New product performance indicators: time horizon and importance attributed by managers

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Abstract

New product performance is one of the most relevant areas in academic literature because its description has potential implications in companies' growth and success. In particular, this paper provides a deeper insight into the time horizon and the importance attributed by managers to each performance indicator at project level. Several analytical models prove that (market-based, customer-based and financial-based) performance dimensions vary, depending on the method of construction (through a mean score of performance indicators or using the importance attributed by managers to the various performance indicators) both in the short term and in the long term. The relevance of these findings is discussed, along with their implications for managers when studying product performance determinants.

Keywords: new product performance, importance of indicators attributed by managers, short term, long term.

1. Introduction

New product performance is a very important topic for managers and researchers alike. From a managerial perspective, the description of new product performance is essential when it comes to revising new product development strategy decisions (Millson and Wilemon, 2006), launching strategy decisions (Chiu et al., 2006) and analyzing the contribution of new product performance to the value of a firm (Pauwels et al., 2004). Accordingly, a substantial number of publications have tried to identify the best way to define new product performance from a theoretical (Cordero, 1990; Hauschildt, 1991) as well as an empirical point of view (Griffin, 1993; Griffin and Page, 1996; Storey and Easingwood, 1999).

Despite such academic efforts, few attempts have been made to synthesize and empirically test such classification schemes (Huang et al., 2004; Palmberg, 2006). Moreover, according to Henard and Szymanski (2001), the frequently challenging results obtained from analyzing new product performance determinants are partly the result of an incorrect description of new product performance. There are several contributions that can increase our knowledge in this area.

The first contribution of this research has to do with the distinction between short-term and long-term new product performance. Most works that include new product performance in their analysis evaluate new product performance as a global measure and do not typically distinguish between short-term and long-term performance. Such a distinction has provided essential conclusions when analyzing the various stages of the new product development process (Hart et al., 2003), studying the effects of communication strategy (Lee and O´Connor, 2003) or explaining initial competitive positioning (Green et al., 1995). However, there is still a lack of agreement regarding the best way to distinguish between short-term and long-term performance and the consequences of such a distinction.

A second contribution stems from the idea that managers do not attribute the same level of importance to different performance indicators. Hultink and Robben (1995) has demonstrated that managers value performance indicators differently (a firm can, for instance, obtain a good market share and a poor ROI, but managers may consider the ROI performance indicator more important when they evaluate the performance of a new product for strategic or other purposes). Moreover, the importance of these performance indicators may vary based on the time horizon (short-term versus long-term). In line with Wheatley (1988), it is our position that, traditionally, the importance attributed by managers to various performance indicators at project level has thus far received insufficient attention in academic research.

Another contribution related to the description of new product performance is based on the way new product performance dimensions are developed. According to well-known methodological studies like Podsakoff et al. (2003), academics should use multi-item scales to define new product performance dimensions (instead of using a single item, for instance ROI, to analyze a firm's financial performance, managers use a multi-item scale based on different performance indicators, such as ROI, income and/or profit). Thus, in order to develop the performance dimensions, academics usually design the measure through a mean score of the various performance indicators involved (Langerak et al., 2004). This means that all performance indicators are awarded the same importance. The question is, however, whether using the importance managers attribute to these performance indicators (i.e. using a mean weighted measure rather than of a mean score) significantly affect the results of studies in this area?

Finally, in investigating the new product development activities, researchers face a twofold task: in addition to having to describe new product performance (Huang et al., 2004), they must study the new product performance determinants (Cooper and Kleinschmidt, 1987; Kakati, 2003). It may be reasonable to expect new product

performance determinants have a different impact on the two types of performance dimensions: a) non-weighted (using a mean score, not taking the importance attributed by managers to performance indicators) and b) weighted (using a weighted mean score, weighting performance indicators according to the importance attributed to them by managers). This issue requires further research because, as Hart and Craig (1993) has argued, different definitions of performance could lead to different results with regard to new product performance determinants.

Accordingly, the objective of this study is to understand how new product performance should be described and measured. To that end, we start with a thorough review of existing literature surrounding the project level performance indicators and dimensions that are most frequently used (market-based, customer-based and finance-based). Subsequently, we summarize the different approaches to measuring short-term and long-term new product performance and the implications on new product performance description. Next, we discuss the relevance of considering the importance attributed by managers to each performance indicators and the consequences when performance dimensions are developed. Finally, we look at the possible implications of using weighted performance dimensions instead of traditional mean scores in the analysis of new product performance determinants.

We believe that by addressing these gaps, this study will improve the measurement of new product performance dimensions. From a managerial point of view, according to (Huang et al., 2004), greater knowledge of the outcomes managers expect from new product development activities will help them allocate their resources more effectively. To this aim, this paper is organized as follows. First of all, we present the theoretical background and hypotheses. Next, we explain the research method we have used and conclude by discussing the implications of our findings.

2. CONCEPTUAL BACKGROUND

2.1. New product performance indicators and dimensions at project level

Empirical research in new product performance is made difficult by its multidimensionality and different levels of analysis (Palmberg, 2006). One of Hart and Craig (1993), most important findings is that performance dimensions vary depending on the level of analysis (firm, program or project). Accordingly, authors such as Hooley et al. (2005) or Hult et al. (2004) have measured performance at firm level by assessing the profitability or sales growth. Others, including Atuahene-Gima (2005) and Cooper and Kleinschmidt (1995a) have focused on describing performance measures at program level, based on program impact and profitability. By contrast, other authors, for instance Hultink and Robben (1999) and Langerak et al. (2004), focus on the project level of analysis, identifying performance indicators ranging from financial to customer-based measures.

The unit of analysis of our study is the project level. Our position is in line with Palmberg (2006), as it appears that firm-level or program level studies overlook the true diversity of innovation activities within firms.

There is a large body of literature dealing with the most suitable performance dimensions at project level (Table 1). Griffin (1993) and Griffin and Page (1996) offer comprehensive reviews of the most relevant new product performance dimensions at project level (customer acceptance, financial performance, product level and firm level) that have been generally accepted by academics and practitioners alike. In recent years, new contributions around performance dimensions (strategy-based, market-based, etc.) have been suggested (Langerak et al., 2004; Storey and Easingwood, 1999). However, as Huang et al. (2004) and Lee and O´Connor (2003) have recently demonstrated, the three product performance dimensions generally accepted by academics and managers are market-based performance, customer-based performance and financial-based performance.

Insert table 1 about here

Market-based performance evaluates the results of a new product in terms of the level of success of that product in the market. Several authors, including Cooper and Kleinschmidt (1987) and Hultink and Robben (1999), have included market-based performance indicators, such as number of units sold, penetration rate and market share. Customer-based performance looks at the impact of a new product in terms of customer behaviour. Consequently, a number of performance indicators, for example customer satisfaction and loyalty, have been widely used by various authors, including Lee and O´Connor (2003). Financial performance is one of the most commonly used measures to analyze the outcomes of a firm's decisions, and many researchers, including Hart (1993) and Moorman and Miner (1997), have used financial indicators such as profit and return on investment.

