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Firm Performance and Degree of Sophistication of Capital Budgeting Practice: Some Malaysian Evidence

Mohd. Zulkhairi Mustapha and Susan Tho Lai Mooi

Previous findings presented in the finance and accounting literature have indicated a trend towards greater sophistication in capital budgeting practice by firms over time. Theoretically, a firm that employs sophisticated capital budgeting practice should perform better, in term of its profitability, than a firm, which employs less sophisticated capital budgeting practice. However, empirical evidence on this theory provided mixed results. This paper attempts to replicate the previous study to see whether the degree of sophistication of capital budgeting (DOSCB) practice affects the firm performance, in term of its profitability. Using the sample of 42 firms listed in Kuala Lumpur Stock Exchange (KLSE), the results showed that there is insufficient evidence to conclude that the DOSCB affects firm performance.

Keywords: Capital budgeting, profitability, Malaysian evidence.

INTRODUCTION

The survival of a company depends very much on its ability to generate returns from its investments. Capital expenditures required in investment normally involve large sums of money and the benefits of the expenditures may extend over the future. Utilising a systematic capital budgeting process would enhance capital expenditures decisions.

Capital budgeting can be defined as the process of evaluating and selecting long term investments consistent with the firm owners' goal of wealth maximisation [1]. The process could be based mainly on managers' judgement or based on quantitative analysis using scientific and analytical tools. By instituting a systematic capital budgeting decision process introduces procedures to mitigate some of the negative influences of subjective capital expenditure decision making.

Studies on the practice of capital budgeting in many countries have shown that over the years, firms are increasingly employing more sophisticated capital budgeting for making investment decisions [2, 3, 4, 5]. These findings have motivated researchers to study the relationship between the degree of sophistication of capital budgeting practice and firm performance, in terms of profitability.

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THE CAPITAL BUDGETING FRAMEWORK

This study adopted the capital budgeting framework developed by Abdul Rahman [6]. The relationships are depicted in Figure 1.

At the start of the capital budgeting process, firms need to establish long range plans to enable management to improve control over the capital investment decision process. Secondly, within the overall framework of the long-range plan, a long-term capital budget is developed to provide direction for future growth.


Figure 1. Capital Budgeting System.
The next stage is for firms to continuously and systematically search for investment alternatives and after careful review and screening to identify a short list of alternatives for further analysis.

In the project evaluation process, cash inflows and outflows are forecasted and evaluated using techniques, such as payback, internal rate of return (IRR), net present value (NPV) and mathematical programming. Project risks are taken into account by incorporating adjustments for risk. The most popular risk adjustments include probability analysis and sensitivity analysis.

Limiting factors such as capital rationing, scarcity of skilled workers, need to be incorporated into the analysis to minimise potential problems that may arise in the implementation stage. A standard cut-off point as a criterion for accepting or rejecting investment proposals also needs to be determined.

The implementation comes after the approval for the project is obtained. Expenditure control is an important factor in implementation. The purpose is to ensure the project finishes within the estimated timeframe and within expenditure limits, and to take corrective action, if necessary. After implementation, the post audit function is carried out by a formal body to compare project estimates with actual figures as a means of control.

**OBJECTIVES OF THE STUDY**

Firstly, this study seeks primarily to analyse the relationship between the degree of sophistication of capital budgeting practice and firm performance, in term of its profitability. Secondly, the study attempts to provide information on the current capital budgeting practice utilised by Malaysian firms. Additionally, this study would contribute to the sparse literature on capital budgeting in a developing country environment, such as Malaysia.

**PREVIOUS STUDIES**

Numerous works of early researchers in capital budgeting were found in the USA and UK [11, 12, 13]. Later studies [14, 15, 16] showed that companies over the years have increasingly adopted more sophisticated capital budgeting practice. In Malaysia, studies on capital budgeting practice are scarce [5, 6]. However, these studies found that the Malaysian firms are becoming more sophisticated in their capital budgeting practice.

The trend towards the adoption of more sophisticated capital budgeting created an interesting area for researchers to investigate: whether such sophisticated practice leads to better profitability. Studies conducted in this area produced mix result.
Three studies [2,8,9] found that the mere adoption of sophisticated capital budgeting techniques did not increase the performance. However, two studies proved otherwise [6, 7]. Given the mix results over the years, this study seeks to provide further evidence on the degree of sophistication of capital budgeting and firm profitability.

