A MULTIDIMENSIONAL FRAMEWORK FOR STRATEGIC DECISIONS

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Abstract. Literature offers a wide variety of approaches for solving strategic decisions in the firm. Within firms one can often observe a clear gap between the strategic and financial evaluations of major decisions. In this paper we describe how different types of evaluations are being made, describe the gap between the approaches and give some reason for its existence. Since we are convinced that a more integrated approach to solving decisions is desirable, we present a synthetic framework.

Given the nature of the decision problems involved, the framework allows for both quantitative and qualitative information. In addition, the framework is quite naturally one which encompasses a multiplicity of goals, constraints and viewpoints. In this way the multicriteria decision methodology offers a tool for learning and communication, bringing together disciplines and approaches which would otherwise be hardly capable of communicating. The framework is illustrated by a real-life example of a new product decision in a Finnish drug company.

1. Introduction

The focus of strategic management (SM) literature and its practical implementation is clearly changing [7], [14], [15]. Earlier approaches to SM concentrated on the use (or lack of use) of analytically rational decision processes and pictured the task of intelligent management as that of failure to act rationally [11], [12]. Strongly associated with the concept of intelligent management is that of rational choice, i.e. the specification of well-defined objectives and pursuit of those objectives by means of gathering information to assess alternatives in terms of their possible future consequences and choosing actions expected to fulfill objectives (in finance we had and have the expected utility approach towards this type of decisions). In other words, normative decision models have been successfully applied to **well-structured and well-specified decision situations** [21], but have proven ineffective for strategic decision-making processes, because strategic decisions are far from well-structured and the decision situations are far from well specified [8], [2], [3], [4], [5], [6].

The key question in a firm's strategic decision is: *how can future performance of an activity be improved*, i.e. how to estimate the effects on performance when changes in an activity either through decisions taken by the company or as a result

of third party actions? What still makes things more complicated is that even if a decision is taken over a specific action it is highly uncertain what ex post performance will actually result from that activity. In this paper we adopt the view that part of the uncertainty is caused by a number of external forces which cannot be influenced by a decision maker, and that many of the key elements central to strategic decision-making are implicit. It is therefore difficult for the decision maker to explicitly describe them and at times even to be aware of their existence. It is therefore not so strange that these elements are left out of decision-making models. To illustrate this problem we will describe a case from the real-life business world, where the task was to develop a decision support system (DSS) for a Finnish drug company to support their strategic management process. The conceptual framework was based on Porter's competitive framework [16], [17]. We defined strategic management as **the process of creating a sustainable competitive advantage (SCA)**. The source of a firm's SCA was it ability to manage its critical success factors (CSF). Hence, our case company, called C-3, **had to manage their CSFs better than their competitors** [10]. There were six CSFs and eight competitors. Hence, The CSFs were the criteria by which an SCA was determined.

This may seem like an easy task, however, only one of the CSFs was quantitative, the other five were qualitative and as we will describe in section two this was a source for considerable difficulty.

In this paper we present a framework for strategic decisions which consists of two main parts: One is concerned with a performance evaluation which results in the identification of firm characteristics - both quantitative and qualitative - that affect the firm's performance, taking account of the influence of external sources of risk that are beyond the control of management. The second part of the framework is directed towards the strategic management of the firm characteristics, again taking account of uncertainties. We are in this paper using firm characteristics and CSFs as synonymes. This framework still only on the conceptual level and the real-life case described here illustrates the necessity for dealing with this issue. In future work the authors intend to test the framework in order to aquire a proper validation of the framework.

The performance evaluation is based on an approach by Spronk and Vermeulen [19], in which in the first step the firm's perfomance is partly explained by a series of firm characterisitics. The unexplained part is then explained as the impact of external risk factors beyond the control of the firm. This is done by measuring the firm's sensitivity for unexpected changes in the risk factors. The firm's sensitivities can themselves be viewed as firm characteristics, but in the approach they are related to the firm charcteristics that were mentioned in the first place. This approach will be described in some more detail in section 3. This framework was originally developed to support decisions in finance and this paper explores the possibility of using the same approach in a strategic management context. Hence, the approach that has thusfar included relatively 'hard' and measurable firm characteristics only, will now be extended as to include qualitative charactersitics.