3. Hypotheses development
3.1 Time horizon: short and long term new product performance

The idea of measuring new product performance at different points in time was suggested by Cordero (1990), who introduced the time horizon after observing product outcomes during the development and launch stages. Subsequently, Hart and Craig (1993) have argued that it is preferable to include measures that indicate how a company will perform in the future, rather than merely focusing on the present. This was later tested empirically by Hultink and Robben (1995), who analyzed new product performance indicators in different moments of time. Few other studies (Hart et al., 2003; Tse et al., 2003) have measured new product performance in both the short and the long term, although Henard and Szymanski (2001) considered this aspect a priority when examining the determinants of new product performance.

To distinguish short-term and long-term new product performance, several approaches have been proposed:

1. As a percentage of the product life cycle. Some authors, including Hultink and Robben (1995), have argued that the short term should be defined as the first 25% of a product's life cycle, and the remaining 75% should be seen as the long term. The problem with this method is that it is difficult for managers to apply a percentage to each product in order to distinguish between the short term and long term.

2. Based on the number of years a product has been on the market. This approach has been used by various researchers (Green et al., 1995; Moorman and Miner, 1997), but it would require studying each product independently because of its specific characteristics (some product may last longer than other in the market).

3. Based on the product life cycle stages. This method is based on the notion that the short term should be defined as the introduction and growth phases of a product's life cycle, and the long term as the maturity and decline phases (Lee and O´Connor, 2003). This method has been widely used by academics in recent years.

We believe that the third approach is the more appropriate one, for several reasons. First of all, managers clearly understand the product life cycle stages and what they represent in strategic terms. In addition, it is relatively simple for managers to use, as they do not need to estimate percentages or product life (first method) or the number of years the product has been in the market (second method). Overall, we propose that a time-related distinction based on the product life cycle will make it easier to identify how managers give different both short-term (introduction and growth stages) and long-term (maturity and decline stages) performance indicator ratings. Accordingly and based on the prior discussion, we propose:

H1: Performance indicators ratings for the short term (introduction and growth stages) and the long term (maturity and decline stages) will be different.

3.2 The importance attributed by managers to each performance indicator

When surveying firms with regard to academic research, a frequently heard criticism is that academics and practitioners measure different aspects of new product performance. Basically, academics focus on different performance indicators or treat all performance indicators as equally important. Thus, there is a gap between what academics do and the real decisions managers are faced with, and several studies have shown that the importance attributed by managers to the various performance indicators is an important issue.

As demonstrated by Wheatley (1988), the introduction of competition has made some indicators more important than others. In line with this, Hultink and Robben, (1995) has been a pioneer by introducing the idea that firms do not attribute the same value to short-term and long-term performance indicators. These authors have suggested that there are several market-related and firm-related characteristics that influence managers' perception of which performance indicators are more important in the short-term or in the long-term. Unfortunately, other researchers in later studies have not adopted this approach.

Our position is that it is crucial to understand the consequences of the importance attributed by managers to the various performance indicators. Specifically, we believe that distinguishing between the short term and the long term based on the product life cycle, in contrast to the approach based on the percentage of product life proposed by Hultink and Robben (1995), may be more appropriate when it comes to distinguishing the importance attributed by managers to the various performance indicators, which is why, in line with our previous argument, we propose that:

H2: The importance attributed by managers to the various performance indicators for the short term (introduction and growth stages) and the long term (maturity and decline stages) will be different.

3.3 The aggregated performance dimensions and the importance attributed by managers to each performance indicator

As discussed earlier, there are many possible performance indicators for each performance dimension. Accordingly, researchers typically aggregate the indicators into higher level dimensions that represent the various performance indicators, using the mean score of the individual ratings (Atuahene-Gima et al., 2006), or simply by adding up the various items (Danneels and Kleinschmidt, 2001). The former approach has received has been more universally accepted and is widely used by researchers in regression analysis (Carbonell et al., 2004) to study the differences of performance determinants through ANOVA (Lee and O´Connor, 2003) or in cases where second order constructs are reduced to lower abstraction to be implemented in a multidimensional analysis (Langerak et al., 2004). All of these procedures attribute the same weight to each performance indicator. However, in line with what we have argued above, Hultink and Robben (1995) have demonstrated that managers may differ in terms of the importance they attribute to each performance indicator.

Based on these findings, the performance dimensions can be constructed in two ways: a) by a mean score or simple sum of performance indicators, and b) through a weighted measurement, using the importance attributed by managers to each performance indicator. This type of distinction can be valuable from a managerial point of view and requires an understanding of new product performance.

Furthermore, we have previously provided reasons to expect that managers may attribute different values to performance indicators ratings and the importance attributed to each of these performance indicators within the two distinguished moments of time (short-term and long-term). Building on this idea, we propose that the new product performance dimensions may vary, depending on the way they are constructed (using

either the mean score or the importance attributed by managers to the various performance indicators) in the short term and in the long term.

H3: The non-weighted performance dimensions (mean score) will be different from the weighted performance dimensions (using the importance attributed by managers to each performance indicator) both in the short term (introduction and growth stages) and in the long term (maturity and decline stages).

3.4. The determinants of product performance and the aggregated performance dimensions

One of the most important themes in innovation research has been identifying the factors associated with new product performance (Cooper and Kleinschmidt, 1987). Therefore, a considerable number of studies have investigated the determinants of new product performance in various disciplines, including marketing, organizational behaviour, engineering and operational management (Millson and Wilemon, 2006). Some of these studies adopt a theoretical approach (Krishnan and Ulrich, 2001), while others carry out empirical studies to test the outcomes of new product performance determinants (Cooper and Kleinschmidt, 1995b; Green et al., 1995).

The meta-analytical reviews conducted by Montoya-Weis and Calantone (1994) and (Henard and Szymanski, 2001) provide an overview of the most important determinants of new product performance. One of the most relevant conclusions of these two studies is that there is a lack of organized synthesis of past research with regard to new product performance description. Researchers are clearly influenced by existing studies, which has resulted in a series of inter-correlated conclusions or challenging results. In relation to performance description, the two studies mentioned above agree that multi-item scales and short-term and long-term delimitation are crucial in explaining the potential differences among performance determinants. Building on

this idea, Hart (1993) argues that the way new product performance is defined clearly influences the description of the factors that contribute to new product performance

Having said that, the implications of new product performance determinants for the various possible ways to construct performance dimensions have not yet been clearly explored. Thus, although, according to the literature the relationship with new product performance is quite consistent (Henard and Szymanski, 2001; Montoya-Weis and Calantone, 1994) different performance dimensions may provide different results. Therefore, consistent with Hart (1993), the impact of performance determinants may be different in the short-term and in the long-term, depending on the way the performance dimensions are constructed: a) using non-weighted performance dimensions (mean score of performance indicators), b) using weighted performance dimensions (using the importance attributed by managers to each performance indicator). Consequently, we propose that:

H4: The influence of new product performance determinants will be different from the non-weighted performance dimensions (mean score) and the weighted performance dimensions (using the importance attributed by managers to each performance indicator), both in the short-term (introduction and growth stages) and the long-term (maturity and decline stages).