RESEARCH METHODOLOGY

This study covers the capital budgeting practices of Malaysian companies listed on the Kuala Lumpur Stock Exchange (KLSE). The sample firms exclude hotels, finance and trust companies.

In theory, we would expect that firms that employed more sophisticated capital budgeting practice would be likely to be more profitable. Secondly, we also expect that the capital budgeting practice among Malaysian firms would increased in sophistication over time. The research hypothesis is:

H0: “Firms using more sophisticated capital budgeting practice will perform better, in terms of higher profitability, than firms using less sophisticated capital budgeting practice”

Degree of Sophistication of Capital Budgeting Practice (DOSCB):

The definition of DOSCB is adopted from the study of Abdul Rahman [7]. DOSCB is composed of the following factors:

1. The preparation of a long term capital budget
2. A systematic search for alternatives to investment projects
3. The existence of a formal reviewing and screening body
4. The use of capital budgeting techniques
5. The use of management science techniques
6. Risk analysis
7. Expenditure control
8. Comparisons of project completion time with the estimated period
9. Post completion audits

Information on the above factors is obtained from the questionnaire survey of the sample firms. A respondent is requested to assign a score of ‘1’ if his firm includes a particular factor, and a score of ‘0’ is given if a factor is ignored by his firm in the capital budgeting process.

As firms may view the importance of each of the nine factors differently, weights are assigned to each of the nine factors [7]. DOSCB is computed using the following formula.
\[
\text{DOSCB} = \sum_{i=1}^{9} \lambda_i F_i
\]

where

\( F_i \) the \( i \)th factor from the set of nine factors considered for the computation of the DOSCB,

\( \lambda \) the weighting assigned to each factor, \( 0\% \leq \lambda \leq 100\% \), and \( \sum \lambda = 100\% \).

The weight for each factor is, then calculated based on the following formula:

\[
\lambda = \frac{\sum fx}{n \times 100\%}
\]

where

\( x \) = the ranking given to a factor,

\( f \) = the number of respondents that assigned \( x \) as the ranking, and

\( n \) = the total of \( fx \) for each factor

**Firm Performance**

Firm performance is represented by two measures in this study, the return on assets (ROA) and the earnings per share (EPS) which have been also used by previous capital budgeting studies [6,7]. ROA is computed based on the following formula:

\[
\text{ROA} = \frac{\text{Net Income After Tax}}{\text{Total tangible assets (excluding financial assets)}}
\]

EPS is an established and traditional way of reporting profitability to equity investors. A basic EPS computation as defined by the Malaysian Accounting Standard No. 13: Earning Per Share (2000) is used for the purpose of this study.

**Data Collection and Analysis**

A questionnaire survey is used to obtain information on the capital budgeting practice of the responding firms. Secondary data for the computation of ROA and EPS are extracted from the companies’ annual reports obtained from the Sequencer Database.

Using the Statistical Package for Social Science (SPSS) regression analysis and t-tests are conducted to test the research hypothesis. The regression equations are as follows:
ROA = $a_0 + a_1 \text{DOSCB}_1 + U$
EPS = $b_0 + b_1 \text{DOSCB}_1 + V$

Where
\[ a_0, b_0 = \text{constant terms} \]
\[ a_1, b_1 = \text{regression coefficients} \]
\[ U, V = \text{random terms} \]

The t-test is used to test the difference between the mean profitability of two groups of firms, namely firms with high DOSCB and firms with low DOSCB at 0.05 level of significance. The sample firms are categorised into three main categories: low DOSCB (with DOSCB of less than 60%), average DOSCB (with DOSCB of between 61% to 80%), and high DOSCB (with DOSCB above 81%).

**RESEARCH FINDINGS**

*Capital Budgeting Practice*

Forty-six questionnaires were collected back from the responding firms. However, only 42 responses (21%) are found to be usable. Table 1 shows the usage of the nine factors in the capital budgeting process by respondents in this study and corresponding findings in the studies of Abdul Rahman [6]. Findings on these nine factors are discussed in the following paragraphs.

