Ernst, Holger; Teichert, Thorsten Andreas

Working Paper
Assessment and benchmarking of innovation processes: Implications from a case study

Manuskripte aus den Instituten für Betriebswirtschaftslehre der Universität Kiel, No. 445

Provided in Cooperation with:
Christian-Albrechts-University of Kiel, Institute of Business Administration

Suggested Citation: Ernst, Holger; Teichert, Thorsten Andreas (1997) : Assessment and benchmarking of innovation processes: Implications from a case study, Manuskripte aus den Instituten für Betriebswirtschaftslehre der Universität Kiel, No. 445, Universität Kiel, Institut für Betriebswirtschaftslehre, Kiel

This Version is available at:
http://hdl.handle.net/10419/149063

Standard-Nutzungsbedingungen:
Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen. Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:
Documents in EconStor may be saved and copied for your personal and scholarly purposes. You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public. If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.
Assessment and Benchmarking of Innovation Processes - Implications from a Case Study

Holger Ernst und Thorsten Teichert
Nr. 445

Assessment and Benchmarking of Innovation Processes - Implications from a Case Study

Holger Ernst und Thorsten Teichert

Copyright 1997

Dr. Holger Ernst
Dr. Thorsten Teichert
Institute for Research in Innovation Management
University of Kiel
Olshausenstrasse 40
24098 Kiel
Germany
Phone: +49-431-880-3614
Fax: +49-431-880-3349
E-mail: ernst@bwl.uni-kiel.de
Assessment and Benchmarking of Innovation Processes - Implications from a Case Study

Abstract

Benchmarking of innovation processes requires the reliable assessment of non-documented organizational characteristics. Based on key informant literature we discuss the difficulties of gaining reliable information from respondents and identify potential sources for heterogeneous perceptions among different respondents. We apply an existing benchmarking approach to critical success factors of innovation processes in a comprehensive case study of a major German industrial corporation. We find that perceptions differ substantially among the individual respondents. In particular, we observe different functional perceptions between respondents from Marketing and Research & Development. The results are consistent with expectations from interface theory. These perceptual differences have a severe impact on the managerial conclusions drawn from benchmarking. There appears to be no single reliable source of information within an organization. Furthermore, variances among informants' assessments should be recognized and regarded as valuable information for the benchmarking process. It is our recommendation that multiple informants ought to be included in the evaluation of innovation processes in future benchmarking studies.
1 Introduction

Companies are increasingly realizing that cost cutting activities have at best a short-term impact on profitability. Long-term, sustained market success can only be achieved through continuous development and introduction of new products [7]. As innovation become more and more relevant to sustained success, companies are attempting to adjust their organization accordingly.

A variety of auditing and/or benchmarking tools have been proposed as a means of improving innovation processes [15, 18, 19, 24, 52]. Benchmarking, a specific form of the long-known interfirm comparison [48], has become increasingly popular among practitioners and researchers. Benchmarking identifies potential problems through comparison of the firm's current practices to best practices. However, the quality of results obtained from benchmarking depends on reliable and valid assessment of current practice. Inaccurate measurement can bias the assessment derived from benchmarking and thus lead to ineffective or even detrimental strategies.

One mode of benchmarking innovation activities employs objective "hard facts", i.e. quantitative measures of inputs into and outputs from the innovation process. The ratio of the two measures produces an efficiency indicator, which can be benchmarked against a suitable best practice [52]. Unfortunately, these measures are more likely to mirror symptoms than to provide information on the underlying, more fundamental causes for performance deficits. The "soft characteristics" of the innovation process (such as process execution, organization, strategy, culture and commitment) have an important impact on innovation performance [18]. In order to assess these elements of the innovation process, one must rely on personal judgments gained from interviews and/or questionnaires. Therefore, one should not overlook the importance of obtaining reliable information from carefully selected respondents.

The all-too-common practice of interviewing a single respondent per company impedes the assessment of validity. Multitrait-multimethod approaches, which apply various methods to acquire information from multiple respondents, could be used to overcome this problem [13]. Nevertheless, the current trend in the study of innovation management is to focus on validating the content of the questions only (e.g. by means of factor analysis). A systematic evaluation of potential respondent effects is missing in most studies.
A recent meta-analysis of 47 individual empirical research studies of the innovation process shows that the issue of data collection is not being adequately addressed [42]. The level of respondents (i.e. project, departmental, divisional or corporate level) was given in only 36% of the studies. In contrast, the functional role of the respondents (i.e. management versus R&D versus marketing) was reported in 74.5% of the studies. Of these functional respondents, 40% were listed as "managers". However, it is unclear what the category "manager" actually contains: whether it is intended to signify a hierarchical role, a functional role or a general catch-all category. To date, most studies rely on a single information source within each company. Only a handful of studies included more than two respondents, multiple hierarchical levels and/or functional departments. No study examined differences of perceptions between top management and members of lower ranks. Montoya-Weiss et al. conclude that additional research is necessary to assess the consistency of and correlation between multiple responses. They suggest that case studies should be used for "... developing a multilevel interviewing process that may have implications for comparing intrafirm perceptions" [42, p. 413].

Following this suggestion, we applied an in-depth case study for a method, which has been recently proposed for benchmarking innovation processes [19]. Deviating from the initial concept, we asked multiple informants the same questions about the nature of their company's innovation process. Our main objective was to determine, whether individually and/or functionally differentiated perceptions among respondents existed and if they had an impact on the overall outcomes of the benchmarking process. The knowledge gained from this case study has theoretical and practical implications for the assessment of innovation processes.

The paper is organized as follows. After a discussion of the theoretical dimensions of measurement and assessment of innovation processes, we describe the case study's design, execution, and outcome. We conclude this article with an evaluation of the implications of our findings for further research and for management.

2 Thoughts on measurement

It is well known that the use of archival data for the assessment of soft factors is insufficient for both strategic [54] and organizational research [35]. Therefore, one must rely on information provided by individual respondents. Because our interest lies not in their personal attitudes but in gaining a quasi-objective evaluation of organizational properties, respondents are labeled "informants" [12].
Use of the informant technique has a long tradition in marketing research [2]. Measurement errors are an integral part of this process. Despite decades of research on a wide variety of issues, researchers have consistently observed and are still plagued by the low level of consensus among respondents [21, 41, 45]. Thus, Kumar et al. conclude that "there may be little correspondence between informant reports and actual events" [35, p. 1634].

Total response variation may result from either random errors or systematic biases (see figure 1). Random errors cause fluctuation of responses around the "true" value and may therefore lead to a limited reliability of findings. Systematic biases lead to a deviation of the average observed values from their true means and thus directly hamper the validity of outcomes. After discussing the possible sources of response variation, particularly with respect to the assessment of innovation processes, we investigate the influence of respondents' organizational roles as a cause for systematic biases.

Figure 1: Sources of response variation
2.1 Variation of responses

The questions put to respondents are not simple and thus require "complex tasks of social judgment on potentially sensitive or controversial issues" [43, p. 396]. Informants often combine several unrelated individual observations in order to make inferences on a broader, organizational level. Therefore, a respondent needs to meet two rigid requirements: (1) he/she must be knowledgeable on the relevant issues, and (2) he/she must provide consistent and unbiased answers. Thus, respondents need first-hand knowledge and the ability to make objective and consistent judgments.

