DOES PRODUCT DEVELOPMENT PERFORMANCE MAKE A DIFFERENCE ?

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Abstract

High performance of the product development function is seen as a path to competitive advantage in companies across many industries. Product development performance is commonly measured as the efficient and rapid development of new and high performing products. However, the relevance of development performance for business success depends on the competitive market environment in which a firm operates. This article develops a market contingency framework of the impact of development performance on profitability. The market environment dimensions are growth, industry profitability, market share and product life cycles. We statistically test the framework on data from 86 companies in 12 electronics industries worldwide. We show that product development performance is more important in technologically stable and mature industries. In addition, large companies can significantly impact their financial performance through product development, whereas the profitability of small firms is driven mainly by their industry environment.

The CEO of a worldwide leading carmanufacturer, after being asked for his technical vision for the next decade: "Money, Money, and again Money."

INTRODUCTION

New product development (NPD) has received much attention in academic and managerial literature over the last ten years, because it is seen as an important source of competitive advantage (see, e.g., [2, 3, 36]). Much work has been dedicated to identifying NPD performance dimensions that drive the business success of a company. Such dimensions have been identified at the project level [5, 6], but they are also needed at the level of the product development function as a whole, in order to understand its contribution to company success [1].

Widely named NPD performance dimensions revolve around time, cost and quality; the length of development cycles and the fraction of products first to market, development productivity, the percentage of distinctive and financially successful new products, or the proportion of sales from new products [11, 36]. Empirical studies sometimes stretch across industries [5] and are sometimes industry specific [6], but there is commonly the implicit assumption that performance dimensions can be "generalized". Recent work, however, raises the issue that the relevant performance dimensions change across industries, or, in other words, that NPD performance and the market environment are not independent [3, 15].

The objective of our research is to introduce the influence of the market context into the NPD performance literature. Our study is based on 86 business units across 12 different electronics industries worldwide. We show that NPD performance is important in technologically stable and mature industries, but we find no significant link between development performance and profitability in industries with fast growth or short product life cycles. In addition, large companies can significantly impact their financial performance through product development, whereas the profitability of small firms is driven mainly by their industry environment.

In this article, we first review some of the relevant literature, then develop a market contingent framework of product development performance, and, after an overview of the research methodology, we present the empirical results. The article concludes with a discussion on theoretical and managerial lessons.

LITERATURE REVIEW

The Product Development Performance Literature

One major problem of research investigating the link between product development and success is an appropriate choice of the unit of analysis. First, there are many studies on NPD performance focused on the individual project level. These studies have managed to find and confirm a number of key project success drivers, such as understanding user needs, internal and external communication, attention to marketing, efficiency of development, and the authority of R&D managers (see, e.g., [20, 26, 27]). Although the large number of relevant factors reported makes it difficult to formulate precise managerial and theoretical implications, the importance of market pull (listening to the customer's voice), as opposed to technology push, was discovered. These research findings were later complemented and confirmed by, among others, Cooper & Kleinschmidt (1987), Zirger & Maidique (1990), and Cooper and Kleinschmidt (1993) [5, 6, 37]. The latter study, for example, identifies five key predictors of project success: customer orientation, sharp product definition, a cross-functional development team, synergy with existing products (market strength), and an efficient development process. Most of the project-oriented studies are industry specific, and it has been pointed out that most of them apply to stable and mature industries (see below).

Second, there are technology strategy studies at the aggregate industry level, for example, the literature on technology life cycles and their influences on competition (e.g., Tushman and Rosenkopf (1992) [33], or Utterback and Suárez (1993) [34]). Adler (1989) points out that our understanding of R&D as a success driver at the firm level remains weak: "The polarization of research at these two levels [project level and industry levels - note by the authors] leaves a gap at the firm level, limiting the value of research results for strategy analysis" (p. 27, [1]).

Only a few studies address the firm level of development performance measurement, e.g., Foster *et al.* (1985) [9] and Griffin and Page (1993) [11]. These articles offer performance measures, but do not test their relevant impact on business success. Closest to the focus of the present article comes Morbey (1988) [19] with his result that R&D expense levels (gained from annual reports) predict growth, but not profitability. This study looks across many industries but does not take into account NPD performance (only R&D expense), nor does it look at characteristics of the market environment.