<table>
<thead>
<tr>
<th>Capital Budgeting Factors</th>
<th>% of Respondents Using Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Study</td>
</tr>
<tr>
<td>Preparation of a long term capital budget</td>
<td>35.7</td>
</tr>
<tr>
<td>Systematic search for alternatives to investment projects</td>
<td>90.5</td>
</tr>
<tr>
<td>Existence of a formal reviewing and screening body</td>
<td>90.5</td>
</tr>
<tr>
<td>Use of capital budgeting techniques</td>
<td>97.6</td>
</tr>
<tr>
<td>Use of management science techniques</td>
<td>35.7</td>
</tr>
<tr>
<td>Risk analysis</td>
<td>71.4</td>
</tr>
<tr>
<td>Expenditure control</td>
<td>100.0</td>
</tr>
<tr>
<td>Comparison of project completion time with the estimated period</td>
<td>97.6</td>
</tr>
<tr>
<td>Post audit</td>
<td>78.6</td>
</tr>
</tbody>
</table>

(a) Preparation of a Long Term Capital Budget

Only 36 percent of the responding firms indicate that they prepare
long-range (defined as more than 5 years) capital budgets as compared to Abdul Rahman’s [6] findings where 71.4% of his respondents do so. A possible explanation could be due to the volatility of the economy in the last five years, including the recessional period of 1997/1998, which makes long term planning seem futile.

(b) Systematic Search for Alternatives to Investment Projects and Existence of a Formal Reviewing and Screening Body

Majority of respondents (more than 90%) stated that they systematically search for alternatives to investment projects and employed a formal body to evaluate them before deciding on the acceptance of a project.

(c) Use of Capital Budgeting Techniques

Almost all the responding firms (97.6%) use at least one capital budgeting technique in evaluating their capital expenditure proposals. Table 2 shows the usage of capital budgeting techniques, and almost 86% of the respondents indicated that they use a combination of techniques, rather than just one technique in isolation.

The most popular combination is indicated by 24% of the respondents that used all four methods; NPV, IRR, ARR and Payback. These results are generally consistent with Ruhana [5] where these two combinations of capital budgeting techniques are also the most popular as indicated in Table 2.

Table 2. Usage of Capital Budgeting Techniques

<table>
<thead>
<tr>
<th>No. of Techniques Used</th>
<th>Capital Budgeting Techniques Used</th>
<th>Current study</th>
<th>Ruhana 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 NPV, Payback</td>
<td>5 11.9</td>
<td>3 0.8</td>
</tr>
<tr>
<td>2</td>
<td>2 NPV, IRR</td>
<td>3 7.1</td>
<td>3 2.4</td>
</tr>
<tr>
<td></td>
<td>3 NPV, ARR</td>
<td>3 7.1</td>
<td>2 2.4</td>
</tr>
<tr>
<td></td>
<td>4 NPV, Payback, IRR</td>
<td>2 4.8</td>
<td>3 3.2</td>
</tr>
<tr>
<td></td>
<td>3 NPV, Payback, ARR</td>
<td></td>
<td>2 2.4</td>
</tr>
<tr>
<td></td>
<td>2 NPV, Payback, IRR</td>
<td>9 21.4</td>
<td>8 12.0</td>
</tr>
<tr>
<td></td>
<td>3 NPV, Payback, ARR</td>
<td>3 7.1</td>
<td>3 5.6</td>
</tr>
<tr>
<td></td>
<td>2 NPV, IRR, ARR</td>
<td>2 4.8</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 Payback, IRR</td>
<td>2 4.8</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 Payback, ARR</td>
<td>1 2.4</td>
<td>3 2.4</td>
</tr>
<tr>
<td></td>
<td>1 IRR, ARR</td>
<td>1 2.4</td>
<td>2 2.4</td>
</tr>
<tr>
<td></td>
<td>2 IRR, ARR</td>
<td>1 2.4</td>
<td>3 3.2</td>
</tr>
<tr>
<td></td>
<td>4 NPV, Payback, IRR, ARR</td>
<td>10 23.8</td>
<td>55.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42 100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 3: Standard Payback Period and Rate of Return

