Flexibility in Investments: Exploratory Survey on How Finnish Companies Deal with Flexibility in Capital Budgeting

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Abstract

Flexibility is an important issue when investments are being planned and valued. How flexibility inherent in investments is utilised and exploited is, therefore, of great importance to the accuracy of the plans and the valuation. This paper describes an exploratory survey, done with leading Finnish companies, exploring the use of Real Option Valuation (ROV), and the methods that Finnish corporations use to take flexibility into consideration, when planning and valuing investments.

We found that real options exist in Finnish investments, but there are very few companies that have an established methodology of identifying, categorizing, or valuing them. We also found that Finnish managers have mixed views about the value of flexibility in investments.

Very few Finnish managers seem to be aware of research done in the field, but most seem to have an intuitive understanding of how different variables affect the value of flexibility in an investment.

Keywords : flexibility; real options; capital budgeting

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1. Introduction

Managers have long relied on discounted cash flow (DCF) methods for assessing the value of investment projects despite the fact that it has been recognised that DCF investment planning methods fail to take the value of flexibility properly into consideration, Kulatilaka and Marcus (1992). Managers have tried to deal with the problems created by the static nature of the DCF methods mainly by using intuition, and by modifying the DCF criteria[1]. However, real options is a new, more sophisticated capital budgeting method that can take managerial flexibility into consideration. The method is based on the idea of using option valuation in valuing real investments. The idea is very old, but the term real options was introduced by Myers in 1977, after the option pricing breakthrough by Black and Scholes (1973). There is now a growing interest on the subject and an increasing number of publications on real options and real options thinking are available.

Many of these have a strategic management focus like Kulatilaka and Marks (1988), Smit and Ankum (1993), Luehrman (1998), and Amram and Kulatilaka (1999). The methods and mathematics of real options are quite well developed, for example, Trigeorgis and Mason (1987), Trigeorgis (1988), Sick (1989), Dixit and Pindyck (1994), Micalizzi and Trigeorgis eds. (1999).

Another issue that can be assessed with real options is the optimal time of investment under uncertainty. Literature includes a number of articles with a focus on optimal investment under uncertainty, for example, Abel (1983), Martzoukos and Teplitz-Sembitzky (1992), Kulatilaka and Perotti (1992), Micalizzi (1999). Furthermore, there are a number of web sites disseminating information about real options.

Despite the recognition of the drawbacks of current tools and the fast development of real option theory, option pricing has so far not been used very much in the evaluation of corporate investments. Reasons for this are that the idea is relatively new, it is mathematically not as straightforward as DCF methods, and practicable models have not been available for use by companies. There are, however, articles depicting use of real options in the corporate word, for example, Kemna (1993), Kulatilaka (1993), Benaroch and Kauffman (1996), Busby and Pitts (1997), Laughton (1998). So far real option valuation has been mostly used in evaluating natural resource investments and research and development. It seems that the real real option revolution is still to come.

Latest developments in real option valuation include fuzzy real option valuation to eradicate false impressions of certainty in future cash flows, Carlsson and Fullér (2001), Collan, Carlsson, and Majlender (forthcoming), and including qualitative information into fuzzy real option valuation, Collan and Majlender (forthcoming).

[1] Managers often use higher discount rates than the real cost of capital and/or accept NPV-negative projects because of their "strategic importance"

This paper presents an exploratory survey made in Finland to find out how well managers in Finnish companies perceive and assess flexibility in investments, and how well they are aware of the research done on the subject. The aim of this paper is to give a picture about the investment planning culture in Finland, rather than to test hypotheses on the subject. Examples of previous studies about Finnish capital budgeting decision-making are Kasanen, Virtanen, Laine and Matinpalo (1993), Keloharju and Puttonen (1995), and Wikman (1997).

The next section of this paper describes the method used in the survey. Section 3 will analyse the results and conclusions. Finally section 4 will present a summary of the conclusions.