Various studies have shown that demanding questions can overtax respondents' knowledge and, thus, increase random errors [14, 51]. Therefore, knowledge of a respondent should be assessed by global measures or by specific evaluations.

The respondent's length of employment and/or his position in the organizational hierarchy are often used as global measures [35]. They are inadequate for the assessment of innovation processes for several reasons: Firstly, there is no typical innovation expert. Innovation processes are organized quite differently across companies and the features characterizing an expert will thus vary from firm to firm depending on the size of the organization or the mode of information flow [32, 50]. Secondly, innovation processes typically integrate diverse activities by multiple actors in different departments at different points of time. Therefore, an expert on one issue is likely to be uninformed in another issue. Thirdly, a low degree of written formalization and of repetition makes it difficult for actors to accumulate knowledge on all relevant aspects of the innovation process. Consequently, global measures of knowledge are unlikely to adequately reflect respondents' competence for assessing innovation processes, just as they have been found to be inadequate in the assessment of respondents' knowledge in far less complex areas of organizational research [35].

In contrast to global measures, specific measures relate directly to the issues of concern. The respective level of knowledge is measured by asking respondents to assess their own knowledge regarding single issues [20, 31]. However, such self-assessments may be biased as well, particularly if respondents have an incentive to appear more knowledgeable or important than they actually are [33]. Therefore, self-evaluation is also of limited use [35]. It seems advisable to obtain an independent, objective assessment of respondents' competency (e.g. by a third party's reference [33]).
Knowledgeable respondents in and of themselves, guarantee neither consistent nor valid answers. Questions are often subjectively interpreted and even when respondents base their evaluation on the same information, they may place different values on different pieces of information [43]. Thus, even faithful responses can be biased, when events are interpreted in the context of a person's background and experiences. This is especially problematic for the use of Likert-type scales, where there is no metric anchorage and where respondents are forced to make comparative judgments. Difficulties in judgment may be increased by novelties in the innovation process when the organization has not previously experienced such processes and when they deviate substantially from those which are established for well-known and repeatedly performed business processes [30]. Thus, comparative judgments are context-dependent, i.e. they are likely to be different when respondents base their evaluation either only on the current company or on similar companies or even on different types of companies.

Finally, judgment capacities can be influenced by factors such as political correctness [14], halo-effects and prejudices. Retrospective accounts compounds the problem of subjectivity [23, 33, 49]. Factors such as memory failure and distorted recall bias perception and recounting of past events.

A lack of knowledge should lead all else being equal to random error, since uncertainty about the state of nature is likely to cause random variation around the „true“ mean. Deficiencies in the ability of judgment are more likely to effect systematic biases, if they are based on (intentionally or unintentionally) distorted perceptions. Such biases are especially harmful for evaluation purposes because of two reasons: first, the observed values depart on average from the „true“ values and thus lead us in the wrong direction. Second, while random error causes observable noise, a systematic bias may remain unobserved, if it is consistent among respondents. Thus, knowledge is a necessary, but by no means a sufficient precondition for achieving valid answers. Accordingly, Kumar et al. conclude that "just because two informants are knowledgeable does not necessarily mean they will completely agree with each other" [35, p. 1646]. Special care should be taken to control for biased judgments.

In research practice, the selection of key informants is based on global measures of competency and their judgment capacity is taken for granted. Despite both of the shortcomings we have just addressed, this remains standard practice in organizational research [33]. This is understandable given the effort required to locate competent respondents and to test their judgment capacity. However, one
possible source of response variation is easily recognizable and controllable: The organizational role of respondents.

2.2 Response biases caused by organizational roles

Knowledge on specific issues and the respective judgment capacity are likely to be correlated with the organizational role of the respondent. Theoretical considerations [34] as well as practical evidence [43] confirm that role behavior can exert a high influence on the respondents' perception of organizational characteristics. Organizational research has revealed considerable and systematic disagreement between respondents in different organizational roles [4]. In particular, both one's position in the organizational hierarchy and the perspective attributable to one's department have been shown to have an impact on the responses given [50]. Even the role-specific judgments of the CEO's are quite different from those of second-level executives [29].

The influence of departmental views seems to be particularly important in the context of assessing innovation processes, because the successful development and implementation of new products requires the integration of specialized knowledge from different organizational units [6]. In particular, the cooperation between Marketing and R&D has been identified as a critical success factor for new product development [25]. Nevertheless, empirical researchers have found that disharmony between R&D and Marketing can often be observed and is detrimental to the success of innovations [9, 22]. Barriers to cooperation between the two departments might be attributed to such factors as different personalities, cultures, languages, organizational responsibilities and physical barriers [25]. There is further empirical evidence that interface problems are perceived differently by R&D and Marketing [9, 36] and that both departments tend to favor different means of overcoming the problems [26, 47]. Thus, the different perceptions of R&D and Marketing could have an impact on the assessment of a company's innovation process as well as the resulting strategies for improvement [9].

Numerous studies in innovation research may be susceptible to a response bias caused by different organizational roles. Two-third of the studies which report the organizational role of respondents base their analyses on a single functional affiliation [42]: Management is most frequently interviewed when assessing innovation processes (12 out of 27 studies), followed by R&D (33%), with Marketing (22%) less frequently interviewed. This creates the potential for shortcomings in the research findings, because neither the perceptions of management nor the perceptions of a single department are unbiased and adequate.
Empirical research shows that while answers differ systematically between hierarchical levels [8], the higher-level respondents do not necessarily provide more reliable and valid assessments than lower-level respondents [43]. Accordingly, Montoya-Weiss et al. point out that "no study examined the differences between top management's perceptions and the various functions' perceptions" [42, p. 414].

In order to shed some light on possible implications from functional and hierarchical biases, we provide an incidental example. Mishra et al. [38] replicated a study by Cooper [16, 17] on new product success at the project level. Cooper chose Canadian respondents from general management, whereas Mishra et al. asked Korean marketing managers. The latter study differs remarkably from the former in respondents' evaluation of success factors. This leads the authors to conclude that "variables that are important in one study are either not important or less important or have an inverse relationship in another study" [38, p. 548]. Whereas Mishra et al. attribute their findings entirely to intercountry effects, these results might be influenced by functional differences between the respondents as well. In fact, many indicators point towards a systematic distortion of answers. Even an aggregated comparison of success factors reveals differences which may have been influenced by the organizational role of respondents [38]:

1) Correlations between project characteristics and new product success are on average higher in the Korean (0.5 ≤ r ≤ 0.62) than the Canadian (0.03 ≤ r ≤ 0.36) sample. Obviously, the Korean marketing managers provided more consistent and clear-cut answers. It appears that the departmental view builds on a more closely shared perception both of relevant strengths and shortcomings. This shows a high consensus among the respondents.