<table>
<thead>
<tr>
<th>Standard Payback Period</th>
<th>No. of Firms</th>
<th>Percentage</th>
<th>Standard Rate of Return</th>
<th>No. of Firms</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3 years</td>
<td>7</td>
<td>20.6</td>
<td>&lt; 10%</td>
<td>4</td>
<td>11.8</td>
</tr>
<tr>
<td>3 to &lt; 6 years</td>
<td>18</td>
<td>52.9</td>
<td>10% to &lt; 15%</td>
<td>10</td>
<td>29.4</td>
</tr>
<tr>
<td>6 to &lt; 9 years</td>
<td>7</td>
<td>20.6</td>
<td>15% to &lt; 20%</td>
<td>13</td>
<td>38.2</td>
</tr>
<tr>
<td>&gt; 9 years</td>
<td>2</td>
<td>5.9</td>
<td>&gt; 20%</td>
<td>7</td>
<td>20.6</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>100</td>
<td></td>
<td>34</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3 below shows the standard rate of return or payback period that respondents require before accepting a project. The cut-off period for most firms that responded is between three to less than six years (52.9%). Majority of the respondents (58.8%) requires a rate of return of more than 15%.

(d) Risk Analysis and the Use of Management Science Techniques

Most firms (71.4%) take into account risks of a project. Risk analysis techniques used include shortened payback period (SPP), risk-adjusted discount rate (RAD), utility analysis (UA), certainty equivalent approach (CEA), sensitivity analysis (SA), Markowitz approach (MA) and capital asset pricing model (CAPM). The results are shown in Table 4.

Twelve respondents do not have any formal method of adjusting project estimates for risk. Sensitivity analysis, risk-adjusted discount rate and shortened payback period are the most popular risk analysis techniques among the respondents.

Table 4: Usage of Risk Analysis Techniques

<table>
<thead>
<tr>
<th>No. of Risk Analysis Techniques</th>
<th>Risk Analysis Techniques Used</th>
<th>No. of Respondents</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>12</td>
<td>28.6</td>
</tr>
<tr>
<td>1</td>
<td>SPP</td>
<td>3</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>RAD</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>SA</td>
<td>11</td>
<td>26.2</td>
</tr>
<tr>
<td>2</td>
<td>SPP, RAD</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>RAD, SA</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>SPP, SA</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>CEA, CAPM</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>3</td>
<td>SPP, RAD, SA</td>
<td>5</td>
<td>11.9</td>
</tr>
<tr>
<td>4</td>
<td>SPP, RAD, SA, CAPM</td>
<td>3</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>42</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 5 tabulates respondents' use of management science techniques in capital budgeting. Majority of respondents (62%) do not use any of the management science techniques indicated. The most popular methods used are computer simulation and pert/critical analysis.

Table 5. Usage of Management Science Techniques

<table>
<thead>
<tr>
<th>No. of Management Science Techniques</th>
<th>Management Science Techniques Used</th>
<th>No. of Respondents</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>26</td>
<td>61.9</td>
</tr>
<tr>
<td>1</td>
<td>Computer simulation</td>
<td>5</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>PERT/Critical Path</td>
<td>3</td>
<td>7.1</td>
</tr>
<tr>
<td>2</td>
<td>Computer Simulation, PERT/Critical Path</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>Decision Theory, Regression Analysis</td>
<td>2</td>
<td>4.8</td>
</tr>
<tr>
<td>3</td>
<td>Computer Simulation, PERT/Critical Path, Regression Analysis</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Computer Simulation, PERT/Critical Path, Game Theory</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Computer Simulation, Decision Theory, Game Theory</td>
<td>1</td>
<td>2.4</td>
</tr>
<tr>
<td>5</td>
<td>PERT/Critical Path, Decision Theory, Game Theory, Mathematical Programming, Regression Analysis</td>
<td>1</td>
<td>2.4</td>
</tr>
</tbody>
</table>

42 100

(e) Expenditure Control, Comparisons of Project Completion Time with the Estimated Period and Post Audit

As indicated in Table 1, all responding firms controlled the money actually spent in carrying out a major investment project and the money approved for it. Almost all of them evaluated the actual time taken for completion of a project against the estimated period allowed. The importance of a post completion audit is also recognised by 78.6% of the responding firms.