2. Method

The study is based on a questionnaire, sent in April 2000, to 86 Finnish companies listed in the Helsinki Exchanges (HEX) main list in December 1999. The questionnaire consisted of four pages, and included thirteen questions. The purpose was to find out to what degree Finnish managers are acquainted with flexibility in investment and to find out what kind of investment planning tools and methods are in use at present. Real options were of special interest in the survey. Real options, or the real options way of thinking were, nevertheless, not emphasised in the survey. This was done deliberately, since it was our scope to find out how Finnish managers view flexibility in investments, and if they are aware of the research conducted on the subject, and of the terminology used in the literature. The term options was used in only one question.

Of the thirteen questions, seven were quantitative and four semi-quantitative. The semi-quantitative questions were questions, which asked the respondents to further specify on a yes-no question, or otherwise on a numerical question. Two questions were qualitative, where the respondents were asked to answer to open-ended questions. The respondents were also asked to give feedback on the survey. They were also asked if they were interested in assessing flexibility in investments. The questionnaires were available in Finnish, Swedish, and English.

Thirty-six (42%) answers were returned of which thirty-two were useful and four were either blanks, or included an explanation why the questions were not answered. There was no intention of generalising the results and drawing general conclusions concerning a larger population. Respondents were asked to state their name, job title, and contact information. Most of the respondents had a title that suggested a senior, or very senior position within the firm. The respondents were assured anonymity, and that the identity of their company would not be revealed.

3. Results and conclusions from the survey

In the first question of the survey the respondents were asked to remember how many larger investments (>> 1 million FIM)[2] of various types their company does annually on average. In some responses it was stated that the company makes countless investments which are larger than FIM 1 million in size, and the managers indicated that the figures they provided were not very precise. The different types of investments given were expansion, efficiency, environment, maintenance, research and development, real estate, personnel, and divestment. The respondents were also asked to indicate how much money was spent on research and development as a percentage of the turnover, and to tell how much they spent on investments in the personnel in thousands of FIM.

By adding the number of investments in the different categories we hope to get an idea of the total number of investments made by different companies. The companies that have a high total number of investments were expected to have more advanced procedures of investment planning, and a better knowledge of real options. This, of course, means the larger companies were expected to have better readiness to value investments, than smaller companies. Companies with high ratio of research and development costs were expected to have better overall knowledge of the importance of flexibility in investments, than the average company.

A total of 28 usable answers were returned to question 1. The respondents estimated on average a total of 890 annual investments, of which the largest posts are investments on maintenance (310 investments), efficiency (217 investments), and research and development (110 investments). It seems that the most companies had made investments in efficiency (23 of 28). Other types of investments made by most companies were real estate (22 of 28), maintenance (21 of 28), and expansion (20 of 28). Investments in research and development were made by 17 companies, of which in two answers the number of investments could not be quantified. Divestment had the smallest number of occurrences (7 investments by five companies), to personnel (22 investments by seven companies), and to environment (28 investments by 13 companies).

The research and development investments by percentage of turnover varied between 0.01% and 10%. On average, the investments on research and development were 2,9% of the turnover.

Flexibility in the investments was the main focus of the second question. The recipients were asked to divulge information on how often the possibility for different types of flexibility was exhibited in their investments. Existence of the possibility for flexibility implies existence of real options. The different types of flexibility listed in the question were possibility to postpone investment, possibility to abandon investment, possibility to grow, possibility of technical change, and possibility of rescaling the investment. In the survey five alternative percentage intervals were given, each 20 percentage points in size, from zero up to 100 percent.

[2] Approximately EUR 170.000

On average the possibility for flexibility was found in 41-60% of all investments. The averages in different types varied only slightly - the average for existence of flexibility to abandon the investment was lowest, existing in 21-40% of the investments, where possibility for the other mentioned types of flexibility existed in 41-60% of the investments. Averages do not reveal the whole truth and, therefore, it was chosen to present the numbers also in a different way. In table 1 below the percentage responses are presented as a proportion of all responses to each respective type of possible flexibility. Median responses are underlined. The survey reveals that abandonment is clearly perceived to have the smallest likelihood of occurrence. Sixty-four percent of investments include only a 0 to 20 percent chance of abandonment. On the other hand, this makes the option to postpone more valuable. Indeed, postponement together with growth, are the most common types of flexibility. However, this may also be, because the managers seldom understand, or accept abandonment of an investment or a project to be an option in the first place. In addition, if abandonment is openly announced as a possibility, it may cause the organisational commitment to the investment to be less solid. After the results from the first question, where we saw that divestments were clearly the least made form of investment with only 7 occurrences of the total of 890 investments, this result is no surprise. The survey reveals that 64 percent of investments include only a 0 to 20 percent chance of abandonment.