4. METHODOLOGY

4.1. Data collection and sample

To test our hypotheses we used a cross-sectional survey methodology. Our research population consisted of 1120 highly innovative firms from different sectors (chemistry, metallurgy, furniture, electronic devices, textile and machinery), which were selected because they depend on new products for their continued growth and presented high innovation rates according to several reports. We used a telephone and mail pre-survey to contact the firms. The questionnaire was first tested on ten companies and ten academics, after which it was sent to the marketing managers of the firms. The respondents were asked to select an innovative product that was developed and introduced to the market in the last three years. The product had to be a major release, not a component of a product or a maintenance release version (Lee and O´Connor, 2003). The mailing contained a cover letter, the questionnaire and a reply-paid envelope. In addition, the respondents were offered a free report summarizing the most relevant findings of the research. Non-respondents were called after two weeks to ask if they had received the questionnaire and to remind them of the importance of their cooperation.

In all, 118 questionnaires were returned, representing an effective response rate of 10.53%. Eight of the questionnaires were incomplete, which means that the final sample size was 110. Although this is not a high response rate, it is consistent with previous studies (Swink, 2000) and it should be noted that it was difficult to find firms involved in developing new products that were also willing to disclose information about the decisions involved. In addition, Hunt (1990) maintains that it is possible to achieve valid generalizations from studies with low response rates, unless there is a good reason to believe that there is in fact a difference between the respondents and the

non-respondents with regard to the substantive issues in question, and that this difference would make the results of the study unreliable.

To ensure that the managers who responded did not differ substantially from those who did not, we tested non-response bias by comparing early respondents with late respondents (Armstrong and Overton, 1977). The rationale behind this comparison is that late respondents show a greater resemblance to non-respondents than early respondents do. The means of several constructs (demographic, industry type, etc.) were compared, and t-tests revealed no significant differences between the two groups, suggesting that non-response bias is not a major problem.

Table 2 presents the sample composition and summary statistics, including information about the mean number of employees and sales volume. We also checked for sample representativity. Chi-square distribution analyses revealed no significant differences between our sample and the population from which it was drawn in terms of industry distribution, number of employees and sales volume. Because projects were drawn from several companies from different industries, tests for between-group differences in any of the constructs included in this study were undertaken. Analysis of variance procedures and post-hoc Tukey multiple-comparison tests revealed no significant between-group differences in the averages of our constructs at the 95% confidence significance level. In addition, following Podsakoff et al. (2003), we analyzed common method variance (CMV), and the results revealed that it was not a serious risk.

Insert table 2 about here

4.2. Measures

Our multi-item scales were drawn from earlier studies. The appendix provides a measurement summary of all the items. We reviewed the first theoretical discussions (Cordero, 1990; Venkatraman and Ramanujam, 1986) and the latest empirical

contributions in literature (Huang et al., 2004; Storey and Easingwood, 1999), with the aim of measuring the different dimensions of new product performance. In accordance with these findings, we use three dimensions of new product performance measured on the basis of a total of eight items: market-based performance (market share, volume share and penetration rate), customer-based performance (customer satisfaction and customer loyalty) and financial-based performance (net income, net profits margin and return on investment). To measure the importance attributed by managers to the various performance indicators, we reviewed the work by (Hultink and Robben, 1995), and also used 5-point Likert scales. To distinguish between short-term and long-term performance, we adopted the approach used by (Lee and O´Connor, 2003) based on the product life cycle. Therefore, we defined the short term as the introduction and growth phases of the product life cycle, and the long term as the maturity and decline phases. We selected this method because of its general acceptance in existing literature and because it was understood by the managers that took part in the pre-test.

The determinants of new product performance were extracted from several well-known studies (Appendix). After reviewing the meta-analyses carried out by Montoya-Weis and Calantone (1994) and Henard and Szymanski (2001), we decided to select product innovativeness from the firm perspective and from the customer perspective, which are both closely related to new product performance (Hult et al., 2004), and as a result will be useful in identifying the potential differences between the two ways to construct performance dimensions (through mean score and using the importance attributed by managers). In addition, as Akgün et al. (2007) has recently shown, existing literature broadly indicates the importance of product innovativeness to explain performance. We divided product innovativeness for firms into the dimensions of technological familiarity and market familiarity (Danneels and Kleinschmidt, 2001). To measure product innovativeness from the customer's point of view, we decided to adopt

the recent terminology suggested by Lee and O´Connor (2003). Therefore, following Rogers (1995), we identified two constructs: compatibility and complexity. Product compatibility relates to the degree to which an innovation is consistent with an adopter's behaviour patterns, lifestyle and values whereas complexity refers to the degree to which an innovation is perceived to be relatively difficult to understand and use.

4.3. Scales properties

To refine the measures, we conducted a confirmatory factor analysis (CFA), using Lisrel 8.7 to determine the validity and reliability of our measures. As can be observed in Table 3, the confirmatory factor analysis for the performance dimensions in both periods ($\chi2$ =118.58, df =62 , p =.000 ; $\chi2$/d.f=1.9, GFI = 0.87; CFI = 0.91; RMSEA = 0.08; TLI =0.91; IFI =0.91) and for product performance determinants ($\chi2$ =84.38, df =55, p =.001; χ^2/d.f=1.53, GFI =0.90; CFI =0.93; RMSEA =0.07; TLI =0.93; IFI =0.93) provide an acceptable fit of the data.

Insert table 3 about here

All of the loadings for the items on their respective constructs were large and significant, which provides evidence of convergent validity (Bagozzi and Yi, 1988). The reliability of the measures was calculated with the Bagozzi and Yi (1988) composite reliability index (ρc) and with the Fornell and Larcker (1981) Average Variance Extracted index (A.V.E). We further assessed the discriminant validity of the latent constructs in two ways. Firstly, as suggested by Anderson and Gerbing (1988), we calculated the 99% confidence intervals around the correlation parameter estimates between all possible pairs of scales, and established that none of these intervals included 1. Secondly, the square of the correlation between any two constructs was less than the average variance extracted estimates of the two constructs (Fornell and Larcker, 1981). Overall, these results show an adequate level of reliability and validity.

5. MAIN RESULTS

5.1 Time horizon: short and long term new product performance

In order to test the first of our hypotheses, we compared the rating of each performance indicator in both time horizons. As can be observed in table 4, T-tests confirmed that there are significant statistical differences, especially for the market-based and financial indicators. We want to point out that there were no differences in the ratings of customer-based indicators. This may be due to the fact that managers pay special attention to meet customer expectations, both in the short term and in the long term. Therefore, the results obtained in table 5 confirm our hypothesis H1, that a time horizon (short-term versus long-term) based on the product life cycle needs to be taken into account, as new products clearly present different rating from the managers' point of view with regard to most performance indicators.