DOSCB and Firm Performance

The average DOSCB among the responding firms is 75.5%, with a minimum DOSCB of 21.6% and a maximum of 100%. Table 6 shows the responding firms' DOSCB.
Table 6. Degree of Sophistication of Capital Budgeting

<table>
<thead>
<tr>
<th>DOSCB Score</th>
<th>No. of Respondents</th>
<th>Percentage</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% to 60%</td>
<td>8</td>
<td>19.0</td>
<td>Low DOSCB</td>
</tr>
<tr>
<td>61% to 80%</td>
<td>18</td>
<td>42.9</td>
<td>Average DOSCB</td>
</tr>
<tr>
<td>81% to 100%</td>
<td>16</td>
<td>38.1</td>
<td>High DOSCB</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

The results of the two linear regression with ROA and EPS as the dependent variables and DOSCB as the independent variable are shown in Table 7.

The F-statistics and t-test indicate that both models are insignificant at 5% level. There is not enough evidence to infer that the DOSCB and firm performance (ROA and EPS) are linearly related. We therefore reject the hypothesis.

Table 7: Regression Results - Firm Performance and DOSCB

<table>
<thead>
<tr>
<th></th>
<th>ROA</th>
<th>EPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>R square</td>
<td>0.0443</td>
<td>0.0190</td>
</tr>
<tr>
<td>F statistics</td>
<td>1.7880</td>
<td>0.7850</td>
</tr>
<tr>
<td>p value (sig)</td>
<td>0.1890</td>
<td>0.3810</td>
</tr>
<tr>
<td>Coefficient</td>
<td>0.0698</td>
<td>0.0034</td>
</tr>
<tr>
<td>T</td>
<td>1.3370</td>
<td>0.8860</td>
</tr>
<tr>
<td>p value (sig)</td>
<td>0.1890</td>
<td>0.3810</td>
</tr>
<tr>
<td>Std error</td>
<td>0.0520</td>
<td>0.0040</td>
</tr>
</tbody>
</table>

The t-test was used to test the difference of means between low DOSCB firms and high DOSCB firms for both the dependent variables. The results of the t-test are shown in Table 8.

Table 13. The t-test results

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>Sig (p value)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>-1.163</td>
<td>0.128</td>
<td>Accept null hypothesis</td>
</tr>
<tr>
<td>EPS</td>
<td>-0.758</td>
<td>0.228</td>
<td>Accept null hypothesis</td>
</tr>
</tbody>
</table>

The t-tests show that the null hypothesis is accepted at 5% level of confidence. There is insufficient evidence to say that the highly sophisticated firm performance is better than less sophisticated firms.

Both the regression analysis and the t-test conducted show that there is
no evidence the adoption of sophisticated capital budgeting practice by a firm brings about higher profitability.

**SUMMARY AND CONCLUSION**

The results show that majority of respondents employ the nine factors in the capital budgeting process except for the 'preparation of long range capital budgets' and the 'use of management science techniques'. Respondents use multiple capital budgeting techniques to assist them in investment evaluation but only a small number of respondents use management science techniques. Risk analysis is carried out by majority of respondents.

The results of the regression analysis and t-test show that the DOSCB does not significantly affect firm performance, measured by ROA and EPS. Theoretically, the use of sophisticated capital budgeting process should increase the effectiveness of the firms' investments decision making. Thus, the results of this study failed to confirm with the theory and the previous Malaysian study by Abdul Rahman [6].

Further studies are needed to test the relationship between the DOSCB and firm performance. Future research could use different firm performance measurements and adopt different methodology to determine DOSCB practice. Future research could also test a larger sample size, and maybe focus on a certain industry to obtain homogeneous data. Further, employing the interview method as opposed to the questionnaire method as used in this study, might increase the quality of input data for analysis.

Although this study has not established a statistically significant association between high DOSCB and firm performance, a systematic and comprehensive evaluation of the costs and benefits of capital expenditure forms the basis for transparent decision making and good corporate governance. This lack of confirmatory evidence of increased profitability through use of more sophisticated capital budgeting practice should not deter firms from continuing the present trend in the adoption of more highly sophisticated capital budgeting process. Furthermore, firm profitability is the outcome of a complex combination of factors in the business environment, making the link between profitability and degree of sophistication in the capital budgeting process much less evident than intuitively so.

In conclusion, usefulness of the findings of this study is enhanced if they can influence finance managers to consider more sophisticated capital budgeting methods in their present practice in light of the knowledge of practices adopted by their counterparts in other firms.

**REFERENCES**