2) According to the answers of the Korean marketing managers, all ten marketing-related variable sets have a similar impact on project success and/or failure. In the responses of Canadian general managers, only five out of ten variable sets are correlated highly with project success. The most important variable set of the Canadian responses is concerned with the proficiency of the formal NPD activities. Hence, there is a distinct focus in the responses of the Canadian general managers which corresponds with their organizational role: They are more accustomed to issues of organizing processes than of operational marketing.

In sum, the accuracy of respondents' assessments of innovation processes seems to be highly questionable in the light of possible response variations. In

---

1 Differences in findings derived from international surveys can be attributed to a variety of factors. Weisenfeld-Schenk provides an overview on the various possible sources of differences [55].
particular, systematic response biases caused by organizational roles may distort the answers of individual informants. Therefore, any method of selecting a single key informant has corresponding deficiencies. One can simply not obtain reliable and comprehensive information on all issues from one source.

However, the standard practice in innovation research is the use of single respondents. While this constitutes a severe shortcoming, it is common because of a concern for research efficiency: Most believe that the cost incurred by sophisticated selection procedures of informants override the benefits. It is our view that this is a false and dangerous assumption. We assume that response variation in general and systematic response biases in particular constitute a serious problem in the assessment of soft factors of innovation processes. Concern for research efficiency should not have a detrimental impact on research effectiveness.

It is thus advisable to use multiple informants in order to improve the validity and reliability of results. The advantages of multiple informants are well documented and their usage has been recommended for some time [23, 49, 50]. Studies should include respondents from different hierarchical levels and from different functions as both theoretical works and empirical findings suggest that their are indeed serious role-specific and systematic biases.

3 Case Study

In a recent study, Cooper/Kleinschmidt identified critical success factors in new product development at the company level [18, 19]. Their study is noteworthy for two reasons: First, they identify characteristics of the innovation process which distinguish successful from unsuccessful companies; Second, on a practical level, a company can use these findings to benchmark its own innovation process against these proven success factors, which, in the absence of suitable benchmark partners, serves as a very cost efficient instrument for assessing and improving a firm's innovation process [18]. Unlike Cooper/Kleinschmidt who relied on a single information source for their questionnaire [19], we applied their benchmarking method in an in-depth case study, in which we asked multiple informants to evaluate their company's innovation process. Data came from a strategic business unit (further referred to as "company") of a major German industrial corporation. The company of our case study operates in the area of high-tech and (in 1996) had annual sales above 1 billion DM and more than 4,000 employees.
3.1 Case study design

3.1.1 Selection of informants

In the study conducted by Cooper/Kleinschmidt, the selection of respondents was based on their organizational status. Thus, a global measure of competency was applied (see paragraph 2.1). 90% of their respondents came from senior management, i.e. corporate officers which had been involved in their company's new product development (NPD) program for at least three years. No further information was given on the individual or functional background of these corporate officers. This selection of respondents purposely utilizes senior management's perception of the company's NPD program. The authors argue that the "use of single informants is valid when the respondents possess unique process insights" [19, p. 379]. This proposition has to be questioned in the light of our previous discussion on measurement aspects.

In our case study we chose to identify a number of informants who could be viewed as competent with respect to the questions to be asked on the company's NPD program. It was our intention to use these heterogeneous perceptions to generate a differentiated, more complete, picture of current practices in the company's NPD program. The company under consideration supported our use of the multiple informant approach as it secured commitment of the whole organization, which was necessary for the successful implementation of changes based on the findings of our case study.

The selection of appropriate interviewees was done in close interaction with the „Innovation Manager“, who serves as the „Process Promoter“ [30] and thus coordinates the relevant organizational entities in the overall innovation process. These promoting activities allow the innovation manager to identify those persons from various departments who are experienced with a substantial number of innovation projects and can thus be regarded as most competent to assess the current practice in the company's NPD process. Only a handful of employees were found to fulfill these rigid requirements. For the present case study, eight informants could be identified, of which four persons came from marketing and three from R&D. All of these informants have been extensively involved in NPD projects either as project leaders or as supervisors for their functional department. Additionally, one person from the controlling department was included, as the company applies a continuous monitoring system for their NPD projects.

We restricted our analyses to a few individuals, because we intended to avoid response errors, which would have occurred if we had included more, but less
knowledgeable respondents. This approach draws on experiences from Campbell, who found data of three knowledgeable respondents to be more accurate than those of a much larger group of less knowledgeable respondents [12]. Although the limited number of observations in this case study does not allow for the application of sophisticated statistical tools, this should not be viewed as a shortcoming as this kind of benchmarking tool remains suitable for practical implementation.

3.1.2 Mode of investigation

Personal interviews according to a standardized questionnaire were conducted with all eight respondents. Before the interview, we defined what was meant by innovation and by an innovation process, as a common understanding of these core elements of the benchmarking effort is essential. We focused on substantial innovations with new product attributes in order to clearly distinguish these innovations from marginal improvements. With respect to the innovation process we looked at all relevant steps carried out from idea generation to product launch and stressed the fact that judgments should be based on generic corporate characteristics rather than on experiences from an individual project.

The questionnaire consisted of 26 performance variables as outlined in the Cooper/Kleinschmidt article [19]. As these variables needed to be translated into German, care was taken to guarantee a common view of the content of each variable across all respondents. In this context, some variables had been adapted to the specific situation of the company under consideration.

In accordance with Cooper/Kleinschmidt, respondents were first asked to rate the current practice of each performance variable on a five point Likert-type scale. Furthermore, we briefly asked the respondents to explain reasons of their assessment and about ideas for improvement. These qualitative remarks proved to be of great value for the interpretation of the benchmarking results (see paragraph 3.3.2). In addition to the evaluation of current practice, we asked respondents to rate each performance variable according to its importance for the success of innovation processes, which was likewise measured on a five point Likert-type scale. The difference between importance and current practice served as an indicator for the extent of dissatisfaction with current practice. Thus, we produced a measure of

---

2 The variable "team players have frequent meetings" was removed from the case study.

3 In particular, the variable "homework activities (predevelopment)" was related to the screening of new product ideas in feasibility studies, which are regularly done prior to the start of the actual innovation project.
internal benchmarking, in which the current practice is compared to a perceived "ideal situation". The average interview lasted two hours.

The benchmarking findings were extensively discussed in a workshop where, in addition to our interviewees, senior management and the innovation manager were present. Through this workshop we identified means of improving current practice. The workshop proved to be an important tool in the validation of the benchmarking results. It helped to achieve a broad consensus and commitment of all relevant hierarchical and functional units, which is essential for the success of further steps taken based on the results of this benchmarking study.

Due to confidentiality, we cannot report mean values for the NPD performance variables. In line with our research objective, our presentation is restricted to those measures which indicate response variations and response biases.