The Importance of Market Context: Insights From Other Fields

Strategy research has emphasized the influence of environmental variables for a long time [10, 24]. Miller and Friesen (1981) and Miller (1987) [17, 18] argue that in uncertain environments, the fate of small- and medium-sized firms is determined by industry characteristics, such as technology change or market growth. Large firms, in contrast, are less driven by such contextual influences, due to their market power, resources, and external stability [17].

Porter presents a strategic framework to explain how the importance of product development might change over time, with the changing industry context. This framework is based on the product life cycle model [22, 23]. The product life cycle comprises four stages: embryonic, growth, mature, and decline. The product life cycle model predicts that marketing is more important than development in phases of high industry growth, while product development (and manufacturing) matter more when the industry matures, requiring frequent variant introductions at low cost.

In addition, the importance of industry context in explaining firm profitability has been addressed by a number of empirical studies. For example, Schmalensee (1985) [29] reported that industry membership accounted for .6 percent of observed variance in business unit returns. In a follow-up study, Wernerfelt and Montgomery 1988 [35] derived comparable results. Finally, Rumelt (1991) [28] found 17 percent of business unit returns explained by industry membership, only half of which was due to "structural" industry differences that are stable over time, while the other half stemmed from year-to-year industry fluctuations. Using a different methodology than the one applied in these three studies, Powell (1996) [21] used perceptual data of success and industry characteristics and also found about 20 percent of success explained by the industry context. Powell points to firm-internal factors to account for a substantial proportion of the residual variance. Our model focuses on development performance as one of those internal factors.

RESEARCH QUESTIONS

The unit of analysis in our study is the business unit and thus follows previous studies in industrial organization [28, 29, 35] as well as in the NPD performance literature [15]. Our objective is to incorporate the influence of the market context into the NPD performance literature.

In a recent survey, Brown and Eisenhardt (1995) [3] observe the omission of market context variables in NPD performance research to date, which leaves two gaps in our current understanding of the link between NPD performance and business success (Figure 1).

Insert Figure 1 about here.

First, the direct effect of the market context on business success has been insufficiently addressed. From the strategy literature, we expect that some proportion of business success variance is explained by industry membership. Consistent with Powell (1996) [21], some of the residual variance should be explained by company internal variables, one of which is development performance.

Second, Brown and Eisenhardt conjecture the existence of an indirect effect of market variables. That is, the market context influences which NPD performance variables have an impact on business success and which do not. Therefore, understanding the role of the market context is important for choosing the right dimensions of a development strategy in a particular industry. For example, introducing many new products into a market where success is driven by technical performance or low costs can be disastrous.

Figure 1 illustrates the Brown and Eisenhardt framework, with the symbol "?" indicating the two shortcomings dicussed above. We can summarize our research objective in the following two research questions:

(1) How do market characteristics influence business success? What is their contribution to explained success variance, and how does it compare with the contribution of NPD performance?
(2) How do market characteristics influence the importance of established NPD performance measures?

Figure 2 presents the model that guides the statistical analysis we conduct to answer the above research questions. It contains both the direct and the indirect effects of the market context, as well as the link between NPD performance and business success.

Insert Figure 2 about here.

The results of Cusumano *et al.* (1992) [7] and Porter (1980) [22] suggest that the development performance dimensions are less predictive of business success in industries characterized by fast growth or fast product change. In addition, we expect that large firms (with a large market share) can use economies of scale and market power (such as established distribution channels) to determine their own fate, while small companies are more determined by their industry environment. We thus expect NPD performance to be more important for large firms, and the control variable to be significant for small firms.

THE DATA

The following variables, all of which have been identified in previous studies, were used to describe the following three dimensions of market context,

- market power, measured by market share
- market growth, measured by annual industry sales growth
- external stability, measured by product life cycle duration

Average industry profitability is used as a control variable for industry attractiveness. Data constraints prevented us from including other economic variables such as entry barriers or inter-firm rivalry, which together determine industry attractiveness [22, 23].