The performance evaluation yields insight not only into the relative strengths and weaknesses of the firm but also into the determinants of these strengths and weaknesses: being the firm's sensitivities for external risk factors. In this way,

strategic management obtains a series of instruments through which the firm's performance can be manipulated. This issue will also be discussed in more detail in section 3.

2. Managing a successful drug release: feedback from reality

In the early nineties, a Finnish drug company, here called C-3, developed within three years from a minor player to the leading company in the antidepressant drug market. The study was done during the years 1990 thru 1993. In 1990 C-3 had less than 5% of the market share, in 1993 they held nearly 40% of the antidepressant market. A key to this rapid change was their release of a new antidepressant that held superior qualities compared to the competitors' products. But this was not the only explanation. The new drug possessed qualities fundamentally different from the existing ones, in terms of efficacy and tolerance, that it altered the whole market. Furthermore, the company had superior knowledge in marketing. This conclusion comes from the fact that they lacked funding to support the relaese through heavy advertising campaigns, instead they had to use other marketing and sales promotion methods such as personal selling. The use of sales personnel can be even more successful, but it requires entirely different skills than advertising. Sales forces create a push effect whereas, advertising create pull effects, thus they function from a different perspective, yet their objective is the same - to promote a product. Common to both is that the result of the actions taken may not show immediately (advertising is likely to show sooner) in terms of revenue, but will show immediately in terms of cost. When there is an increase in performance it may be difficult to determine which action actually caused the effect on performance.

Although the drug was successful, and still is (today they have over 50% of the market), we all know that there will be a time of saturation (cf. product life cycle) on the market. What is more threatning for a drug company and likely to set in before market saturation is the expiring of patents, both will have a declining impact on sales. As a consequence, the company faces decisions over whether to invest more in marketing efforts or to harvest and focus its resources on the next success drug coming in the pipe-line.

In the discussions with the chief executive officer (CEO) of C-3 it was determined that in the pursuit of a sustainable competitive advantage (SCA), which was the objective of the strategic management process, C-3 had to manage certain critical success factors (CSFs) better than their competitors. These CSFs were determined as **product quality, good reputation, R&D, wide product range, new products, marketing resources, and marketing knowledge.** We soon found that with the exception of marketing resources all others were descriptions of some competensies, that nobody seemed to have a clear idea on how to quantify them but it was considered necessary and good to quantify them. Marketing resources refered directly to the amount of money available for marketing, not number of marketing personnel or the skill and competence level of the personnel. Hence, in the strategic management process, the decisions involved taking into account multiple criteria, in terms of CSFs for our firm, but at the same time to consider the performance of the

competitors vis à vis these CSFs. Once this was agreed on it quite soon became clear that some CSFs were more important than others, i.e. they would have a greater impact on the performance, and naturally, that some of the eight competitors were stronger than the others. Therefore, our first task was to aquire a ranking of the CSFs and then a ranking of how the CEO's perception of how the competitors managed their CSFs compared with C-3.

At first the CEO was asked to rank the CSFs according to their importance and then he was to rank C-3s level of performance with referens to the most important competitors which were eight, using a semantic scale known as a competitor strenght grid (CSG) [1], [10]. This did not prove successful as basis for quantifying simply because the CSG was too vague. After allowing the manager to do the same ranking using Expert Choice, based on the AHP [18], we finally acquired a good ranking. Now we had weights for the CSFs and for the competitors. However, reasoning in terms of weights was new to the CEO. After further discussions we came up with a different suggestion for the CEO.