3.2 Variation of responses

3.2.1 Assessment of current practice

The respondents were asked to evaluate the current practice of the 26 performance variables for the company's NPD process. In the first column of table 1 we present the resulting standard deviations for the respective variables. This figure serves as an indicator of the degree of response variations. A high standard deviation shows a substantial level of disagreement among the respondents, whereas a low standard deviation hints at a high degree of homogeneity of assessments. The following findings are of particular interest:

1. The mean standard deviation over all 26 performance variables is 1.06, which shows a quite strong disagreement between individual respondents. The mean difference of the performance variables between the most and least successful companies in the study of Cooper/Kleinschmidt, i.e. between "solid performers" and "dogs", is 0.86 [19], which lies well below our standard deviation. If we take the results of Cooper/Kleinschmidt as a benchmark for our company, the conclusions drawn from such a comparison depend on the interviewed person. According to some respondents, our company may be characterized as a "dog", whereas others would see it as a "solid performer". The consequences of these

---

4 For the 26 performance variables listed in table 1, we strictly follow the expressions used by Cooper/Kleinschmidt [19].
perceptual differences are severe when benchmarking is based on the view of a single respondent only.

2. Performance variables with large individual differences are identified and highlighted in table 1: adequate R&D budgets, new products aimed at familiar markets, tough Go/Kill decision points, NP measures part of senior management's objectives, defined arenas for NPD program and homework activities. In these cases, a high standard deviation indicates an above average disagreement among the respondents regarding the current situation. This calls for a careful investigation of the possible underlying factors, before hasty conclusions are made.

3. For some other performance variables a low standard deviation can be observed. These are senior management involvement in Go/Kill decisions, product definition prior to development, flexibility of NPD process, evaluation of NP program's performance and necessary people in place for NPD objectives. The low standard deviation indicates a consensus of views among individual respondents. Here, more or less pressing needs for improvements in the NPD process can easily be identified through comparison with the benchmark values of the "solid performers".

3.2.2 Importance Weights

In addition to the evaluation of current practice, respondents were asked to rate the importance of each performance variable for the success of NPD programs on a five-point scale. We use the standard deviation of the obtained answers as a measure of differences in importance of each performance variable to the interviewees. The results are displayed in column two of table 1. The following aspects should be stressed:

1. The mean standard deviation over all variables amounts to 0.70. This indicates that the respondents agree more on the importance weights given to each performance variable than on its current practice. Thus, general beliefs of importance seem to generate less variances in the answers than individual perceptions of current shortcomings, e.g. due to dissatisfaction caused by latest experiences.

2. The standard deviation for each importance rating indicates areas of relative agreement and disagreement. On the one hand, respondents agree on the importance of market orientation of the NPD process, necessary people in place for NP objectives, homework activities, time off for creative things and senior management commitment to the NPD program. On the other hand, respondents
disagree on the importance of supporting skunk works, aiming new products at familiar markets, having adequate R&D budgets, defining arenas for NPD programs and having a flexible NPD process.

3. It seems that current practice and importance given to each performance variable are not assessed independently. In fact, a correlation analysis between the mean values of both sets of variables (N = 26) revealed a significant negative relationship (r = -0.46; p = 0.02). Therefore, it can be said that a high importance rating is related to a low satisfaction with the current situation. Although we cannot determine the direction of causality from a correlation analysis, it is reasonable to assume that individual judgments of current situations are influenced by perceptions of what factors are important for innovation success. This could have a substantial impact on the reliability of benchmarking outcomes, as it is based on a comparison of best practice to perceived current practice.

3.2.3 Extent of perceived dissatisfaction

The perceived dissatisfaction for each performance variable is measured by the difference between the individual judgment on current practice and on importance of the variable [27, 53]. The mean difference and its standard deviation are displayed in column three of table 1. A high mean value indicates a large discrepancy between importance and current practice. This internal benchmark identifies those performance variables which the respondents feel should be given priority for improving the NPD process. The standard deviation of mean differences serves as an indicator for the degree of heterogeneity of respondents' answers. Severe dissatisfaction occurs for six of the performance variables, for which the mean differences between importance and current situation are substantially above average (0.97):

1. There seems to be a broad consensus among the interviewees that the company's NPD process could be substantially improved by supplying more personnel resources. Here, the relatively low standard deviations for current practice, importance and dissatisfaction show a consistent assessment across respondents. This consensus was evident in the interviews, as respondents unequivocally complained about the domination of day-to-day business over NPD projects. This was identified as a major deficit of the company's NPD process. A distinct separation of innovating activities from daily routine was consistently and firmly advocated.

2. NP performance as part of senior management's bonuses, fast outside decisions during the NPD process and market orientation of the NPD process were
identified as potential areas for improving the innovation process. The standard deviations are relatively moderate for all three performance variables. Hence, we can assume a similar degree of dissatisfaction among respondents with respect to these criteria. It is interesting to note that market orientation of the NPD process is considered of high importance by all respondents. However, there is considerable disagreement about the current situation. In paragraph 4.3, we show that this disharmony is attributable to functional differences between Marketing and R&D.

3. For the variables homework activities and the existence of tough Go/Kill decision points, large standard deviations are apparent. Evidently, the level of dissatisfaction on these variables diverges considerably among our respondents. Both variables receive consistently high importance ratings, but the assessment of current practice is inconsistent across individuals. In this case, a further examination seems to be advisable in order to determine the causes of the varying assessments.

Overall, large standard deviations with respect to differences between current situation and importance are striking for many of the variables (see table 1). The mean standard deviation (1.29) is larger than the mean value (0.97) of perceived dissatisfaction. This clearly reveals that the extent of dissatisfaction differs substantially across individual respondents. Consequently, there appears to be a lack of consensus about the selection of those performance variables, which should be the focus of efforts to improve the innovation process.

It becomes evident from our analyses that individual differences can lead to distinctively different assessments of current practice and importance weights and, thus, to varying levels of dissatisfaction for those variables used to measure the performance of NPD programs. There is some support for the view that these measures are not independent from each other: The assessment of current situations may be influenced by the importance weights. These measurement aspects exert a decisive impact on benchmarking and its implications. Functional differences may have led to the observed heterogeneous judgments.

3.3 Functional differences

3.3.1 Assessment of current practice

In order to get to the root of heterogeneous perceptions, we analyze functional differences between Marketing's and R&D's perceptions about current practice with respect to the performance variables. We omit the presentation of functional differences regarding the importance of each variable, since the benchmarking of our
company against "solid performers" identified by Cooper/Kleinschmidt [19] is based on the assessment of current practices.\(^5\)

The mean standard deviations over all performance variables for Marketing and R&D, 0.89 and 0.93 respectively, are lower than the mean standard deviation for all respondents (1.06). Thus, intrafunctional judgments on current practice are more homogeneous than interfunctional judgments.\(^6\) It appears that answers from Marketing are slightly more homogeneous than those from R&D. However, it has to be stressed that there are still substantial variations of judgments within the two functional departments. Individual differences are present even after controlling for functional heterogeneity. These functionally differentiated assessments of performance variables are highlighted in columns four and five in table 1.

In column six of table 1, the mean differences between Marketing's and R&D's assessments of current practice are displayed. High absolute values indicate a high degree of disagreement, where positive (negative) numbers show that current practice is rated higher (lower) by Marketing than R&D. In general, it can be observed that R&D is more dissatisfied with current practice than Marketing. Marketing assesses the current situation more critically for only eight out of the 26 variables. Only four of these variables differ substantially from their corresponding values for R&D. These variables are support for skunk works, NP performance part of senior management's bonuses, time off for creative things and role of NP program clear to all.