The measurement of NPD performance follows previous work that has identified a number of performance dimensions [11, 15]. From our data set, we were able to construct variables for the following of these dimensions:

- Technical product performance
- Market leadership
- Development intensity
- Product line freshness
- Innovation rate

The development intensity measure could be distorted if business units were to systematically pursue short-term profits by disinvesting development expense ("milking" the product line). However, all the participating business units were instructed to choose a product line for their responses, that was important for current and future business. Thus, we conclude that differences in development intensity measure efficiency in the use of development resources, not disinvestment.

We use business unit ROS (return on sales) as our dependent variable to be consistent with the studies quoted above [28, 29, 35]. Profits were defined as operating profits from the normal business, excluding extraordinary profits (losses) and taxes. All variable definitions are shown in Figure 3.

Insert Figure 3 about here.

RESEARCH METHODOLOGY

Our analysis is based on a sample of 163 detailed questionnaires from electronics business units in the US, Japan, and Europe. During the period of 1992-1993, 101 electronics companies completed detailed questionnaires on development, operations, strategy and business performance as part of the *Excellence in Electronics* project jointly undertaken by Stanford University, the University of Augsburg, and McKinsey & Company. Many of the world's leading companies agreed to participate in the survey, providing us with data on 12 of the 25 leading computer manufacturers and 4 of the 6 biggest TV manufacturers, to cite two industry examples. In 1994 - 1995, 62 electronics business units worldwide participated in a second round of the Excellence in Electronics survey.

In the first data set, measures were reported as of 1991, and in the second data set, as of 1993. Questions that were not posed in precisely the same way in both questionnaires were excluded from the analysis.

We organized the 163 completed questionnaires into 14 industry groups. These industry groups were characterized by different growth rates, industry profitability, and product life cycles. We then deleted observations for three reasons. First, business units with less than $50 M in sales were omitted, because they are often peripheral units or experimental corporate ventures. Second, business units with three or more of the variables (for this study) missing in their responses were deleted. Third, scatter plots of regression residuals identified four business units as outliers in most of our regression models. This graphical evidence was supported with the observations having studentized residuals larger than three. These four observations were deleted because such outliers can substantially disturb the regression analysis [12]. The remaining sample contained 86 business units in 12 industries. Further details of the data analysis procedure are given in the appendix.

Insert Figure 4 about here.

Figure 4 presents the industries in the sample, with their subsample sizes, average growth rates, and product life cycles. The data contains high growth industries (relative to the median) with short and long life cycles (PCs vs. small medical systems), as well as low growth industries with short and long life cycles (TV and VCR vs. mainframes).

OVERALL REGRESSION

Table 1 presents the results for an ordinary least square regression analysis with return on sales as the dependent variable. The other variables are as previously defined. Model 1a shows the expected control effect of industry profitability on the dependent variable, about 20 percent of whose variance is explained by industry profitability. These findings are consistent with [28, 29, 35], both in terms of significance of the control variable and magnitude of the adjusted R^2 value.

Model 1b adds the market context variables to the regression. The model now includes the control variable and the main effects of the market context. The adjusted R^2 increases by 5 percent, with market share having a statistically significant positive influence on profitability. Market growth and product life cycles do not have a significant direct impact.

Variable	*Model 1a*	*Model 1b*	*Model 2*
Industry profitability	*.862******	*.750******	*.606******
Market share		*.031******	*.021**
Market growth		*.041*	*.033*
Product life cycle		*.001*	*.001**
Development intensity			*-.053******
Market leadership			*.021*
Product line freshness			*.012*
Innovation rate			*-.041*
Techn. product performance			*.001****
Adj. R^2	*.186******	*.236******	*.343******

<.10; **<.05; *<.01; N=86*

Table 1: Regression for Overall Sample

In Model 2, we add our measures for development performance. The explanatory power increases to an adjusted R^2 of 34 percent. In addition to the control variable and the context variable market share, two development performance variables are significant: development intensity and technical performance. All influences go in the expected directions. It is interesting to note that product performance and development efficiency (efficiency used in the sense of negative intensity, i. e., higher intensity means lower efficiency and thus lower profitability) are significant, while innovation rate and market leadership are not.

We now turn to the indirect effects of the three market context variables, in order to explore the postulated contingency effect and to improve on the small amount of variance explained in Model 2. From a methodological perspective, this means that we perform three separate split sample analyses to investigate how the dimensions of product development performance depend on the market context.