Insert table 4 about here

5.2 The importance attributed by managers to each performance indicator

Next, we compared the importance attributed by managers to all the performance indicators in both time periods. The results, as summarized in Table 5, indicate how managers attribute different levels of importance to each performance indicator in both time horizons. Some of these indicators, for instance customer satisfaction, showed no significantly between both time horizons, confirming the results obtained by Hultink and Robben (1995). By contrast, managers agree that financial indicators are important in the short term as well as in the long term. Also, the importance attributed by managers to financial indicators is similar to customer indicators, albeit at a slightly lower level. These outcomes confirm our hypothesis H2, that the importance attributed by managers to the various performance indicators is a crucial element in the analysis of new product performance delimitation.

Insert table 5 about here

5.3 The aggregated performance dimensions and the importance attributed by managers to each performance indicator

Once the ratings and the importance attributed by manager to each performance indicator in the two time horizons were compared, we calculated the performance dimensions: market-based, customer-based and financial. Thus, we construct two separate measures of this performance dimension in both time horizons: a) non-weighted (through a mean score, not considering the differences between performances indicators) and b) weighted (through a weighted mean score, weighting each performance indicator with the importance attributed by managers to each performance indicator). The non-weighted and weighted performance dimensions were compared in isolation for each timeframe. As can be observed in table 6, there are statistically significant differences between the non-weighted and weighted performance dimensions, not only in the introduction and growth stages of the product life cycle (short term), but also in the maturity and decline stages (long term). This result confirms hypothesis H3, where we stated that if the importance of performance indicators attributed by managers to each performance indicator is taken into account, we can obtain different performance dimensions in the short term and in the long term. The next step will be to analyze the consequences of these findings.

Insert table 6 about here

5.4 The determinants of product performance and the aggregated performance dimensions

Finally, several determinants that are known to have an impact on new product performance were introduced as independent variables in a regression analysis. The dependent variables were the non-weighted and weighted measurement of each of the performance dimensions. As can be observed in table 7, twelve out of the sixty relationships show differences in significance, albeit never in sign. It is only for the

short-term financial performance term and the long-term market-based performance that the same results with regard to the product performance determinants are presented. This result confirms our hypothesis H4, supporting the statement made by Hart (1993), that the way new product performance is defined clearly influences the findings describing the factors that contribute to new product performance. In the next section, we will discuss the consequences of these outcomes.

Insert table 7 about here

5. DISCUSSION

As stated by Venkatraman and Ramanujam (1986, p. 801) more than twenty years ago, "the treatment of performance in research settings is perhaps one of the thorniest issues confronting the academic research". In fact, as we have demonstrated in this study, nowadays there are still many studies dealing with the best way to define new product performance, making this an attractive topic that requires further research.

With this study, we have focused our attention on the most recent contributions surrounding new product performance at the project level in order to provide a more precise measure of this relevant variable for academics and managers. Specifically, we have focused on the lack of attention to the importance of performance indicators attributed by managers to performance indicators and on the different time horizons (short-term versus long-term).

We have started our research by reviewing the most relevant studies in the area of new product performance delimitation and we defend a project level of analysis. We then concluded about the three generally accepted dimensions of new product performance (market-based, customer-based and financial).

To begin with, we have demonstrated that our approach to different time horizons based on the product life cycle (short-term = introduction and growth stages; long-term = maturity and decline stages) is appropriate. In particular, we have

confirmed our hypothesis H1, because the ratings of each performance indicator are different between both time horizons. Moreover, our results are consistent with Hultink and Robben (1995), but we would argue that our approach is more appropriate, as managers do not have to think in percentages of product life of number of years the product has been on the market. Overall, following Henard and Szymanski (2001) and recent empirical contributions (Hart et al., 2003; Tse et al., 2003), the short-term and long-term performance measures provide a useful contextual factor in the analysis of new product results.

We have also demonstrated that taking the importance attributed by managers to each performance indicator into account is a crucial element in new product performance delimitation. In fact, nowadays it is generally accepted that managers do not attribute the same importance to every performance indicator in the short and long-term due to the competitive or launching-related objectives of the firm (Hultink and Robben, 1995; Wheatley, 1988). Therefore, we have demonstrated our hypothesis H2, that giving the same importance to each performance indicator is oversimplifying the real situation that firms encounter.

The fact that the ratings and importance of new product performance indicators varies depending on the stages of the product life cycle has potentially important implications when measuring the aggregated product performance dimensions (market-based, customer-based and financial-based) at project level (Lee and O´Connor, 2003). Thus, we have demonstrated our hypothesis H3, that it is possible to obtain different types of performance dimensions: a) a non-weighted measures (using the mean score of performance indicators) and b) using a weighted measure (using the importance attributed by managers to the various performance indicators). This duality of performance dimensions has not been previously tested in the literature and neither have their implications from an academic and managerial point of view.

Having said that, the question is whether these weighted performance measurements are more valid than previous approaches to constructing performance dimensions. We would argue that at least to some extent that is the case. We have demonstrated that there is no rationale for attributing identical weight to the various performance indicators, because not all of them can be assumed to be equally important and relevant to the firm. We feel that academics should take this into account when drawing conclusions regarding the outcomes of new product performance determinants. In fact, we have demonstrated our hypothesis H4 that depending on the type of performance dimensions considered (non-weighted or weighted) the impact of new product performance determinants is different. In addition, the explained variance of our regression models close to 30% is consistent with similar studies in this area. Specifically, Narver et al. (2004) report an explained variance of 19.8% when studying the implications of market orientation and other environmental issues on new product success.[1]

Although the results obtained in our study may be somewhat "shocking" at face value, they must be interpreted carefully. Thus, if the importance attributed by managers to performance indicators is considered, certain product performance determinants may be more relevant than others in explaining new product performance. However, none of the relationships between the performance determinants and performance dimensions do differ in sign when taking the non-weighted and weighted measures into account. This means that previous studies concerning new product performance determinants were not wrong, but they should be clarified. Thus, our results are in line with the meta-analytical reviews conducted by Montoya-Weis and Calantone (1994), and Henard and Szymanski (2001). Moreover, our research may provide some insights into some of the inconsistent

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[1] As one reviewer pointed out, nonlinear effects are equally likely. Therefore, we fitted nonlinear models between the independent and dependent variables. However, nonlinear effects fitted worse than the linear models in most of the cases or did not outperform substantially the results obtained in the linear models which let us assume the linear model as more appropriate and parsimonious. These results might be due to the type of product selected, really new and radical new products, but no incremental ones.

findings obtained by these authors and other previous studies around new product performance determinants.

We also acknowledge that the use of different performance dimensions in various studies makes it harder to replicate the research findings (Danneels and Kleinschmidt, 2001), but we want to point out that academics may include this procedure to provide more accurate and valuable information to the firms in their reports. In fact, our approach may provide valuable recommendations to managers on the best way to allocate firm resources, which is in line with Huang et al. (2004). Therefore, by considering the time horizon and the importance attributed by managers to various performance indicators provides a closes approximation to actual business decisions such as launching new products into the market (Chiu et al., 2006).