High mean differences illustrate that perceptions on current practice are distinctively different between Marketing and R&D. We tested the mean differences for significance by means of a parametric T-test and further checked the results by a non-parametric Mann-Whitney U-Test [11]. Significant differences between Marketing's and R&D's perception of current practice occur for seven performance variables. R&D is significantly more dissatisfied with current practice than Marketing in case of homework activities, market orientation of the NPD process, completeness of the NPD process, senior management commitment to the NPD process, necessary people in place for NPD program's objectives and the involvement of senior management in Go/Kill decisions. Marketing is significantly more dissatisfied

---

\(^5\) However, it should be noted that functional differences of importance ratings did also occur in our case study, which, as discussed earlier, might have influenced the judgments on the current situation.

\(^6\) This is further supported by an analysis of F-values for each performance variable, for which its intragroup variance is related to its variance in the total sample [1]. For Marketing and R&D 69% and, respectively, 65% of F-Values are smaller than 1, which means that the variance of each performance variable is smaller within the respective function than in the total sample.
with current practice than R&D in case of support for skunk works and NP performance part of senior management’s bonuses. It should be noted, however, that the implications from these statistical analyses are limited by the small number of observations. For other performance variables where large mean differences between Marketing and R&D exist, fairly large standard deviations within each function prevent the mean differences from being significant (see table 1).

Summarizing, it is obvious that substantial and partly significant differences exist between Marketing’s and R&D’s assessment of their company’s NPD current practices for many performance variables. Particularly with respect to those performance variables for which the level of integration between both functions is critical, deviating assessments of current practice identify interface problems [27, 53]. Such differences between Marketing and R&D are a severe problem, since harmony between both functional departments has been found to be a success factor for innovation processes (see paragraph 2.2). Different perceptions of current practice between these two functional units almost inevitably lead to disagreements regarding the implications derived from benchmarking.

3.3.2 Implications for benchmarking results

We benchmarked the company’s current practices against the "solid performers" of Cooper/Kleinschmidt [19]. Large discrepancies indicate those characteristics of the company’s NPD process which need to be improved. A distinction is made between the assessments of Marketing and R&D. For each performance variable and from both functional units’ perspective, we calculated the deviation between the evaluation of current practice and the respective benchmark values of "solid performers". The results are illustrated in figure 2. On the ordinate we measure areas for improvement from Marketing’s perspective, whereas R&D’s perspective is shown on the abscissa. The cut-off lines between the four quadrants show that current practices in the company under consideration and those of "solid performers" are identical. The deviation of each performance variable from both cut-off lines shows the need for improvement as perceived by either Marketing or R&D.

Areas of agreement and disagreement can be identified. In the lower-left and upper-right quadrant those performance variables are located where both functional departments basically agree on the assessment of current practice and hence with the resulting implications. For those variables falling into the lower-left quadrant, both functional units see little need for change ("No Changes"). For those variables falling into the upper-right quadrant, there is interdepartmental consensus regarding the
need for change ("Go"). Thus, clear recommendations can be made with respect to two groups of performance variables located in the upper-right quadrant.

1. Both departments equally agree on the lack of long-term thrust for the NPD program. If one adds the assessment that personal resources are inadequate to reach the NPD program's objectives and the lack of senior management commitment to the NPD program, it can be concluded that respondents perceive a discrepancy between the NPD program's stated objectives, as indicated by the existence of a variety of instruments for the measurement and evaluation of innovation performance (lower-left quadrant), and the means to achieve these objectives. Respondents argued in the personal interviews that the company lacks a proactive, technology-based innovation strategy. In most circumstances, short-term-oriented, incremental product improvements prevail over fundamental innovations. With respect to defined arenas for the NP program, respondents felt that the vast majority of new products are often designed for established markets rather than searching for new and possibly more risky applications. In this context, interviewees criticized senior management's commitment to the NPD program. Supporting innovations was given only lip-service. Thus, insufficient backing of single projects often occurs due to senior management's risk-averse decision making behavior.

2. Both departments basically agree that tough Go/Kill criteria are not applied at certain milestones during the innovation process. Furthermore, respondents are dissatisfied with decisions from outside the NPD process. Both criticisms are again directed towards the role of senior management during the innovation process, as supervisory or steering tasks for the entire NPD program lie within senior management's domain. In particular, respondents felt that senior management's decisions were based on subjective perceptions, which could be easily manipulated by the respective project leader, rather than being based on systematic, consistent and transparent criteria, which should be continuously revised through the innovation process.

The areas of consensus between Marketing and R&D are related to the influence of senior management in the innovation process. It appears that both functional units generally agree when assessing other groups or individuals within the organization. However, severe perceptual differences occur between Marketing and R&D with respect to those issues which are related to functional-specific tasks and inputs into the innovation process. Here, the interface problems between Marketing and R&D are evident. Our case study illuminates the hierarchical influence on the assessment of innovation processes (see paragraph 2). Had we posed our
questions on the same set of variables to senior managers [19], we would have received very different assessments. This fact was revealed to us in discussions during the workshop, where senior management attributed the perceived lack of commitment entirely to a communication problem to the lower levels within the organization. However, the respondents' answers clearly revealed not only a communication deficit but more important that senior management's activities to actually support innovations were viewed to be either missing entirely or to be inadequate. With respect to the insufficient monitoring of innovation activities, senior management agreed with the findings.

In the lower-left quadrant ("No changes") we find those aspects of the innovation process with which both departments are satisfied. The assessment of variables like new products aimed at familiar markets, evaluation of NPD program's performance and performance measures kept during NPD process corresponds well with the interpretations given above. With regard to the latter variable it should be added that a number of methods have been introduced in the company for monitoring and evaluating innovation projects. However, such methods are rarely used and if they are used, no consequences result from them. This is clearly shown in the example of missing application of Go/Kill decision criteria. The mere existence of performance measures as reported in the standardized questionnaire does not automatically indicate their appropriate application within the innovation process. Without the qualitative insights gained from the personal interviews, one cannot adequately understand the benchmarking of this performance variable.

Even within areas of general consensus, different weights on the assessment of the performance variables are given by Marketing or R&D. In the following paragraph, we will discuss those issues on which Marketing's and R&D's perceptions substantially differ. These performance variables can be found in the upper-left (Marketing: "Go") and lower-right quadrants (R&D: "Go") of figure 2.7

R&D's perspective

Three areas for potential improvement of current practices can be identified from R&D's perspective. These are integration with Marketing, direction of R&D strategy and the role of management guidance during the innovation process.

