such an impact is positive. Economic factors such as WACC or CAPM cost of equity capital would increase by 0.096 for every unit increase in Managerial and Organisational Profile / Attributes. This coefficient value is not significant at the 5% level.

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Similarly, the unstandardised coefficient of Managerial and Organisational Profile / Attributes on quality of capital budgeting practice is 0.141 representing the partial effect of managerial and organisational profile/attributes on quality of capital budgeting practice, holding the other path variables as constant. The estimated positive sign implies that such an effect is positive that CB policy factors such as clarity of policy and adoption of a five-phase capital budgeting system increase by 0.141 for every unit increase in managerial and organisational profile/ attributes. This coefficient value is not significant at the 5% level.

Based on the standardised coefficients in Appendix 3, it can be observed that the use of advanced capital budgeting methods (ACBMs) relative to financial factors in the capital investment decision model CIDM (0.625) is the most influencing path in this SEM model, followed by using ACBMs on non-financial factors in CIDM (0.484), at 1% level of significance respectively. The rest of the observed relationships are insignificant at a 5% significance level.

Table 2 displays the variables in the SEM analysis. From the results in Table 2, the values of all the items are above the suggested value of 0.5 (Renganathan et al., 2012). A higher level of probability associated with Chi-square tends to be associated with a closer fit between the hypothesised model and the perfect fit (Hox & Bechger, 1998). Thus, as per the result, the Chi-square statistics with a p-value greater than 0.05 show a good fit for the model.

Table 2: Model fit summary of Capital Budgeting Structural Equation Model

Indices	Value	Suggested value
Chi-square value	0.708	-
P-value	0.400	> 0.05 (Hair et al., 1998)
The goodness of Fit Index (GFI)	0.997	> 0.90 (Hu and Bentler, 1999)
Adjusted Goodness of Fit Index (AGFI)	0.962	> 0.90 (Hair et al. 2006)
Normed Fit Index (NFI)	0.997	> 0.90 (Hu and Bentler, 1999)
Comparative Fit Index CFI	1.000	> 0.90 (Hooper et al., 2008)
Root Mean Square Error of Approximation (RMSEA)	0.000	< 0.08 (Hair et al. 2006)

In sum, from Table 2, it was found that the calculated p-value is 0.400, which is more significant than 0.05, indicating a perfect fit. Here, the GFI value (0.997) and AGFI value (0.962) are respectively more effective than 0.9, which means a good fit. Also, the calculated NFI value (0.997) and the CFI value (1.000) suggest it is a perfect fit. The RMSEA value is 0.000 is less than 0.08, thus also indicating the ideal fit of the model.

5. Discussion

The present SEM application to capital budgeting in the Oman context has indicated the presence (model fit) of interrelationships among five broad determinants of sustainable capital budgeting practice – (i)managerial/organisational, (ii) rationale for capital budgeting methods selection, (iii) adoption of advanced capital budgeting methods (ACBMs), (iv) financial and non-financial factors, and (v) effectiveness of capital budgeting policy. The results have generated more insights into capital budgeting practice than previous

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studies. Notably, the impact of ACBMs on financial factors in the capital investment decision model) is observed to be the most influential path in the resultant SEM model obtained from the present contribution. Overall, the model has an acceptable fit by satisfying the recommended values. Thus, using the relatively more advanced capital budgeting approaches such as real options could significantly impact financial and other critical elements tested in this study - Cash flow, net present value (NPV), environmental, social, and governance (ESG) considerations, top management role, and clarity of business policy, etc.- thereby opening the prospects for more integrated project appraisal approaches. These results are broadly consistent with previous studies (Yordudum & Suttipun, 2020) (Cornell & Damodaran, 2020), among others), with important implications for continuing capital budgeting research and capacity development in more advanced project appraisal techniques at the top management level. Additionally, the evidence from the findings in this study shows that, unlike many other market economies, the government/regulatory framework plays a pivotal equity financing role in the study area, but this is expected to shift under Oman's Vision 2040 plan as the Government repositions its economy towards the private sector dominance.

Specifically, in terms of the financial factors (Q13) that the managers consider crucial to sustainable capital budgeting, the three topmost economic factors are cash flows (3.95), followed by NPV (3.96), and WACC (3.87), which follow the established capital-income theory well documented in the literature (Friedman, 2007) (Umoh, 1997) (Hillier et al., 2012) (Desai, 2019) (Damodaran, 2013) Palebu et al., 2016). Interestingly, government subsidy was rated the least crucial financial factor (3.54) in the emerging market context, unlike what may be obtainable in more developed markets. For non-financial factors (Q14) that the managers consider crucial to sustainable capital budgeting, the two most cited non-financial factors are human capital issues (4.04) followed by ESG issues (3.99); this is consistent with the growing sustainability concerns of global researchers (Cornell & Damodaran, 2020) (Yordudum & Suttipun, 2020) (Goss & Roberts, 2011)). Furthermore, the path analysis revealed in Fig. 2 diagram of the multiple regression model has shown the significance of innovative, more sophisticated techniques as critical drivers of sustainable capital budgeting practice; this aligns with the previous postulations, notably (Butler, 1988) (Choe, 2014), and (Nieto-Rodriguez, 2021), among others

Lastly, in terms of the critical elements for assuring sustainable capital budgeting policies and procedures, the two topmost aspects include clarity of business policy or blueprint (4.10), followed by recognition of a 5-phase capital budgeting system (project identification, estimation, evaluation, authorisation, and control/monitoring – IEEAC (4.09). These results appear to sync with what we know from several contributions to national economic management policy development literature (Cleland, 1998) (Dornbusch & Fischer, 1990) (Yew, 2011) (Kamoopuri, 2016; (Heagney, 2016) MoCI, 2014).

In sum, the current research findings show that the CIDM has an acceptable fit by satisfying the recommended values (Bentler & Yuan, 1999).

6. Conclusion

This study was designed to obtain empirical evidence about the factors that influence sustainable capital budgeting practice in the context of Oman's industrial sector, using the structural equation modelling (SEM) approach. The results show that the model has an acceptable fit by satisfying the recommended values. Using relatively more advanced capital budgeting approaches such as real options could significantly impact financial and non-financial factors, thereby opening the prospects for more integrated project appraisal approaches. Cash flow, net present value (NPV), environmental, social, and governance (ESG)

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considerations, top management role, and clarity of business policy are among the determinants of sustainable capital budgeting practice.

While modern computers and software packages like AMOS have made the SEM methodology relatively easy to apply to various sectors, it is essential to bear in mind that there is nothing in the SEM mechanism that conclusively transforms correlational or regression data into causal relationships (Marcoulides & Schumacker, 1996; (Kim & Ulferts, 1996) (Ullman, J. B., and Bentler, 2013). The sample (< 200) for the SEM analysis) was taken from a pilot survey, suggesting room to expand the sample size of managers willing to participate in a further study. Additional data sources may include focused group discussions or workshops with financial and project managers in the industrial sector to revalidate the results from the current research.

Acknowledgments

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