We suggested that each CSF had some maximum and minimum value on sales and the CEO could well estimate these values for a specific product. Thus, each CSF when added together gave the total market share value of this drug. The CEO could also estimate these values for the competitors' products and he could even estimate what impact any action by a competitor would have on his own products. And he could do this several years into the future. The negative value effects were estimated according to a worst-case scenario. The AHP ranking was consisitent with the maximum value estimates (the CSF with the highest weight also had the highest possible impact in sales).

In our work with C-3 the through out the project the objective had been to develop a DSS that would enable the user to model both quantitative and qualitative elements. With the system, MOCK (Many Options on Complex Knowledge), the CEO could conveniently monitor the impact of each CSF on the performance, and he would know the value of the CSF. In Fig. 2 one display of the system is shown. Here the CEO can choose a specific year (1994), whereas the estimated sales for that year (37500) is displayed. He can then choose a CSF (provided that something has taken place on the market) and indicate this change (either negative or positive) by scrolling the positive or negative bars accordingly. When he has made the necessary changes the changes will **update** the market share value (sales) in a different display with the financial data. hence, the CEO can immediately assess the impact of changes in CSFs and is thus better prepared to react to changes in the overall business environment.
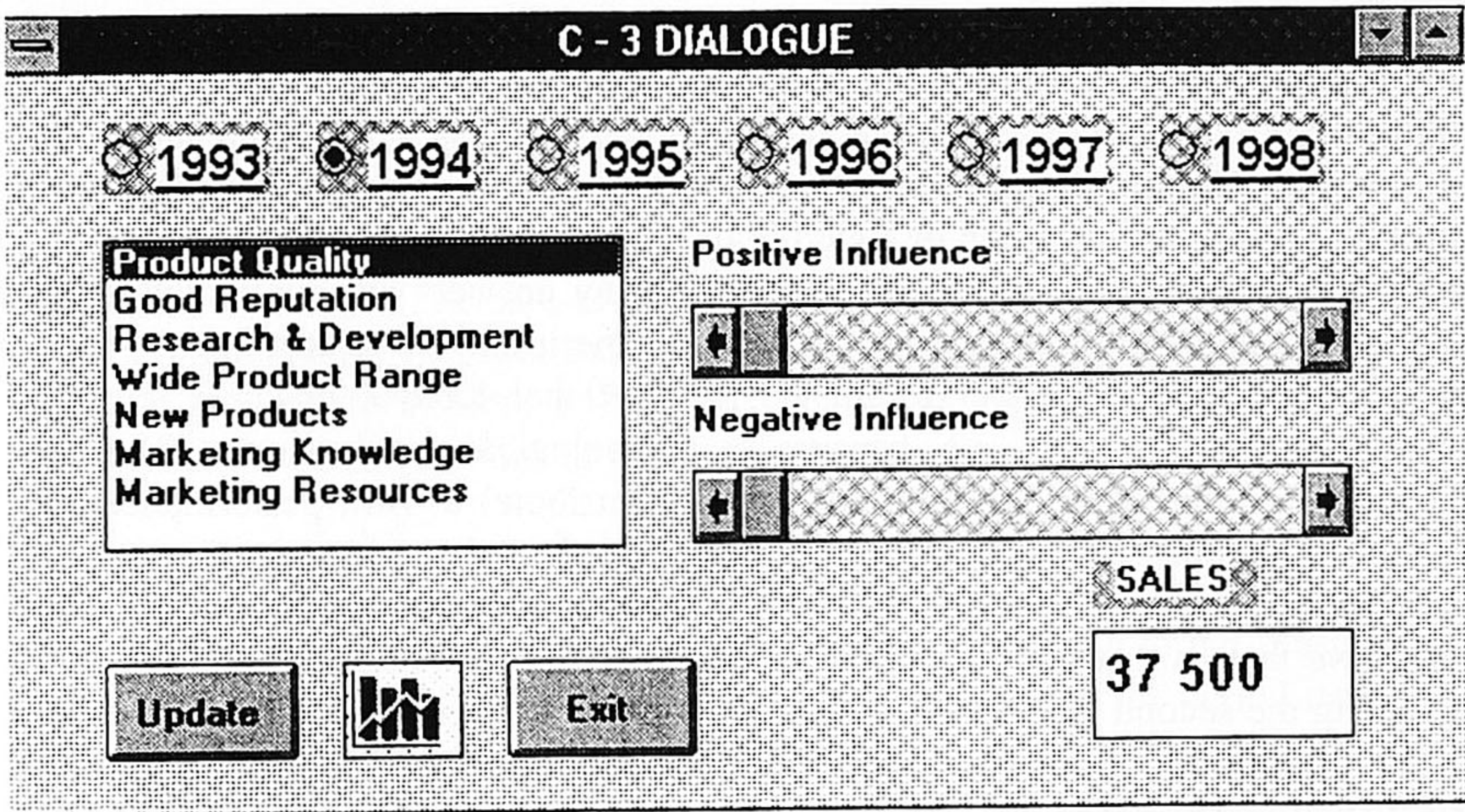
Fig. 2: Quantifying CSFs