We will also like to point out that the use of objective versus subjective performance measures has been very controversial in the literature. Our approach to measuring a firm's performance has allowed us to obtain a more precise measure of performance. Some people may wonder why we did not consider real objective performance measurements in our research. Obviously, this will be an interesting guideline for the future, but it should be taken into account that sometimes it is virtually impossible to obtain objective measures. In addition, it has been demonstrated that this type of measurements to be closely related to the subjective results obtained from managers (Langerak et al., 2004; Song and Parry, 1997).

6. LIMITATIONS AND FUTURE RESEARCH

There are limitations to this study that need to be addressed. We have selected really new products, because managers find it critical to know the potential consequences of a new product being launched onto the market. However, because the projects we selected were limited to really new products, the results cannot be generalized to include other type of innovations, such as incremental new products. In

addition, we asked marketing managers to evaluate product performance, because they usually supervise the launch of a new product (Lee and O´Connor, 2003). Although we have demonstrated that common method variance (CMV) was not a serious threat, rather than using a single respondent approach, it would be interesting to contrast our results with those obtained from several informants inside a firm. Our regression analyses leave quite some variance unexplained for short-term and long-term new product performance (about 60% of the variance is not explained). Even though new product innovativeness is generally accepted as an important determinant of new product performance, we acknowledge that other types of antecedent, such as strategic or environmental ones are also relevant (Henard and Szymanski, 2001). Also, long-term product performance could also be explained by other variables, such as the direct or indirect network externalities. Nonetheless, with our study we did look for an overall model explaining new product performance but to demonstrate the different effect of new product performance determinants depending on the way performance dimensions are constructed.

Future research should address these limitations, but there are other research directions that could also be exploited. Our study has only measured performance at project level. Therefore, it could be interesting to test these results when measuring performance at program (Cooper and Kleinschmidt, 1995a) and firm level (Hult et al., 2004). Another potentially fruitful avenue for future research is to include new dimensions of product performance, such as technical performance (Huang et al., 2004; Talke, 2007), process performance (Hart et al., 2003) and strategic performance (Storey and Easingwood, 1999), to contrast the results obtained in our study.

APPENDIX

Product performance

- **Short term and long term new product performance** *(Griffin, 1993; Griffin and Page, 1996; Huang et al., 2004; Hultink and Robben, 1995; Lee and O´Connor, 2003; Storey and Easingwood, 1999)*

-Market-based performance:

-**Short M.Perfor1 / Long M.Perfor1**: Market share performance

-**Short M.Perfor2 / Long M.Perfor2**: Volume sales performance

-**Short M.Perfor3 / Long M.Perfor3**: Rate of market penetration

-Customer-based performance:

-**Short C.Perfor1 / Long C.Perfor1**: Customer satisfaction

-**Short C.Perfor2 / Long C.Perfor2**: Customer loyalty

-Financial-based performance

-**Short F.Perfor1 / Long F.Perfor1:** Net income

-**Short F.Perfor2 / Long F.Perfor2:** Net profits margin

-**Short F.Perfor3 / Long F.Perfor3**: Return on investment

Product performance determinants

- **Technological familiarity** *(Danneels and Kleinschmidt, 2001)*

-**T.Fam1:** To what extent did the technology involved in the development of this product represent new or different technology for your firm? [Totally new technology for us - Our existing technology].

-**T.Fam2**: To what extent did the engineering and design work involved in this new product project represent new or different work for your firm – a type of engineering or design work you had not done before? [Totally new work for us - Very familiar work for us].

-**T.Fam3**: To what extent did the production technology and production process represent a new and different one for your firm – a type of production you had not done before? [Totally new production process to us - Existing production process to us].

- **Market familiarity** *(Danneels and Kleinschmidt, 2001)*

-**M.Fam1:** To what extent was this product aimed at new customers to your firm-customer that you had not sold before? [Totally new customers - Existing customers].

-**M.Fam2:** To what extent was the market for this product new or different from the market you normally sell into? [Totally new market - Our existing market].

-**M.Fam3:** To what extent did this product represent a new product category- a type of product that your firm had not made and/or sold before? [Totally new product category - Existing product category for our firm].

- **Product superiority** *(Lee and O´Connor, 2003)*

-**Sup1**: The benefits this product offers were new to the customers.

-**Sup2**: Customers perceived the product features as novel/unique.

-**Sup3**: This product offers dramatic improvements in existing product features.

- **Compatibility** *(Lee and O´Connor, 2003)*

-**Comp1**: The knowledge required to use this product was new to the customers.

-**Comp2**: Customers needed to learn how to use this new product.

- **Complexity** *(Lee and O´Connor, 2003)*

-**Complex1**: Customer tended to resist adopting this new product.

-**Complex2**: Customer needed to change their behavior in order to adopt this product.

REFERENCES

Akgün, A.E, Keskin, H., Byrne, J.C., and Aren, S., 2007. Emotional and learning capability and their impact on product innovativeness and firm performance. Technovation. 27 (9), 501-513.

Anderson, J.C. and Gerbing, D.W., 1988. Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin. 103 (3), 441-423.

Armstrong, J.S. and Overton, T.S., 1977. Estimating nonresponse bias in mail surveys. Journal of Marketing Research. 14 (3), 396-402.

Atuahene-Gima, K., 2005. Resolving the Capability-Rigidity Paradox in New Product Innovation. Journal of Marketing. 69 (3), 61-83.

Atuahene-Gima, K., Li, H., and De Luca, L.M., 2006. The Contingent Value of Marketing Strategy Innovativeness For Product Development Performance in Chinese New Technology Ventures. Industrial Marketing Management. 35, 359-372.

Bagozzi, R.P. and Yi, Y., 1988. On the evaluation of structural equation models. Journal of the Academy of Marketing Science. 16 (1), 74-94.

Calantone, R.J., Cavusgil, S.T., and Zhao, Y., 2002. Learning orientation, firm innovation capability, and firm performance. Industrial Marketing Management. 31 (6), 515-524.

Carbonell, P., Rodriguez, A.I., and Munuera, J.L., 2004. Technology Newness and Impact of Go/No-Go Criteria on New Product Success. Marketing Letters. 15 (2-3), 81-97.

Cooper, R.G., 1998. Benchmarking new product performance: Results of the best practices study. European Management Journal. 16 (1), 1-17.

Cooper, R.G. and Kleinschmidt, E. J., 1987. Success factors in product innovation. Industrial Marketing Management. 16 (3), 215-223.

Cooper, R.G. and Kleinschmidt, E. J., 1995a. Benchmarking the firm´s critical success factors in new product development. Journal of Product Innovation Management. 12 (5), 374-391.

Cooper, R.G. and Kleinschmidt, E.J., 1995b. Performance Typologies of new product projects. Industrial Marketing Management. 24 (5), 439-456.

Cordero, R., 1990. The measurement of innovation performance in the firm: An overview. Research Policy. 19 (2), 185-192.