1. The first group of performance variables consists of market orientation of the NPD process, predevelopment (screening), quality of NPD process execution,

---

7 A * denotes those performance variables in figure 1, for which perceptions have been found to differ significantly between Marketing and R&D (see paragraph 4.3.1 and table 1).
completeness of NPD process and customer involvement. The perceptions of the respondents from R&D are internally quite consistent for these five performance variables (see table 1) and three of them prove to be significantly different from Marketing's perceptions. In general, R&D believes that the level and quality of information on markets and competitors is not sufficient throughout the entire innovation process. This argument has been put forward in the interviews as the main reason for the negative assessment of current practice. In the predevelopment or screening phase of a new product idea, R&D sees the level of market information as being inadequate and further questions the quality of the existing information regarding customer needs and market potentials. This would lead either to the premature rejection of promising new ideas or to the pursuit of projects based upon estimates which are found to be faulty only at the point of product launch. According to R&D, a thorough and accurate technological and market evaluation in the earlier stages of the innovation process is essential for effective and efficient project management. In this sense the NPD process is considered to be incomplete and sloppily executed. Since market information is not updated and used as an important criteria for Go/Kill decisions, the market orientation of the NPD process is rated very low. This leads to the fundamental criticism that customer involvement in the NPD process is lacking.

As in previous empirical studies, these results demonstrate severe interface problems between Marketing and R&D. Several studies have shown that R&D managers are particularly dissatisfied with the transfer of information from Marketing to R&D, e.g. with respect to customer requirements for new products, marketing tests results, customer feedback and competitors' moves [9, 27, 36, 47, 53]. In a further study of 565 researchers in 16 German companies, Domsch et al. found that the perceived discrepancy between ideal and current level of integration between R&D and Marketing was greatest for idea generation and screening, competitor monitoring and analysis of customer needs [22]. In addition, the quality of the interface between Marketing and R&D was significantly higher when the perceived discrepancy of market information between both functional units was low [22]. Because these tasks are primarily the responsibility of Marketing, a transfer or communication problem with R&D is apparent. This lack of communication results in severe problems for our company for two reasons: First, Marketing and R&D agree on the high importance of interfunctional informational integration for new product
Second, there is empirical evidence that a high level of integration between Marketing and R&D in terms of these variables distinguishes successful from unsuccessful companies [28, 53].

It has been shown that perceptions of the relevance and the credibility of information received have strong effects on its perceived utility [40]. For the company under consideration both influencing factors on information's utility severely diverge. Our respondents' answers reveal that R&D perceives market-related information to be of great importance, whereas the information which is supplied by Marketing is not considered to be credible. It is suggested in the literature that these communication problems between R&D and Marketing may partly result from differences in departmental languages which, in turn, molds perceptions [39]. Here, R&D's belief that information is not adequately gathered and evaluated by Marketing may result from R&D's expectation that this information should be measured and presented according to R&D's own standards. As Griffin/Hauser conclude: "If each group (Marketing and R&D) does not understand customer needs at the level of detail that need to do their job, they become frustrated with the communication process." [25, p. 196]

2. The second group of performance variables concerns the strategic direction of the company's NPD program. Low ratings for senior management's commitment to the NPD process, defined arenas of the NP program (which are more directed to familiar and existing markets) and the neglect of NP measures in senior management's objectives show that R&D does not see a strategic commitment for technology-push-type innovations directed towards the creation of new markets. From R&D's point of view, this lack of strategic support means that insufficient resources are devoted to the NPD program. This is also reflected in the belief of R&D that personal resources, R&D budgets and resources committed to the NPD program by senior management are inadequate.

R&D managers argued in their interviews that the technological basis of the company had to be improved. They stressed that Marketing frequently fails to comprehend the long-term potentials of technologies and thus rejects new ideas for the wrong reasons. In addition, Marketing prefers do make profits on less-risky, short-term, day-to-day business. Again, severe interface problems become apparent,

---

8 Our data shows that Marketing and R&D both consider these marketing-related variables to be of critical importance for innovation success. High importance weights of the respective performance variables together with low variances of answers was observed for both functional departments. Due to limited space and the consistency of these findings with previous research [27, 53], we omit the presentation of these findings.
since respondents from Marketing argued at the same time that new product ideas would barely result from R&D.

It is interesting to note that Marketing also perceives a problem with the company's R&D strategy as discussed above and indicated by the performance variables long-term thrust for NP program and senior management's commitment to the NPD process (see figure 2). But at the operational level, Marketing does not perceive the same deficit as R&D as far as these resource variables are concerned. Obviously, Marketing managers are more successful in securing the required resources. The relative importance of Marketing over R&D is explained by management's strategic focus on incremental innovations and established markets. Again, functional perspectives have a decisive influence on the assessment of current practice and the corresponding need for improvement.

3. The third group of variables deals with management guidance during the innovation process. It has been argued that though Go/Kill decision points are neglected and that management does not adequately supervise the NPD process. While Marketing and R&D agree on the first criticism R&D is much more dissatisfied with the neglect of Go/Kill criteria. When evaluating senior management's involvement in Go/Kill decisions, R&D's and Marketing's assessment of current practice significantly differ. Apparently, Marketing appears to be much more satisfied with senior management's participation in Go/Kill decisions. This is perhaps due to the fact that project leaders are mostly recruited from Marketing. Through a persuasive presentation of the innovation project to senior management, the project leader has a decisive influence on the continuation of the respective project. Obviously, Marketing feels to have more influence on senior management's Go/Kill decisions, whereas R&D is lacking this influence. Furthermore, respondents argued that project leaders from Marketing use overoptimistic market forecasts for their new products in order to convince senior management of their potential. Because R&D is more critical about the credibility of this market information, its negative assessment of inadequate market-related Go/Kill criteria and senior management's current handling of Go/Kill decisions is understandable.

*Marketing's perspective*

As previously stated Marketing is more satisfied with the overall current practice in the company's innovation process than R&D (see paragraph 4.3.1). However, there are some areas in which Marketing sees a need for potential improvements. In a few areas Marketing is more critical than R&D (see figure 2):
1. Marketing felt that R&D has not enough time for creative things and that skunk works are not supported by R&D management. Interestingly, respondents from Marketing make assumptions about current practice in R&D which do not correspond at all with R&D's self-assessment. Here, we find further evidence for the previously identified interface problem, which we have attributed to a lack of communication between Marketing and R&D. Obviously, Marketing is not well informed about R&D activities, perhaps because the information transfer from R&D to Marketing is insufficient. This finding corresponds with other empirical studies, where Marketing managers have been found to be dissatisfied with the level of information provided by R&D on new technologies, on R&D's capabilities and on future technologies [36]. In fact, Marketing managers from our company said that ideas for new products would not be produced by R&D, an opinion fully contradictory to that of R&D itself.

2. Marketing felt that senior management's bonuses should be based more on the NPD program's performance. Again, R&D does not share this opinion. This view most likely results from R&D's focus on invention and innovation. R&D considers the importance of new products as self-evident. Marketing, however, is primarily concerned with day-to-day business of promoting existing products. Thus, respondents from Marketing felt that special incentives might be needed to redirect personal effort to the promotion of new products. Once again, we see the impact of functional roles on perception.