3 The framework

In this section we will first describe the performance evaluation (PE) part of our framework for strategic decisions. Immediately after that, the second part of the framework, directed towards the strategic management (SM) of the firm characteristics, will be described. The purpose of the part of the framework dealing with PE is to identify firm characterisitics - both quantitative and qualitative - that affect the firm's performance, taking account of the influence of external sources of risk that are beyond the control of management.

The PE is based on an approach by Spronk and Vermeulen [19] in which in the first step the firm's performance (assume for the moment that we can define a single performance measure P_t, being the performance over the period (t-1,t)) is partly explained by a series of N firm characterisitics $(C_{1,t-1},.....,C_{N,t-1})$ at time t-1[1]. The unexplained part of performance is then explained as the impact of M external risk factors $(f_1,...,f_M)$ beyond the control of the firm. This is done by measuring the firm's sensitivity $(b_1,...,b_M)$ for unexpected changes in these risk factors. The firm's sensitivities can themselves be viewed as firm characteristics, but in the approach they are related to the firm characteristics that were mentioned in the first place [22]. Thus, $b_m = b_m(C_{1,t-1},.....,C_{N,t-1})$ or in other words, the characteristics of the firm

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[1] For simplicity, we assume the firm characteristics to be given and fixed during the period (t-1,t). As shown in Spronk and Vermeulen [19] more realistic assumptions can be handled in straightforward manner.

do determine how the firm react on its environment. Two questions arise almost automatically: One, which are the firm characteristics contributing to the firm's performance and secondly, what are the external factors influencing this performance? Especially with respect to the first question, many answers - both theoretical and empirical - can be found in the literature. Yet, there is by no means a single and clearcut answer. On the contrary, many answers are contradictory and even in case an answer seems to be true at one time it may be rejected again within one year. Part of an answer to this is the fact that today's business world is increasingly fast changing, e.g. because of technological developments. The firm characteristics that contributed (or seemed to contribute) to firm performance may fail to do so tomorrow.

The second question is hardly dealt with in the literature, because it involves many qualitative factors that are difficult to model. We believe that by investigating and answering the second question (even if only partly), the answer to the first question also comes nearer[2]. One argument is that characteristics which help to explain the firm's reaction to unexpected changes in the environment and thus indirectly explain unexpected changes in the firm's performance, are also good candidates for explaining the expected value of the firm's performance.

The drug industry can provide us with a an example of the role of unexpected changes in the environment and how these can effect performance. Let us recall Fig. 2 with the CSFs, where one of the CSFs is **good reputation**. When the CEO for C-3 estimated the maximum positive and negative impact on company performance (which here was sales) the impacts were FIM 5 million positive and FIM 30 negative. This was explained by a worst case scenario. Suppose the company was involved in an environmental accident where the company for example polluted a river. This would have effects on company reputation and would affect sales of all drugs, not just one specific. Yet, in case the company would introduce and announce some environment-friendly production methods, the effects were estimated to be not any higher than FIM 5 million (good news having less effect on market value than bad news). Nevertheless these estimates have not been verified, because 'good reputation' is tacit and indeed difficult to grasp - yet strategically very important and some estimation is needed. Another example - not included in MOCK - is the impact of government regulations that can have a huge impact on profits, and where the short-term and long-term effects may be quite different from one another. Here we must stress that government regulations normally also affects the competitors.