Chiu, Yi-Chia, Chen, B., Shyu, J.Z., and Tzeng, G.-H., 2006. An evaluation model of new product launch strategy. Technovation. 26 (11), 1244-1252.

Danneels, E. and Kleinschmidt, E.J., 2001. Product innovativeness from the firm´s perspective: Its dimensions and their relation with project selection and performance. Journal of Product Innovation Management. 18 (6), 357-373.

Fornell, C. and Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research. 18 (1), 39-50.

Green, D.H., Barclay, D.W., and Ryans, A.B., 1995. Entry strategy and long-term performance: conceptualization and empirical examination. Journal of Marketing. 54 (2), 1-16.

Griffin, A., 1993. Metrics for measuring product development cycle time. Journal of Product Innovation Management. 10, 112-125.

Griffin, A., 1997. The effect of project and process characteristics on product development cycle time. Journal of Marketing Research. 20, 24-35.

Griffin, A. and Page, A.L., 1996. PDMA Success measurement project: Recommended measures for product development success and failure. Journal of Product Innovation Management. 13 (6), 478-496.

Hart, S.J., 1993. Dimensions of success in new product development: An exploratory investigation. Journal of Marketing Management. 9 (1), 23-41.

Hart, S.J. and Craig, A., 1993. Dimensions of success in new product development. Perspectives of Marketing Management. 3 (3), 207-243.

Hart, S.J., Hultink, E.J., Tzokas, N., and Commandeur, H.R., 2003. Industrial companies´ evaluation criteria in new product development gates. Journal of Product Innovation Management. 20 (1), 22-36.

Hauschildt, J., 1991. Towards measuring the success of innovations. in: Technology Management: The New International Language, Proceedings of Portland International Conference on Management of Engineering and Technology. Dundar F. Kocaoglu and Kiyoshi Niwa (eds.) Portland. 27-31.

Henard, D.H. and Szymanski, D.M., 2001. Why some new products are more successful than others? Journal of Marketing Research. 38 (3), 362-375.

Hooley, G.J., Greenley, G. E., Cadogan, J.W., and Fahy, J., 2005. The performance impact of marketing resources. Journal of Business Research. 58 (1), 18-27.

Huang, X., Soutar, G.N., and Brown, A., 2004. Measuring new product success: An empirical investigation of Australian SMEs. Industrial Marketing Management. 33 (2), 117-123.

Hult, G.T.M., Hurley, R.F., and Knight, G.A., 2004. Innovativeness: Its antecedents and impact on business performance. Industrial Marketing Management. 33 (5), 429-438.

Hultink, E.J. and Robben, H.S.J., 1999. Launch strategy and new product performance: An empirical examination in the netherlands. Journal of Product Innovation Management. 16 (6), 545-556.

Hultink, E.J. and Robben, H.S.J., 1995. Measuring new product success: The difference that time perspective makes. Journal of Product Innovation Management. 12 (5), 392-405.

Hunt, S.D., 1990. Commentary on an Empirical Investigation of a General Theory of Marketing Ethics. Journal of the Academy of Marketing Science. 18 (2), 173-177.

Kakati, M., 2003. Success criteria in high-tech new ventures. Technovation. 23 (5), 447-457.

Krishnan, V. and Ulrich, K.T., 2001. Product development decisions: A review of the literature. Management Science. 47 (1), 1-21.

Langerak, F., Hultink, E.J., and Robben, H.S.J., 2004. The Impact of Market Orientation, Product Advantage, and Launch Proficiency on New Product Performance and Organizational Performance. Journal of Product Innovation Management. 21 (1), 79-94.

Lee, Y. and O´Connor, G.C., 2003. The impact of communication strategy on launching new products: The moderating role of product innovativeness. Journal of Product Innovation Management. 20 (1), 4-21.

Millson, M.R. and Wilemon, D., 2006. Driving new product success in the electrical equipment manufacturing industry. Technovation. 26 (11), 1268-1286.

Montoya-Weis, M.M. and Calantone, R., 1994. Determinants of new product performance: A review and Meta-analysis. Journal of Product Innovation Management. 11 (4), 397-417.

Moorman, C. and Miner, A.S., 1997. The impact of organizational memory on new product performance and creativity. Journal of Marketing Research. 34, 91-106.

Narver, J.C., Slater S.F. and MacLachlan, D.L., 2004. Responsive and Proactive Market Orientation and New-Product Success. Journal of Product Innovation Management. 21(5), 334-348.

Palmberg, C., 2006. The sources and success of innovations —Determinants of commercialisation and break-even times. Technovation. 26 (11), 1253-1267.

Pauwels, K., Silva-Risso, J., Srinivasan, S., and Hanssens, D., 2004. New Products, Sales Promotions, and Firm Value; The Case of the Automobile Industry. Journal of Marketing. 68 (4), 142-156.

Podsakoff, P.M., Mackenzie, S.B., Lee, J., and Podsakoff, N.P., 2003. Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. Journal of Applied Psychology. 20 (5), 879-903.

Rogers, E.M., 1995. Diffusion of innovations, 3rd ed. New York: The free press.

Sandvik, I.L. and Sandvik, K., 2003. The Impact of Market Orientation on Product Innovativeness and Business Performance. International Journal of Research in Marketing. 20 (4), 355-376.

Song, X.M. and Parry, M.E., 1997. The determinants of Japanese new product success. Journal of Marketing Research. 34 (1), 64-76.

Storey, C. and Easingwood, C.J., 1999. Types of new product performance: Evidence from the consumer financial services sector. Journal of Business Research. 46 (2), 193-203.

Swink, M., 2000. Technological innovativeness as a moderator of new product design integration and top management support. Journal of Product Innovation Management. 17, 208-220.

Talke, K., 2007. Corporate mindset of innovating firms: influences on new product performance. Journal of Engineering and Technology Management. 24 (1), 76-91.

Tse, A.C., Sin, L.Y., Yau, H.M., Lee, J.S., and Chow, R., 2003. Market orientation and business performance in a Chinese business environment. Journal of Business Research. 56 (3), 227-239.

Venkatraman, N. and Ramanujam, V., 1986. Measurement of business performance in strategic research. Academy of Management Review. 11 (4), 801-814.

Wheatley, J.J., 1988. Performance measures in telecommunications: changing needs. Technovation. 8 (3), 201-219.

Wu, F., Mahajan, V., Balasubramanian, and S., 2003. An Analysis of E-Business Adoption and Its Impat on Business Performance. Journal of the Academy of Marketing Science. 31 (4), 425-447.