SMALL VS. LARGE MARKET SHARE

Model 2 shows a statistically significant main effect of market share in the overall regression. In addition, however, we expect market dominant firms to be subject to other success drivers than small firms. In order to investigate the influence of market share on the success drivers specified in our model, we split our sample into a high and a low market share subgroup. The split is done at the median value of market share. The two resulting subsamples are not exactly of equal size, because some observations have the same market share value and thus fall as a group above or below the median.

Table 2 presents the resulting regressions of the two subsamples. The first column (Model 3) applies to the high market share subsample. It provides the coefficients and significance levels of the regression with all variables (control, market context and NPD performance). The next column describes the adjusted R^2 values of three regressions. First, industry profitability alone explains 15.7 percent of profitability variance. Second, adding the three market context variables increases the R^2 to 25.9 percent. Finally, the complete model reaches an explanatory power of 53.4 percent. Note that although industry profitability alone is significant at the 1 percent level, explaining 15.7 percent of variance, this significance is taken over by other variables in the complete model.

For market dominant firms, the level of explained variance is substantially higher than in Model 2. Only half of the variance (25.9 percent) in profitability is explained by variables outside the control of product development. NPD performance explains another 27.5 percent (53.4 percent - 25.9 percent). The most important variable is development intensity, but technical product performance also positively influences profitability.

The results for the small market share firms are markedly different (Model 4). Industry membership now explains almost 20 percent of firm profitability. However, adding other variables does not yield an increased (unadjusted) R^2 value. As additional variables are included without creating a better model fit, the adjusted R^2 even decreases. The comparison between models 3 and 4 indicates that only the big players on the market seem to be in a position to control their own success. Smaller business units are determined by environmental factors, which is consistent with Miller (1987) [17].

Variable	*Model 3 (high MS)*	*R^2 of submodel*	*Model 4 (low MS)*	*R^2 of submodel*
Industry profitability	.090	.157***	.912***	.191***
Market share	.012		.026	
Market growth	.077		.015	
Product life cycle	.004***	.259***	-.001	.144***
Development intensity	-.084***		-.030	
Market leadership	.088		-.074	
Product line freshness	.022		.005	
Innovation rate	-.007		-.042	
Techn. product performance	.001*		.001*	
Total Adj. R^2		.534***		.109***
*<.10; **<.05; ***<.01;	N=44		N=42	

Table 2: Split Sample Regression for High and Low Market Share

SLOW VS. FAST GROWING MARKETS

We analyze the indirect effect of market growth by dividing the 86 observations at the industry growth median. For the high growth subsample, industry profitability explains again about 20 percent of the variance. Adding the other market context variables increases the adjusted R^2 to 28 percent. Similar to the low market share observations, adding the NPD performance measures results in a decreased adjusted R^2. None of the development performance measures is significant, indicating that success in these growing markets is controlled from outside the NPD function. We can only conjecture which variables, other than industry membership, drive success in these rapidly growing markets. This is further discussed in the outlook on further research.

In the high growth subsample, all variance is explained through contextual variables, whereas for the low growth subsample the opposite seems to be true. The overall fit of the model is surprisingly high, with an adjusted R^2 of 72.5 percent, of which only 23.4 percent is explained by context variables.

The key drivers of success in the regression are efficiency and technical performance. Again, market leadership is not significant, while product line freshness is, but only at the 10 percent level. On the market context side, stability in the sense of slow growth and long life cycles further influences positively firm profitability.

The negative direction of innovation rate is surprising. Bringing out more products than the average competitor seems to hurt rather than to improve success. We see three possible explanations for this. First, we included only major product line changes in our innovation rate measure. But the customer may value many product variants *within* a product line rather than frequent product line turnover. Second, those companies which continuously change their product lines may be the ones that were not successful with their old products. Third, the rate of new product introductions may already be pushed to the limit in the electronics industries (i.e., being faster than the average hurts), whereas in other industries, it may still offer an advantage.