Table 1. Frequency of possible occurrence of types of flexibility in capital investments (percentage responses*)

Frequency (%)	Postponement	Abandonment	Growth	Re-scaling	Technical change
0-20%	23	<u>64</u>	21	26	30
21-40%	17	11	25	<u>32</u>	<u>37</u>
41-60%	<u>30</u>	18	<u>21</u>	16	17
61-80%	20	4	21	19	10
81-100%	10	4	11	6	7

* In this and the following tables, percentage responses are calculated as a proportion of those answering each question. Underlined cells represent median responses. Columns may not add up to 100 due to rounding errors.

Postponement and growth are acknowledged to be the most possible types of flexibility in investments, calculated by combining the 61-80% and 81-100% classes. This is in concord with the results obtained by Busby and Pitts (1997).

The third question concentrated on how much importance is attached to flexibility in investments. The managers were asked how important they think it is that a project includes different kinds of flexibility, when they are making investment decisions. They were asked to rate flexibility to postpone investment, to abandon investment, to have growth opportunities in the investment, to re-scale the investment, and to have a technological change in the investment. A scale from one to six was used, where one represents meaningless and six very important. A scale of six possibilities was chosen in order not to include a “middle alternative”. Since flexibility can be built in, and looking

at the results from the previous two questions, one could expect that the same types of flexibility that occur most often, will also be viewed by the managers as the most important ones. On the other hand, we must not rule out the possibility that a causality of the inverse type exists, i.e., the managers who understand a type of flexibility important, are more prone to identify the existence of the same type of flexibility in investments.

Neither proved to be the case, as flexibility to adapt technical change in the investment was rated to be the most important (rated by most managers to be important or very important). The possibility to abandon the investment was deemed the least important, it was rated by half of the respondents to be meaningless, or fairly meaningless. The results can be observed from Table 2. It seems that the possibility to abandon a project is neither appreciated, nor often exercised in investments of the HEX main list companies. Fifty percent of the managers answered that possibilities for technical change are important or very important in an investment – this reflects the perception of the shortness of the production cycle, and of competition based on development and innovation.

Table 2. The importance of different types of flexibility in investment decisions (percentage responses)

Importance	Postponement	Abandonment	Growth	Rescaling	Technical change
Meaningless	13	17	10	10	7
Fairly meaningless	7	33	10	26	13
Not especially important	17	13	17	10	13
Moderately important	27	10	17	19	13
Important	30	17	24	29	33
Very important	7	7	21	6	17

Underlined cells represent median responses

The fourth question asked the respondents to rate how well different terms stand for flexibility that is found in their investments. The terms were “anticipated”, “necessary”, “available”, and “exploited”, and they were asked to be rated on a scale from one to four, where one represented the case where the term is a bad description, and four a very good description of flexibility. The answers will implicitly tell about the attitudes and the level of preparation that Finnish managers have towards flexibility in investments. The results show that managers do not anticipate having a lot of flexibility in their investments, but they understand it as being necessary in investments (62 percent of the answers stated that flexibility is well or very well described by the term necessary). It seems that if flexibility is available in an investment, it can also be exploited as 76 percent of the responses indicated that available is a good, or a very good description for flexibility, and 58 percent indicated that the term exploited describes the flexibility in their investments well, or very well. It seems that in the

planning stage of investments flexibility is not systematically taken into consideration, but managers intuitively understand the dynamic nature of a life cycle of an investment.

The fifth question was a qualitative question, which asked the respondents to list terms other than listed in the question above, in their opinion reflecting the importance of flexibility in investments. The answers to this question were few, which further portrays the present ways, in which investment planning is done, without taking flexibility systematically into consideration. The answers were, more or less, in line with real options thinking. Efficiency was mentioned most often (higher NPV means lower downside risk), back door (option to abandon), and reserve (financial slack) were other good terms mentioned. Some of the answers took flexibility as a negative thing, and said that "not having planned" (the investment) describes flexibility, i.e., they interpreted having flexibility in an investment is a result of a failure in planning.