Table 1. New product performance dimensions and indicators

Authors	Performance dimensions (performance indicators)
PERFORMANCE AT FIRM LEVEL	
Calantone et al. (2002)	- **Financial performance** (return on assets, return on investment, return on sales)
Hooley et al. (2005)	-**Financial performance** (overall profit achieved, profit margins achieved, return on investment) -**Market performance** (volume achieved and market share achieved) -**Customer performance** (customer satisfaction achieved, customer loyalty, customer loyalty compared to competitors)
Hult et al. (2004)	- **Financial performance** (profits, sales, market share, overall profit)
Sandvik and Sandvik (2003)	- **Financial performance** (return on assets, profit margins achieved) - **Market performance** (sales growth)
Wu et al. (2003)	-**Efficiency** (cost of production, cost of management, cost of coordinating with suppliers, cost of marketing the product, cost of acquiring new customers) -**Market performance** (market share, sales volume, number of new customers, number of existing customers) -**Relationship development** (business relationships with partners, relationships with suppliers)
PERFORMANCE AT PROGRAM LEVEL	
Atuahene-Gima (2005)	- **Program profitability** (profitability goals, profitability growth, internal rate of return, internal rate of return growth)
Cooper and Kleinschmidt (1995a)	-**Program impact** (percentage sales, program impact on sales, program impact on profits, success rate, technical success) -**Program profitability** (profitability relative to spending and relative to competitors, meeting sales objectives, meeting profit objectives, program impact on sales an on profits)
Cooper (1998)	-**Program impact** (percentage sales, program impact on sales, program impact on profits, success rate, technical success) -**Program profitability** (profitability relative to spending and relative to competitors, meeting sales objectives, meeting profit objectives, program impact on sales an on profits)
Griffin (1997)	- **Program impact** (industry position achieved, meeting program objectives)
PERFORMANCE AT PROJECT LEVEL	
Atuahene-Gima et al. (2006)	-**Market performance** (market share growth, sales growth)
Carbonell et al. (2004)	-**Market** (market growth, market share) -**Customer acceptance** (customer satisfaction, product quality, market acceptance) -**Financial** (margin rate, internal rate of return, sales volume)
Cooper and Kleinschmidt (1987)	-**Market impact** (profit, domestic market share, foreign market share, sales) -**Financial performance** (profitability level, payback period) -**Opportunity window** (window in new markets, window in new product categories)
Cooper and Kleinschmidt (1995b)	-**Financial performance** (profitability rating, technological success rating, current domestic share, impact on the company sales and profit) -**Time performance** (time efficiency rating, on-schedule rating)

Griffin (1993)	-**Customer acceptance** (customer acceptance, customer satisfaction, revenue goals, revenue growth, market share, sales) -**Financial performance** (break-even time, margin goals, profitability goals, return on investment) -**Product** (development cost, launched on time, product performance, met quality guidelines, speed to market)
Hart (1993)	-**Financial** (sales growth, average profits, turnover in products in last five years) -**Non financial** (number of R&D projects, number of new products launched, % of successful launches, characteristics of successful new products)
Huang et al. (2004)	-**Objective Customer acceptance** (revenue goal, revenue growth, market share goal, unit share goal) -**Subjective customer acceptance** (customer acceptance and customer satisfaction) -**Financial performance** (break-even time, margin goal, profitability goal, return on investment). -**Technical measures** (development cost, launched on time)
Hultink and Robben (1995)	-**Customer acceptance** (customer acceptance, customer satisfaction, revenue goals, revenue growth, market share goals, unit sales goals) -**Financial performance** (break-even time, margin goals, profitability goals, return on investment) -**Product** (development cost, launched on time, product performance level, met quality guidelines, speed to market)
Hultink and Robben (1999)	-**Market acceptance criterion** (revenue growth, unit sales goals, revenue goals, market share goals, customer acceptance) -**Product** (quality guidelines, product performance level)
Langerak et al. (2004)	-**Market** (unit volume goals, revenue goals, sales growth goals, market share goals) -**Customer acceptance** (customer acceptance, customer satisfaction, number of customers, customer competitive advantage) -**Financial** (ROI, profitability goals, contribution margin goals, development cost) -**Product** (performance specifications, quality specifications) -**Timing** (launch on time, time to market, break even time)
Lee and O´Connor (2003)	-**Market** (market share, volume sales, rate of market penetration) -**Customer satisfaction** (customer satisfaction, customer loyalty) -**Financial** (net profits margin, gross profit margin, return on investment) -**Market extension** (extension in new markets, extension in new product categories)
Song and Parry (1997)	-**Profitability** (overall profitability, relative to firm´s other new products, relative to firm´s objectives for this product)
Storey and Easingwood (1999)	-**Market** (market share, sales, growth in sales, market share, new customers) -**Financial** (profitability, long-term performance, customer loyalty) -**Enhanced opportunities** (reposition the company, open up a new market, platform to introduce new products, positive impact on company's image)
Talke (2007)	-**Market** (market share, time to market, competitive advantage, image gains) -**Financial** (net present value, return on investment, time to break-even) -**Technological** (technical performance, strategic competences, protection by patent, product costs, cost-performance ratio)

Table 2. Sample characteristics (N=110)

SIC Code and Sectors	Industry distribution (population)		Industry distribution (sample)		Number of employees* (population)		Number of employees* (sample)		Sales volume (x10^6€)* (population)		Sales volume (x10^6€)* (sample)	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
22.Textile	140	12.50	13	11.82	138	10.53	127	10.00	15821	7.61	14250	7.16
28.Chemicals	152	13.57	16	14.55	238	18.17	207	16.30	38191	18.38	36200	18.18
30.Plastics	157	14.02	15	13.64	194	14.81	185	14.57	39851	19.17	38500	19.34
34.Metals	230	20.54	24	21.82	165	12.60	175	13.78	32773	15.77	30250	15.19
35.Machinery	132	11.79	12	10.91	209	15.95	190	14.96	31957	15.38	30300	15.22
36.Ele.devices	157	14.02	16	14.55	235	17.94	245	19.29	35697	17.18	34250	17.20
25.Furniture	152	13.57	14	12.73	131	10.00	141	11.10	13539	6.51	15360	7.71
Total	1120	100	110	100	185	100	170	100	28353	100	25990	100

* Mean values are presented for number of employees and sales volume

Table 3. Confirmatory factor analysis

Product performance dimensions						
	Short term			**Long term**		
Market-based	Short M.Perfor1	.90(11.40)	ρc=.86 v.e=.68	Long M.Perfor1	.85(10.46)	ρc=.83 v.e=.63
	Short M.Perfor2	.83(10.09)		Long M.Perfor2	.73(8.44)	
	Short M.Perfor3	.73(8.52)		Long M.Perfor3	.79(9.52)	
Customer-based	Short C.Perfor1	.58(6.00)	ρc=.69 v.e=.54	Long C.Perfor1	.80(9.43)	ρc=.82 v.e=.70
	Short C.Perfor2	.86(8.99)		Long C.Perfor2	.87(10.63)	
Financial-based	Short F.Perfor1	.69(7.37)	ρc=.75 v.e=.61	Long F.Perfor1	.83(9.82)	ρc=.76 v.e=.61
	Short F.Perfor2	.86(9.35)		Long F.Perfor3	.73(8.31)	

$\chi^2(62)= 118.58$ p= .000
CFI=0.91 TLI= 0.91 IFI=0.91 GFI=0.87
RMSEA=0.08 χ^2/d.f.=1.9