Variable	*Model 5 (fast growth)*	*R^2 of submodel*	*Model 6 (slow growth)*	*R^2 of submodel*
Industry profitability	*.870***		*.575*	
		*.205****		*.212****
Market share	*.030***		*.008*	
Market growth	*-.071*		*-.543**	
Product life cycle	*.001*	*.280****	*.004***	*.234****
Development intensity	*.025*		*-.091****	
Market leadership	*-.004*		*.059*	
Product line freshness	*.009*		*.027**	
Innovation rate	*.033*		*-.093***	
Techn. product performance	*.001*		*.002****	
Total Adj. R^2		*.200****		*.725****
*<.10; **<.05; ***<.01;	*N=46*		*N=40*	

Table 3: Split Sample Regression for High and Low Growth

SHORT VS. LONG PRODUCT LIFE CYCLE

In the final regression, we test the applicability of our development performance measures for companies with short product life cycles. The results are reported in Table 4 and are similar to the findings of market share and market growth.

For companies with fast changing products (short product life cycles) none of our variables is significant, resulting in an adjusted R^2 close to zero. This negative result in Model 7 supports recent observations that we need a different model to understand the role of new product development for fast changing companies and industries [7].

For companies with longer product life cycles, 53 percent of the variance is explained. For companies in industries with long product life cycles, market share increases profitability, and development performance also helps. Development efficiency, product line freshness and technical product performance all increase profitability.

Variable	*Model 7 (short life cycle)*	*R^2 of submodel*	*Model 8 (long life cycle)*	*R^2 of submodel*
Industry profitability	*.194*		*.958****	
		.016		*.211****
Market share	*.018*		*.058***	
Market growth	*.256*		*-.046*	
Product life cycle	*-.001*	*.104**	*.002*	*.304****
Development intensity	*.002*		*-.079****	
Market leadership	*.015*		*.041*	
Product line freshness	*-.013*		*.047**	
Innovation rate	*-.005*		*-.042*	
Techn. product performance	*.001*		*.001*	
Total Adj. R^2		*.006*		*.531****
*<.10; **<.05; ***<.01;	*N=40*		*N=46*	

Table 4: Split Sample Regression for Short and Long Product Life Cycles

DISCUSSION AND MANAGERIAL IMPLICATIONS

Strategy research has long stressed the importance of contextual variables in explaining firm profitability. Product development literature has only recently pointed out that the currently dominant model of product development performance has been developed in, and may be mainly applicable to, mature and technologically stable industries [3, 7].

The present article examines the influence of the market context and proposes at least partial answers to our two research questions, using data from 86 business units in the worldwide electronics industries. First, how does the market environment influence profitability, and what is its contribution to profitability variance? In the overall sample, 18 percent of the profitability variance is explained by average industry profitability. Adding the market context variables market power, market growth, and technological stability, increases the explained variance to 23 percent which is consistent with previous findings in the strategy literature ([28, 29, 35]).

Our second research question addresses the contingency effect: How does the market environment influence the importance of the NPD performance dimensions? The development performance model includes the (widely used) dimensions of market leadership, technical product performance, development efficiency, innovation rate and product line freshness. We are able to show how the importance of NPD performance in explaining firm profitability differs across market characteristics. Development performance seems to matter more in markets of slow growth and long life cycles, where the model explains up to 70 percent of the variance. In other words, in industries with slow growth or slow product change, NPD performance explains twice as much variance as the environment, whereas it explains none in a fast changing industries.

The contribution to explained variance also differs substantially between business units with high and low market shares. NPD performance explains 30 percent of profitability variance for high market share units, but none for low market share units. This is consistent with Miller's prediction [17] that large firms may be able to partially insulate themselves from industry changes.

Our findings translate directly into managerial recommendations. The main insight implies that there is no development performance profile that holds independent of market characteristics. For the large players across industries, the key to success lies in efficiency and technical product performance. Small firms can compete through superior technical performance, but the key profitability drivers are not covered by the established NPD performance dimensions.

In slowly changing industries (slow growth or long product life cycles), development efficiency and technical product performance are the key predictors of success, consistent with [5, 6]. In contrast, introducing many new products may actually hurt profitability (significant in the slow growth regression). Several possible reasons for this are discussed above.

The substantial differences in variance explained by our model, dependent on different market environments, serve as a warning to managers against carelessly applying results established in different markets. For example, this warrants caution with regard to benchmarking projects across industries when the benchmarking partners are facing different environmental conditions.