In question six the managers were asked to tell which of the listed methods of assessing flexibility are in use in the companies they work for. The methods listed were simulation models, sensitivity analysis, rules of thumb, no methods, and other methods. The managers were also asked to identify the rules of thumb they were using, and also to give a description of the other type of methods they were employing. (The question does not expect that the companies are using the methods to assess flexibility in a real options mindset, but in a general way, for example, to back up decisions made on NPV criteria.) More than eighty-five percent of the managers responded that they were using sensitivity analysis, when planning their investments. Thirty-eight percent indicated that they had rules of thumb, unfortunately, only two responses specified the kind[3]. One fifth of the companies use simulation models, and roughly fifteen percent of the managers answered that there were no systematic methods to assess flexibility in investments in use. One of the companies uses external assessment of flexibility for their investments. Some remarks concluded that when an investment has been started, and has ended up in a situation where the costs have exceeded the expectations, the schedule and funding have been re-balanced, but the investment has not been abandoned, however, the flexibility has not been assessed beforehand. One answer stated that quick payback is the best form of flexibility, which of course can be said to also be true, since liquidity is flexibility, and since requiring a high discount rate takes account of the downside risk.

The seventh question asked the managers to rate the importance of three specified variables on flexibility, on a six alternative scale, ceteris paribus. The variables were time for which flexibility is available, level of uncertainty, and interest rate. The managers were also asked to identify if the variables had a negative or a positive effect on the value of flexibility. Table 3 presents the results from the question.

The temporal availability of flexibility is seen as important or very important by forty-eight percent of the responses. Fifty percent of the respondents saw the level of uncertainty important, or very important for the value of flexibility. Unexpectedly,

[3] The rules of thumb were both about the length of the payback period.

sixty-eight percent indicated that they thought uncertainty has a negative effect, even if logically in times of uncertainty flexibility is more valuable. The results on interest rate are more dispersed, and it cannot be said on the basis of the results, if it is seen as fairly unimportant or as important. Interest rate is seen as having a negative effect on value of flexibility by sixty-eight percent of the respondents. These findings are not on all points

Table 3. Importance of variables to the value of flexibility (percentage responses)

	Time available	Uncertainty	Interest rate
Meaningless	4	7	11
Quite meaningless	9	14	18
Not especially important	13	11	32
Quite important	35	18	21
Important	35	36	21
Very Important	13	14	7
Positive effect	69	32	16
Negative effect	31	68	68*

* 16 percent responded that the effect is neutral or depends on the interest rate

compatible with real options theory. Most strikingly against theory is the fact that uncertainty is seen to have a negative effect on the value of flexibility by the respondents.

The next three questions concentrate on the existing investment planning tools that the Finnish companies have at their disposal, and the managers' thoughts about the need to assess flexibility. The managers were asked, if they have a computerised system for planning investments. Very surprisingly, less than half of the answers stated that such a system existed. According to the results fifty-seven percent of the companies that participated in the study do not have a specific computerised decision support system for planning their investments. The respondents were also asked to specify the kind of computerised system they have for planning the investments. Most companies using a computerised decision support system seem to have spreadsheet based forms for calculating the plans, either add-on packs for existing spread sheet applications, or self-made forms for them.

The managers were asked to indicate, which methods of planning investments were in use in their respective companies. They were offered six different possibilities: Internal Rate of Return (IRR), Net Present Value (NPV), Return On Investment (ROI/ROCE), Payback, Economic Value Added (EVA), and Other. The most used method was

Payback, which was in use by 90 percent of the respondents. Internal Rate of Return was in use by sixty-five percent of the respondents, and Net Present Value by little over sixty percent. Return On Investment was used by fifty-five percent of respondents and Economic Value Added by forty-two percent. Other methods were used by only six percent of the respondents. Real Options valuation of investments would fall under this category. It can be said that more than half of the companies use three or more methods, when planning their investments. This result indicates that companies have computers at their disposal for planning investments, but less than half of them have a specific investment software, or other systematic computerised way of assessing their investments.