Thus, the empirical questions to be answered are the following:
- What are the external risk factors influencing the firm's performance?
- How sensitive is the firm for each of these risk factors?
- How do these sensitivities depend on the firm's characteristics?

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[2] Vermeulen, [22], tries to explain part of the change in performance by changes of the firm characteristics by the firm during time t-1 and t.

Some factor candidates are not hard to be identified. In fact, inspection of the cash flow statement of a firm does already yield a number of factors. For instance, energy prices and wage rates will influence the cash outflows of any airline. In these examples, it may even be relatively easy to measure the sensitivities to unexpected factor changes. Most airlines know exactly what a one percent change in the oil price would mean for the size of its cash flow. In other cases, in which it may be more complicated to measure the sensitivities, the approach by Vermeulen, [22], and Spronk and Vermeulen, [19],. may be useful. First, the sensitivities b_m are assumed to be linear functions of the firm's characteristics:

$$b_m = b_m(C_{1,t-1,...,}C_{N,t-1}) = \sum_{n=1}^{N} b_{mn} C_{n,t-1}, \text{ for m} = 1,..., M. \quad (1)$$

Where b_{mn} denotes the contribution of firm characteristics n to the sensitivity for external factor m. Next it is assumed that, at the beginning of the period over which performance is measured, the external risk factors can be identified and that the expected end of period values of these factors can be assessed/estimated. However, it is also assumed that only systematic risk factors (persistent influences like dollar risk or interest risk) can be identified and that there are always lots of idiosyncratic risk factors that together cause deviations from expected performance. Performance at time t becomes thus a stochastic variable, which can be written as

$$P_t = E_{t-1}(P_t) + UE_{t-1}(P_t) \quad (2)$$

with $E_{t-1}(P_t)$ being the end of period performance expected at the beginning of the period and $UE_{t-1}(P_t)$ being the part of end of period performance which was not expected at the beginning of the period. The expected performance can be thought of as a function of the firm characteristics and the expected values of the systematic risk factors:

$$E_{t-1}(P_t) = E_{t-1}(C_{1,t-1,...,}C_{N,t-1}, E_{t-1}[f_1],..., E_{t-1}[f_M]) \quad (3)$$

The unexpected part of performance becomes

$$UE_{t-1}(P_t) = \sum_{m=1}^{M} \left\{ UE_{t-1}[f_m] \cdot \sum_{n=1}^{N} b_{mn} \cdot C_{n,t-1} \right\} + \varepsilon \quad (4)$$

with $UE_{t-1}[f_m]$ being the unexpected risk factor change and ε the total (unexpected) effect of all idiosyncratic factors. Spronk and Vermeulen [19] use relations (2), (3), and (4) to estimate the reaction of firm characteristics to unexpected factor changes (b_{mn}) and then use (1) to estimate the reaction of individual firms to unexpected factor changes $(b_m)^j$ with J = 1,...,J being the index of the firm in the sample[3].

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[3] By estimating the firm sensitivities via the sensitivities of firm characteristics it becomes possible to use panel techniques instead of straightforward cross-section techniques. In

Thusfar, empirical studies with this model include 'hard' firm characterisitics only (examples are the firm's debt ratio, sales in different product groups, number of personnel, etc.). Within the framework for strategic decision, it is clearly opportune to include some qualitative firm characteristics in the analysis, as has been discussed in section 2 and in this section. The result of the analysis can be summarised as risk profiles of every individual firm in the sample. A risk profile is the vector showing the firm's sensitivities for the risk factors concerned. In many cases, the risk profile will also include the expected future performance of the firm. Looking at the CSFs of C-3 we realise that all but one is purely quantitative. **Marketing resources** is the only that is quantitative; number of people involved and amount of money available. The other factors are qualitative by nature, yet the CEO was able to estimate the maximum positive and negative effect of each CSF on sales. What is important to realise with the CSFs is that when the CEO of C-3 made his estimates he was considering his own firm's performance and the competitors' performance, based on the knowledge he had on them.