THEORETICAL IMPLICATIONS AND FUTURE RESEARCH

Our theoretical contribution is twofold. First, we present a contextual model of NPD performance that explicitly accounts for the impact of differing market environments. The model permits measuring the relative importance of market characteristics in explaining firm profitability and comparing it with the relative importance of NPD performance. This represents another step towards closing the firm-level gap as described by Adler [1], with respect to NPD performance analysis.

Second, we show that the impact of NPD performance on profitability depends on the characteristics of the market environment: NPD performance is important in slowly changing industries (slow growth or long product life cycles), but explains no profitability variance in fast changing industries.

Our findings open up several avenues for future research. First, previous research on the coevolution of technologies and organizations [7, 30, 31, 33] suggests that the evolutionary state of technology represents an important variable not considered in our model. Further research on NPD performance could, for example, include observations in pre- and post-dominant design periods.

Second, the present article focuses on a contextual approach to development *performance*. Recent work indicates that there are similar contingencies at the operational level of managing the development *process*. For example, Eisenhardt and Tabrizi (1995) [8] demonstrate how the NPD process differs across industries. In stable and mature industries, such as mainframes or microcomputers, the authors find that concurrent engineering (overlapping of activities) reduces completion times of development projects. However, in high velocity environments such as PCs or printers, different approaches are found to be successful. We refer the interested reader to preliminary work in [8, 13, 32], which creates a second avenue for future research.

Third, some of our results are "negative results" in the sense that they merely point to the NPD performance model as being less applicable in rapidly changing environments. This leaves us with the challenge of identifying other business success drivers that do apply under such conditions. These drivers may be found within the traditional NPD measures, or in other functions of the organization such as marketing and distribution or manufacturing.

In summary, future theoretical or statistical work striving to explain the connection between product development and business unit profitability must combine the effects of the industry and market environment with firm-internal variables under the control of the management. NPD performance measurement requires an interdisciplinary approach, utilizing the insights from other management disciplines.

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APPENDIX

In the remaining 86 observations, there were still some data points missing. In order not to lose further observations, we replaced missing values by the average value for the variable in the corresponding industry. No data points were replaced for the dependent variable (all observations that had ROS missing were deleted), and none for industry profitability and market growth. The variable market share had the most missing data points (13). The replacement percentage was below 5 percent for all other variables, and was not concentrated on any variable, observation or industry. Since missing values were spread uniformly, deleting all observations with a missing data point would have reduced the sample size to below 50.

Of the 86 observations, 16 were contributed by 8 business units that appeared in both data sets (1991 and 1993). They were included as separate data points, since each showed substantial differences between the two years across all variables. For example, the average absolute ROS between the two years was over 100 percent for the 8 business units. This may be attributed to the recession that took place between 1991 and 1993, and corresponding restructuring efforts in many companies.