3. Marketing believes that the role of the NPD program is not well communicated by senior management and remains therefore ambiguous to many. This corresponds with Marketing's other assessment that senior management's long-term thrust and commitment to the NPD program is inadequate (see figure 2). Whereas Marketing and R&D agree on the strategic misconception of the NPD program, they differ in their assessments of the need for better communication. This is again most likely the result of R&D's belief that the importance of new products is self-evident and therefore need not be explicitly communicated.

4. Marketing believes that the greatest shortcoming within the innovation process is the inability to achieve fast decision making during the NPD process. This view has to be seen in the light of senior management's effort to shorten development times. Respondents from Marketing stressed the importance of further reducing development times since they are more confronted with the consequences of late market entry. R&D might realize the need of a reduction in development time, in particular, if it is dictated by senior management. However, R&D's assessment is quite different from that of Marketing. R&D does not favor an acceleration of the
innovation process, as it feels it will be at the expense of the quality of execution, esp. during the early stages of the innovation process and in those cases when fast decisions are based on insufficient information.

4 Conclusions and Implications

The case study's experiences yield major implications for the assessment of innovation processes. These address both theoretical and practical considerations.

Theoretical implications

We found significant variation in individual respondents' assessments of current practice, importance weights and, thus, in perceived dissatisfaction with the management of critical success variables for NPD programs. This is in accordance with the findings of other key informant studies, in which a high proportion of variance was attributed to response errors [43]. Therefore, the adequacy of current research practice, which relies on a single information source, is called into question. This problem is not unique to innovation research; other organizational research relies on the single-informant method [35]. The possibility of response variations, attributable to the initial selection of respondents, should cause us to be more careful in interpreting results of single-informant type empirical studies.

Our case study shows that some of the variance across respondents' perceptions can be attributed to their functional role within the organization. Thus, a major source of systematic response biases has been identified. This bias can be addressed by choosing multiple interviewees from different functional entities. In particular, there are substantial differences between Marketing's and R&D's assessment of their company's NPD current innovation practices. These response biases should not be disregarded, as the biases provide valuable information in and of themselves. They point to interface problems and, thus, have important managerial implications. Different perceptions of current practice between these two departments almost inevitably lead to disagreement on the implications of benchmarking. Resolution of the functional differences is critical to the further success of the innovation processes (see paragraph 2.2).

We have reasons to assume a possible management bias in the study by Cooper/Kleinschmidt: their respondents came from only one tier of the management hierarchy. This is crucial for the accurate assessment of performance variables lying outside the direct observation of management or in cases where management's performance is called into question. With respect to the latter case, the findings of our case study show that respondents from lower hierarchical levels are more critical
of management's role in the innovation process than the respective managers. Thus, we need to consider hierarchical-based biases of performance assessment.

Even after controlling for functional heterogeneity, we see that there is still substantial variance across individual judgments. Use of respondents from different functional units does not in and of itself guarantee unbiased answers. Thus, it seems worthwhile to undertake a formal assessment of random and systematic error. This requires the application of a multitrait-multimethod approach in empirical studies on innovation research. Hence, a research design needs to be developed, in which sophisticated statistical tools, such as LISREL, are used to analyze variations across respondents [2, 3]. Because of the limited number of respondents and the objective of our case study, we have not undertaken this task in this work (see paragraph 3.1).

From the viewpoint of research practice, one may simply attempt to limit the degree of uncontrolled individual response errors. Because the error term is influenced by deficiencies in competency, one could construct different subsets of observations and apply them to different respondents [43, 6]. Avoidance of irrelevant questions should enhance research efficiency as well as response quality. However, valuable information about function-based and role-based perceptual differences within the organization is lost. Therefore, we recommend the inclusion of overlapping questions at least in those areas in which interface problems are expected.

When we have multiple responses for the same issues, we can form an overall picture of the whole organization. Current research practice is deficient in this regard. Most frequently, responses are simply averaged [35]. We recommend to use a Delphi-like approach to obtain a general view of the organization. The procedure should be guided by external partners or at least anonymously performed, because respondents would otherwise be influenced by superiors' view [35]. As suggested earlier by Brockhoff [10] and successfully tested by Bardenhewer [5], computerized Delphi-procedures can be used as a practicable and cost-efficient way of doing large-scale empirical research. However, it should be stressed that a holistic overview should not be achieved at all costs. Our case study shows that heterogeneity in perceptions across functional and hierarchical roles is also important to understanding the innovation process.

In sum, the results are encouraging for researchers who pursue multi-respondent analyses in the field of innovation research. They show the necessity of encompassing different views to achieve valid results. In addition, they demonstrate that significant new information can be gained from our benchmarking technique.
Managerial implications

The case study also provides valuable insights for practitioners who employ benchmarking of innovation processes for practical reasons. Cooper/Kleinschmidt's benchmarking concept is very appealing, because it promises to provide, in the absence of suitable benchmark partners, a very cost efficient instrument for assessing and improving a firm's innovation process. However, we urge caution regarding the use of this method, because the assumed managerial bias of respondents and the reliance on individual informants appear as major shortcomings. In order to effectively use this and other similar benchmarking concepts, we generally recommend to encompass the following aspects:

1. Carefully select the most competent respondents within the organization. The inclusion of different views from various functional departments (esp. R&D, Marketing) and hierarchical levels is necessary to get a shared picture of the whole organization, a core prerequisite for commitment and thus effective benchmarking. Perceptual deviations within the firm are important and need to be systematically analyzed.

2. Conduct an additional diagnosis whenever possible. Benchmarking only identifies symptoms, i.e. performance gaps with respect to the critical success factors. The underlying, more fundamental causes for poor innovation performance need to be diagnosed because some of these variables are interrelated (see paragraph 3.3.2). Hence, further qualitative information gained from personal interviews is essential. A proper diagnosis is the basis of integrated and well-defined strategies derived from benchmarking.

3. Include experienced external partners both as interviewers and coordinators of the benchmarking effort. This provides support for less influential respondents, guarantees a well-balanced assessment of the current situation and achieves an effective diagnosis of benchmarking's implications. Furthermore, it minimizes the negative impact of interviewer bias. It is supportive of the benchmarking process and enhances the commitment of various functional and hierarchical groups.

4. Perform workshops. This proved to be an important way of validating the results of benchmarking. It facilitates the development of a broad consensus and ensures a final commitment of all relevant hierarchical and functional entities. This is essential to the success of corrective steps based on the results of benchmarking. Workshops should be moderated by external partners.