4. Conclusion: Towards strategic management

Because the firm's sensitivities are measured by estimating the sensitivities of the firm characteristics, the PE yields insight not only in the relative strengths and weaknesses of the firm as a whole, but also in the determinants of these strengths and weaknesses; being the firm's characteristics, both hard and soft. There are several types of instruments which can be used to change the firm's characteristics. Vermeulen et al., [23], mention *level changing instruments* and *flexibility instruments*. In addition, the firm may have instruments at its disposal, labeled *transformation instruments*, that transform the unexpected change of the risk factor. One example of level changing instruments is the possibility to change the firm's amount of debt. Another is its possibility to change the number of employees. By changing its amount of debt, the firm changes its sensitivity for changes (both expected and unexpected) in the interest rate. By changing the number of employees, the sensitivity for changes in the wage rate is manipulated. A flexibility instruments is an instrument which gives the firm the *possibity* to change the sensitivity, depending on the realization of the change in the risk factor. One example is the possibility to call temporary workers when and if the production volume increases over a certain level. Another example is the possibilty to change the product range offered depending on changes in the market. An important difference between level changing and flexibility instruments is that the latter can be used to react to unexpected factor changes whereas the former type of instruments require a decision on the sensitivity level before knowing the realized factor changes. However, in many cases, flexibility instruments have to be acquired and or developed before they can actually be used. For example, considering an expedition through the Sahara desert, most people would prefer to buy a decent toolbox before

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addition, it may be safer to assume that the sensitivity of firm characteristics for some risk factor remains approximately the same for some periods than assuming that the firm sensitivity for the same factor remains the same.

the trip starts and not to wait until they might actually need to use that toolbox. By definition, the value of the risk factors are beyond the control of management. Nevertheless, transformation instruments may help to limit the effect of these risk factors by passing part of the risk on to other parties. These instruments are generally packed as contracts that are made between two parties or which are traded in (often financial) markets. An example of the first type is a fixed price-fixed volume-fixed quality contract for the delivery of goods. Another example is a bank loan with a cap on the otherwise flexible interest rate. Examples of the second type are financial futures and swaps. Hardly any instrument comes free. The 'price' of an instrument may be directly monetary, but other possibilities do exist: for instance by changing a labour intensive process for a capital intensive process, there is not only the direct effect on the cash flows but also there is a change in the risk profile becoming less sensitive for the wage rate and more for the interest rate.

Every strategy considered by a given firm can be viewed as a particular constellation of instruments, yielding a particular portfolio of firm characteristics. The portfolio determines both expected future performance (cf. (3)) and unexpected future performance (cf. (4)) of the firm. The choice between alternative strategies thus boils down to choosing between different risk profiles (which in this case also include expected future performance given the strategy concerned). In doing so, trade-offs are not only concerned with preferences, but also - probably implicitly - with the assessment of the evaluation of the uncertainty surrounding the respective risk factors. For example, different strategies may yield different sensitivities for the unexpected change in the energy price. Now the trade-off between energy price and e.g. wage rate risk will be different when management believes that energy prices will become very volatile than in the case management believes energy price will remain stable.

The proposed framework for strategic management is explicitly related to performance evaluation. It is multidimensional, both with respect to perceptions and with respect to preferences. It can include both hard and soft firm characteristics. The reactions of the CEO's confronted with this framework were unanimously positive. The issue for future research is now to validate the framework by performing several test with data from several different firms. The case described in section two is only a partial verification that this framework originally intended to support financial decisions also is applicable in ill-structured and ill-defined strategic management contexts.

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