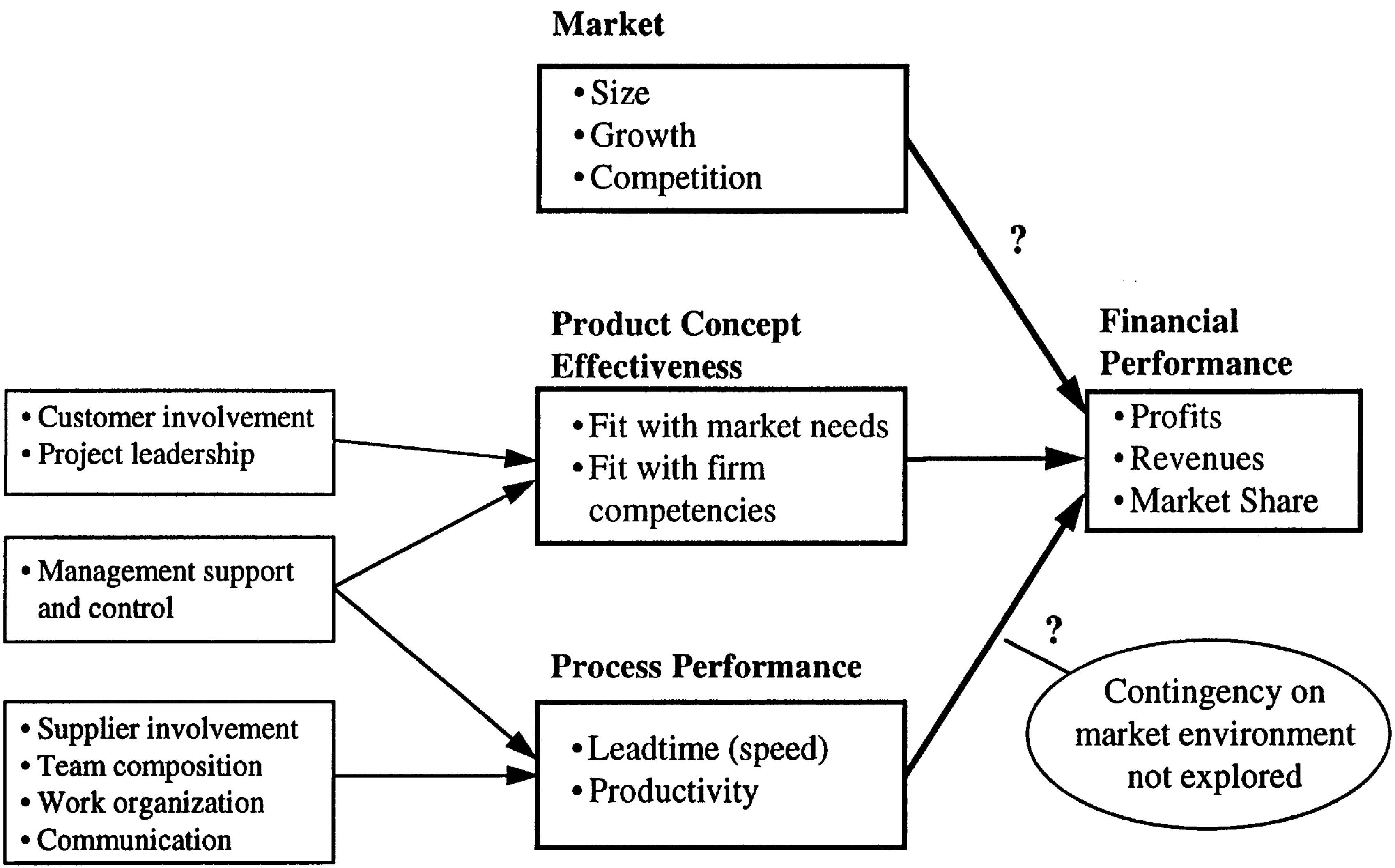

Figure 1: The Brown and Eisenhardt Metamodel

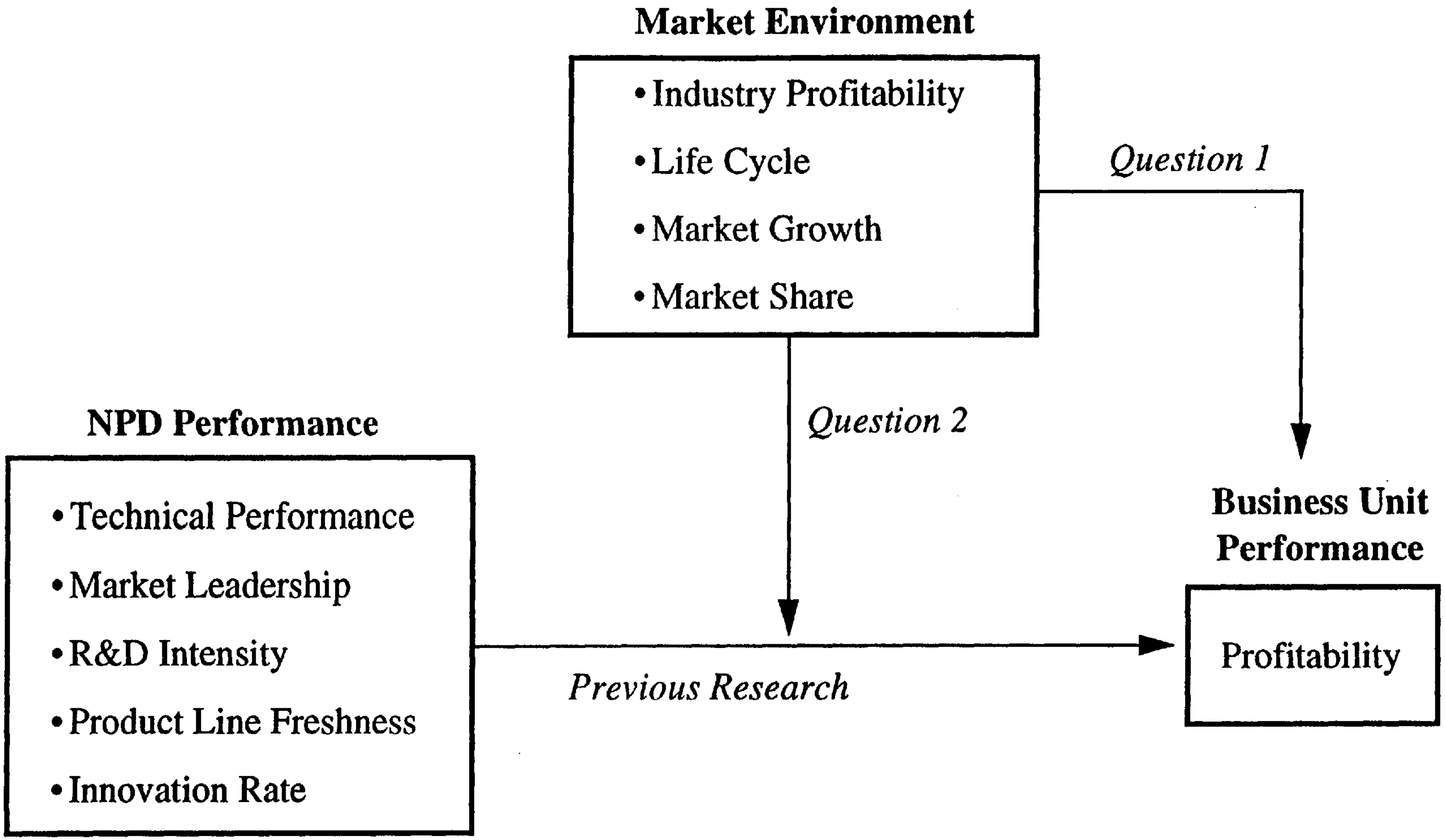

Figure 2: Framework for the Contingency Model

Firm Success (Dependent) Variable:

- Profitability = ROS (Return on Sales) in the last year reported before extraordinary items and taxes

Development Performance Variables:

- Market Leadership = % of significant product innovations that were first to market in the reported period (1989 - 1991 and 1991 - 1993, respectively)
- Technical product performance = product performance as perceived by Marketing, R&D, and Top Management (self reported estimation, cross checked with separate reports from R&D, marketing, and manufacturing)
- Product line freshness = Proportion of sales from products introduced the previous 3 years, as of the last year reported
- Innovation rate, normalized by life cycle = number of significant product line changes and innovations over one life cycle (number over the last 3 years reported, multiplied by product life cycle in years)
- Development intensity = development expense for the product group in question divided by product group revenues in the last year reported.

Market Context Variables:

- Industry profitability = average ROS over the respondents in the industry in the last year reported
- Market growth, averaged over all respondents per industry = (market size in the last year reported, minus market size two years ago) divided by market size two years ago
- Market share = worldwide volume for the product group in question, divided by worldwide volume market size, in the last year reported (domestic and value market shares were also available, and they were highly correlated with the chosen measure, with a correlation coefficient of around .9). This measure is then normalized by industry; the number used in the regression is the percent deviation, plus or minus, from the industry mean.
- Product life cycle = product life cycle in the last year reported, averaged per industry and measured in months.

Figure 3: Definitions of Variables

Industry	Number of Observations	Growth (%)	Life cycle (months)
Mainframes	4	-9%	45
Minicomputers	8	19%	33
PCs	12	36%	18
Printers	9	28%	23
Large medical systems	3	26%	106
Small medical systems	3	53%	72
Industrial controls	4	9%	63
Test and measurement systems	16	14%	61
Data communication systems	5	92%	38
PBX (customer premise equipment)	5	7%	59
Telephone endsets	6	16%	54
TV and VCR	11	5%	25
Total	N*=86	Median = 15%	Median = 35

* Sample used for statistical analysis

Figure 4: Sample Composition