The managers were asked, if in their opinion there is a need for a systematic method for assessing flexibility in investments. They were asked to rate the need for such a method on a four point scale, where the alternatives were there is no need at all, there is little need, there is need, and there is a lot of need. Fifty-two percent of the responses stated that there is little need for a systematic method to assess flexibility in investments. Six percent said there is a lot of need for such a method. The six percent were not the same companies that already have other methods of planning investments in use. Thirteen percent indicated that there is no need for such a method, and twenty-nine that there is a need for a method. The result clearly indicates that real option valuation methods have gained very little ground in the Finnish world of business.

The managers were asked if they had had investments with inherent flexibility, and if it had been there by chance, or if it was intended to be there. They were also asked to specify the kind of flexibility that had existed, or the kind of investment that had enclosed the flexibility. Little over half of the answers stated that there had been investments with inherent flexibility. The different types of investments and flexibility that the companies had had included investments into foreign areas, which had enclosed possibilities of further growth and flexibility in the timetables of the investment. When investing in foreign countries some of the companies also kept a special reserve for unexpected costs, they had also acquired options on delivery prices of products. The most common type of flexibility found in the investments was flexibility in the timetable of the investment. Investments that had been made on technology often contained flexibility. Many responses stated that the companies had set milestones for investments, and that reassessment was made on fixed points in the lifetime of the investment.

The respondents were asked about their knowledge of the terminology used in the literature. They were asked, how well they knew terms Real Options, Growth Options, and Operating options, and they were asked to rate their knowledge on a four point scale, where the alternatives were “unknown”, “heard of”, “known”, and “in use”. Table 4 summarises the results.

From the results it is obvious that the real options thinking, or the real options valuation of investments have not gained ground among Finnish business managers. Also, knowledge about the other types of options is very limited. Under twenty percent of the

respondents report having knowledge of the three types of options, and none reported having the terminology in use. Over half stated that the term real options was unknown

Table 4 Knowledge of the managers about terms used in the literature (percentage answers)

	Real options	Growth options	Operating options
Unknown	52	35	48
Heard of	29	52	42
Known	19	13	10
In use	0	0	0

to them. Terms operating options and growth options were also not common to the respondents, as only ten respectively thirteen percent of the answers stated that the terms were known.

4. Summary of conclusions

The two largest targets of investments were maintenance and efficiency, the smallest was divestment. Abandonment of an investment is not commonly regarded as an available form of flexibility, perhaps, also due to want of maintaining organisational commitment. Postponement of investment and growth of investment were seen as the most common types of flexibility, where as technical change was seen as the most important kind of flexibility in investment. The Finnish HEX-listed companies seem to use mainly sensitivity analysis as a way to assess flexibility in investments. Rules of thumb were in use by roughly one third of the respondents.

Surprisingly general uncertainty was seen as negative, rather than positive to the value of flexibility, contrary to real options theory. This we attribute to the fact that flexibility in investment is not a factor that has had exposure in the Finnish business world, and its characteristics are, therefore, fairly unknown to managers. Also, in investments without flexibility uncertainty is most always a negative factor.

Payback is the most commonly used way to evaluate investments. It is, nevertheless, not used as the only way to plan the investments. The results show that companies usually have three or more methods of investment planning in use. No answers indicated that real options valuation was in use, however, not an insignificant proportion of the answers stated that there was a need or a lot of need for a systematic method to assess flexibility in investment. Surprisingly, less than half of the answers indicated that there was a specific computer system in use for evaluating investments. Companies that have a specific computerised system in use for investment planning are using mostly programs tailored for spreadsheet applications.

Knowledge of the managers about the terminology used in the literature was very limited. Under one fifth of the managers admitted to having knowledge of the term real options, and none had it in use in their companies. Terms growth options and operating options were not common to the respondents. Based on the results of this survey we can say that real options as a way of thinking, nor as a concept have reached managers in the Finnish companies. Also, the perception of managers on flexibility in investment is based on tricks of the trade, rather than on well-established systematic ways of conduct. We found no evidence of larger companies, or companies with a higher ratio of research and development costs, having better knowledge of real options.

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