ρc= Scale composite reliability , v.e= Average variance extracted

Product performance determinants						
Technological familiarity	T.Fam1	.84(9.64)	ρc=.82 v.e=.60	**Product superiority**	Sup1	.77(8.62)	ρc=.81 v.e=.60
	T.Fam2	.80(9.04)			Sup2	.85(9.71)	
	T.Fam3	.70/7.71)			Sup3	.68(7.34)	
Market familiarity	M.Fam1	.80(8.17)	ρc=.76 v.e=.52	**Compatibility**	Comp1	.89(9.60)	ρc=.81 v.e=.68
	M.Fam2	.66(6.65)			Comp2	.75(8.05)	
	M.Fam3	.68(6.92)		**Complexity**	Complex1	.77(7.63)	ρc=.85 v.e=.74
					Complex2	.94(9.20)	

$\chi^2(55)= 84.38$ p= .001
CFI=0.93 TLI=0.93 IFI=0.93 GFI=0.90
RMSEA=0.07 χ^2/d.f.=1.53

ρc= Scale composite reliability , v.e= Average variance extracted

Table 4. Rating of each performance indicator in the short and long term

	Short term	Long term	T-value
Rating of each performance indicator			
Market share (Short / Long M.Perfor1)	3.35	3.64	3.13***
Volume share (Short / Long M.Perfor2)	3.31	3.52	2.29**
Penetration rate (Short / Long M.Perfor3)	3.29	3.51	2.50**
Satisfaction (Short / Long C.Perfor1)	4.13	4.18	0.65
Loyalty (Short / Long C.Perfor2)	3.68	3.80	1.51
Net income (Short / Long F.Perfor1)	3.44	3.47	0.33
Net profits margin (Short / Long F.Perfor2)	3.35	3.52	2.18**
Return on investment (Short / Long F.Perfor3)	3.44	3.67	2.66***
Mean values are presented for the short and long term (1=very bad result obtained, 5=very good result obtained) *We used sum of squares type III. Significance levels: ***p<.01 **p<.05			

Table 5. Importance of each performance indicator in the short and long term

	Short term	Long term	T-value
Importance of each performance indicator			
Market share (Short / Long M.Perfor1)	3.67	4.11	4.40***
Volume share (Short / Long M.Perfor2)	3.70	4.04	4.11***
Penetration rate (Short / Long M.Perfor3)	3.73	4.02	3.00***
Satisfaction (Short / Long C.Perfor1)	4.45	4.51	0.89
Loyalty (Short / Long C.Perfor2)	4.12	4.27	2.39**
Net income (Short / Long F.Perfor1)	3.94	4.00	0.92
Net profits margin (Short / Long F.Perfor2)	4.00	4.12	1.77
Return on investment (Short / Long F.Perfor3)	3.75	3.85	1.25
Mean values are presented for the short and long term (1=not very important, 5=very important) *We used sum of squares type III. Significance levels: ***p<.01 **p<.05			

Table 6. Differences in the non-weighted and weighted performance dimensions in the short and long term

Short term			
Performance dimensions	**Non-weighted**	**Weighted**	**T-value**
Market based	3.28	3.69	4.18***
Customer based	3.88	4.28	5.36***
Financial based	3.40	3.97	6.47***
Long term			
Performance dimensions	**Non-weighted**	**Weighted**	**T-value**
Market based	3.55	4.05	5.93***
Customer based	3.98	4.39	5.68***
Financial based	3.59	4.00	4.67***

Mean values are presented for the short and long term

*We used sum of squares type III. Significance levels: ***p<.01 **p<.05

$$\text{non weight / weight dimensions} = \frac{\sum_{i=1}^{k} n_i * perf ormane\ indicator_i}{\sum_{i=1}^{k} n_i} \bigg/ \frac{\sum_{i=1}^{k} f_i * perf ormane\ indicator_i}{\sum_{i=1}^{k} f_i}$$

ni=1 // fi= relative importance of each performance indicator in relation with the others indicators

Table 7. New product performance determinants for the non-weighted and weighted performance dimensions in the short and long term

Short term	Performance dimensions in the short-term					
	Market based		Customer based		Financial based	
	Non-weighted	weighted	Non-weighted	weighted	Non-weighted	weighted
	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)
Tech. familiarity	0.02(0.24)	**0.25(2.48**)**	**0.22(2.22**)**	0.09(0.84)	0.02(0.18)	0.09(0.83)
Market familiarity	0.06(0.60)	0.13(1.28)	-0.06(0.64)	-0.10(0.99)	0.06(0.66)	0.03(0.25)
P. superiority	**0.21(2.32**)**	0.05(0.44)	**0.27(2.82***)**	0.13(1.25)	**0.26(2.55**)**	**0.21(1.97**)**
P. compatibility	-0.17(1.62)	-0.06(0.54)	-0.12(1.12)	**-0.26(2.26**)**	-0.14(1.18)	-0.03(0.29)
P. complexity	**-0.54(5.51***)**	-0.15(1.38)	**-0.23(2.23**)**	-0.17(1.61)	-0.15(1.42)	-0.01(0.08)
Total sum of squares	86.40	88.30	61.74	48.70	57.73	63.64
R^2 (Adj. R^2)	0.26(0.22)	0.10(0.06)	0.20(0.16)	0.10(0.06)	0.10(0.06)	0.07(0.02)
F value (F prob)	7.08(0.00)	2.44(0.04)	5.22(0.00)	2.35(0.05)	2.33(0.05)	1.46(0.21)
Long term	Performance dimensions in the long-term					
	Market based		Customer based		Financial based	
	Non-weighted	weighted	Non-weighted	weighted	Non-weighted	weighted
	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)	Stand.Coef. (t-value)
Tech. familiarity	0.02(0.14)	0.07(0.69)	**0.21(2.12**)**	0.06(0.55)	0.02(0.17)	**0.22(2.10**)**
Market familiarity	0.16(1.64)	0.11(1.07)	0.03(0.25)	0.13(1.30)	0.16(1.66)	0.11(1.06)
P. superiority	0.08(0.75)	0.08(0.71)	**0.21(2.10**)**	0.11(1.06)	**0.24(2.42**)**	0.08(0.75)
P. compatibility	-0.07(0.63)	-0.11(0.94)	-0.13(1.16)	**-0.21(1.97**)**	-0.04(0.31)	-0.07(0.57)
P. complexity	**-0.44(4.14***)**	**-0.27(2.55**)**	**-0.38(3.67***)**	**-0.28(2.63**)**	**-0.44(4.24**)**	**-0.21(2.02**)**
Total sum of squares	64.71	62.70	68.99	46.02	72.18	61.50
R^2 (Adj. R^2)	0.18(0.14)	0.09(0.04)	0.21(0.17)	0.12(0.08)	0.22(0.18)	0.10(0.05)
F value (F prob)	4.31(0.00)	1.93(0.09)	5.25(0.00)	2.73(0.02)	5.47(0.00)	2.14(0.06)

*We used sum of squares type III. Significance levels: ***p<.01 **p<.05 `
Significant coefficients presented in bold