If these factors are taken into account, benchmarking can provide the foundation of improved innovation processes and, thus, the future success of new products.
5 References


Table 1: Individual and functional differences regarding the assessment of performance variables for the NPD process

<table>
<thead>
<tr>
<th>Performance Variables</th>
<th>Current Practice</th>
<th>Importance</th>
<th>Dissatisfaction</th>
<th>Marketing (CP)</th>
<th>R&amp;D (CP)</th>
<th>MKT v. R&amp;D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of NPD process execution</td>
<td>1.06</td>
<td>0.74</td>
<td>1.06 (1.41)</td>
<td>1.06</td>
<td>0.96</td>
<td>0.75</td>
</tr>
<tr>
<td>Completeness of NPD process</td>
<td>1.19</td>
<td>0.71</td>
<td>1.13 (1.36)</td>
<td>0.58</td>
<td>0.96</td>
<td>1.58*</td>
</tr>
<tr>
<td>Adequate R&amp;D budget</td>
<td>1.60</td>
<td>0.89</td>
<td>0.88 (1.89)</td>
<td>1.53</td>
<td>1.71</td>
<td>0.92</td>
</tr>
<tr>
<td>Necessary people in place for NPD objectives</td>
<td>0.76</td>
<td>0.46</td>
<td>2.75 (0.71)</td>
<td>0.58</td>
<td>0.5</td>
<td>0.92*</td>
</tr>
<tr>
<td>Homework activities (predevelopment/screening)</td>
<td>1.28</td>
<td>0.46</td>
<td>2.13 (1.73)</td>
<td>1.58</td>
<td>1.16</td>
<td>0.67</td>
</tr>
<tr>
<td>Product definition prior to development</td>
<td>0.64</td>
<td>0.83</td>
<td>0.25 (1.16)</td>
<td>0.64</td>
<td>0.83</td>
<td>0.25</td>
</tr>
<tr>
<td>Tough Go/Kill decision points</td>
<td>1.46</td>
<td>0.71</td>
<td>2.13 (1.73)</td>
<td>2.08</td>
<td>1.16</td>
<td>0.67</td>
</tr>
<tr>
<td>Flexibility of NPD process</td>
<td>0.64</td>
<td>0.83</td>
<td>0.25 (1.16)</td>
<td>1.06</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>Market orientation of NPD process</td>
<td>1.2</td>
<td>0.00</td>
<td>2.5 (1.2)</td>
<td>0.58</td>
<td>0.82</td>
<td>1.67*</td>
</tr>
<tr>
<td>Fast outside decisions during NPD process</td>
<td>0.92</td>
<td>0.64</td>
<td>1.75 (1.28)</td>
<td>1.06</td>
<td>0.96</td>
<td>-0.75</td>
</tr>
<tr>
<td>Performance measures kept during NPD process</td>
<td>0.92</td>
<td>0.76</td>
<td>0.88 (1.19)</td>
<td>0.58</td>
<td>1.26</td>
<td>-0.08</td>
</tr>
<tr>
<td>Multidisciplinary project teams</td>
<td>1.13</td>
<td>0.53</td>
<td>0.63 (1.06)</td>
<td>1.16</td>
<td>0.96</td>
<td>-0.25</td>
</tr>
<tr>
<td>Customer involvement</td>
<td>0.93</td>
<td>0.74</td>
<td>1.38 (1.06)</td>
<td>1.16</td>
<td>0.82</td>
<td>0.33</td>
</tr>
<tr>
<td>Defined arenas for NPD program</td>
<td>1.28</td>
<td>0.83</td>
<td>1.38 (1.51)</td>
<td>0.58</td>
<td>1.29</td>
<td>1.17</td>
</tr>
<tr>
<td>Long-term thrust for NPD program</td>
<td>0.99</td>
<td>0.71</td>
<td>1.38 (1.6)</td>
<td>1.41</td>
<td>1.41</td>
<td>0</td>
</tr>
<tr>
<td>NP measures part of senior management's objectives</td>
<td>1.31</td>
<td>0.71</td>
<td>0.25 (1.16)</td>
<td>1.06</td>
<td>1.63</td>
<td>1</td>
</tr>
<tr>
<td>Role of NP program clear to all</td>
<td>1.04</td>
<td>0.76</td>
<td>0.25 (1.16)</td>
<td>1.06</td>
<td>0.96</td>
<td>-1.25</td>
</tr>
<tr>
<td>Senior management commitment to NPD program</td>
<td>0.83</td>
<td>0.52</td>
<td>1.25 (0.89)</td>
<td>1.06</td>
<td>0.96</td>
<td>0.92</td>
</tr>
<tr>
<td>Senior management commits resources to NPD</td>
<td>1.25</td>
<td>0.71</td>
<td>0.88 (1.41)</td>
<td>0.58</td>
<td>1.5</td>
<td>1.42</td>
</tr>
<tr>
<td>Senior Management involvement in Go/Kill decisions</td>
<td>0.46</td>
<td>0.64</td>
<td>-0.38 (0.74)</td>
<td>0.58</td>
<td>0.82</td>
<td>0.67*</td>
</tr>
<tr>
<td>Time off for creative things</td>
<td>1.16</td>
<td>0.46</td>
<td>1 (1.07)</td>
<td>1.16</td>
<td>0.82</td>
<td>-1.33</td>
</tr>
<tr>
<td>Support for skunk works</td>
<td>1.20</td>
<td>1.41</td>
<td>0.88 (2.3)</td>
<td>0.58</td>
<td>0.82</td>
<td>-1.67*</td>
</tr>
<tr>
<td>Corporate goals for NPD program</td>
<td>0.99</td>
<td>0.74</td>
<td>-0.25 (2.3)</td>
<td>1.53</td>
<td>0.5</td>
<td>-0.08</td>
</tr>
<tr>
<td>NP performance part of senior management's bonuses</td>
<td>1.16</td>
<td>0.76</td>
<td>2.75 (1.28)</td>
<td>0</td>
<td>1.29</td>
<td>-1.5*</td>
</tr>
<tr>
<td>Evaluation of NP program's performance</td>
<td>0.71</td>
<td>0.64</td>
<td>0.13 (0.64)</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>New products aimed at familiar markets</td>
<td>1.51</td>
<td>0.99</td>
<td>0.38 (2.2)</td>
<td>1.16</td>
<td>1.29</td>
<td>0.83</td>
</tr>
<tr>
<td>Mean</td>
<td>1.06</td>
<td>0.70</td>
<td>0.97 (1.29)</td>
<td>0.89</td>
<td>0.93</td>
<td>0.86*</td>
</tr>
</tbody>
</table>

Notations: * = number of observations (n = 8); ** = number of observations (n = 7; Marketing = 3. R&D = 4); * Significant in T-test (Mann-Whitney U-Test); + = Calculation based on absolute differences; NPD = New Product Development; CP = Current Practice.
Figure 2: Benchmark of Marketing's and R&D's perceptions of current practices

Marketing: "Go"
- Support for skunk works*
- NP performance part of senior management's bonuses*
- Role of NP program clear to all
- Time off for creative things
- Performance measures kept during NPD process
- Evaluation of NP program's performance
- New products aimed at familiar markets

"No Changes"
- Fast outside decisions during NPD process
- Long-term thrust for NPD program
- Tough Go/Kill decision points
- Necessary people in place for NPD objectives*
- Senior management commitment to NPD program
- Defined arenas for NPD program

Need for improvement as perceived by R&D

R&D: "Go"
- Corporate goals for NPD program
- Product definition prior to development
- NP measures part of senior management's objectives
- Senior Management involvement in Go/Kill decisions*
- Homework activities* (predevelopment/Screening)
- Completeness of process*
- Senior management commits resources to NPD

A * indicates significant differences between Marketing and R&D; interface problems shown in boxes.

Need for improvement as perceived by R&D