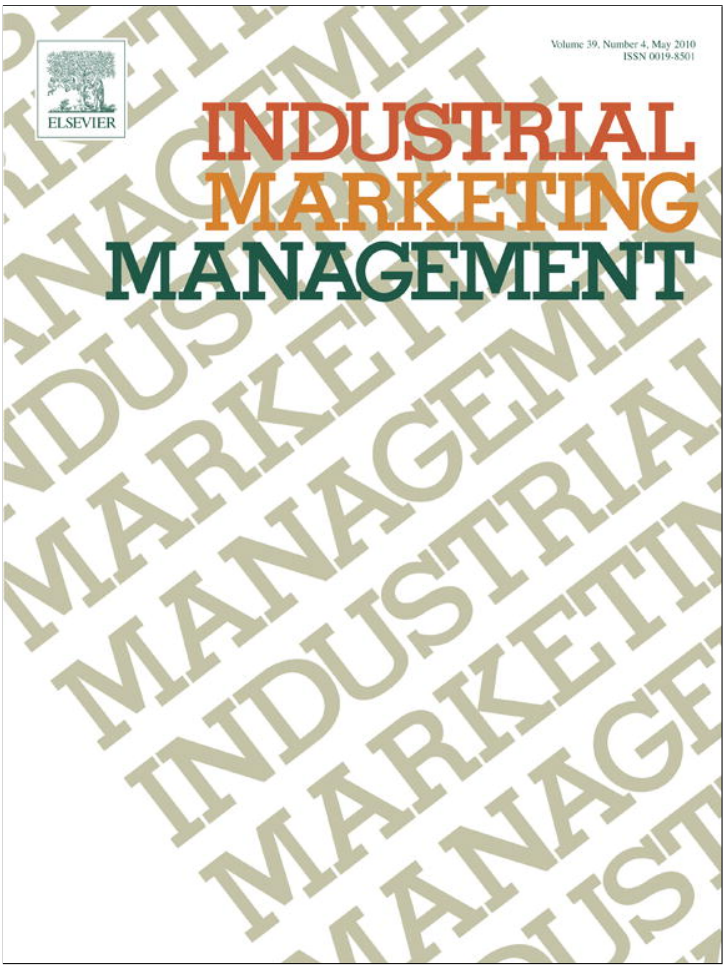

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# Balancing exploration and exploitation capabilities in high technology firms: A multi-source multi-context examination ☆

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ABSTRACT

Based on the dynamic capability view, this study examined the balance between exploration and exploitation capability. With this, we proposed a framework that synthesizes the impact of new product creativity and marketing program creativity on new product quality (*internal* product quality and *external* product quality), and further understanding the path to performance of new products in a select number of industrial and consumer products. The main findings revealed that the effect of new product creativity in consumer product firms through internal and external product quality was less dominant than those in industrial product firms. In contrast, the effect of marketing program creativity in industrial product firms through only *external* product quality was less dominant than those in consumer product firms. Additionally, this paper also discusses the research limitations, future research directions, and theoretical and practical implications.



## 1. Introduction

Product quality has been viewed as an important capability and exploration activity within an organization (Garvin, 1988). Generally, quality activity involves the following: the removal of unwanted variations, the enforcement of strict standards and controls, the application of the best practice, and the elimination of waste and errors (Garvin, 1984b). In addition, creativity is also seen as an important exploitation activity of firms because it involves exploring many radical and unorthodox ideas by deliberately deviating from existing standards and controls. This even involves experimenting with prototypes and devoting resources to projects which are likely to fail. Hence, product quality and creativity are considered as two opposing philosophies requiring very different mindsets and attitudes.

However, from the dynamic capability view, the dynamic processes of exploitation and exploration are the key sources of an organization's sustainable competitive advantage (SCA) (Eisenhardt & Martin, 2000; March, 1991; Teece, Pisano, & Shuen, 1997). This distinction is drawn from March's (1991) view of exploitation as "the refinement and extension of existing competencies, technologies, and paradigms" and exploration as "experimentation with new alternatives that have returns that are uncertain, distant, and often negative." Discussions on the relationship between exploration and exploitation competence (or capabilities) on a firm's performance have attracted much research interest (e.g., Menguc & Auh, 2008). However, relatively little is still known about the reasons why some firms were able to successfully use or balance their exploration and exploitation capabilities (i.e., product quality and creativity), while others were not able to do so. In addition, previous studies indicate that maintaining an appropriate balance between exploration and exploitation activity is a primary factor for the entirety of a firm's system survival and prosperity (March, 1991; Rothaermel & Deeds, 2004).

Sethi, Smith, and Park (2001) suggest that the most important manifestation of creativity may be the success of product quality en route to the success of a new product. Miller (1993) argues that quality improvement is the application of creativity in solving problems in work processes to produce breakthroughs as well as incremental change. The creativity (or innovation) process would include a broader range of criteria in which creativity is linked with product quality (Atuahene-Gima, 2005; Tatikonda & Montoya-Weiss, 2001). However, previous studies did not employ the antecedent factors perspective in examining the relationship between creativity and product quality. Furthermore, the exact conceptualizations and meaning of creativity to product quality are still unclear (Siguaw, Simpson, & Enz, 2006), and it need to be addressed along this line. With this, the first objective of the current study is to contribute to the literature by establishing the relationship among creativity, new product quality, and performance.

To date, however, there has been relatively little research conducted on the marketing of creativity impact on product quality as well as new product performance under multiple industries comparison (i.e., industrial and consumer product firms). Cho and Pucik (2005) argue that understand the potential stable characteristics of the company, analysis must first determine which of the target industry sectors affect the

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industry life cycle. Hence, this study's second objective is to examine the differential impacts of *industrial characteristics* (i.e., industrial and consumer product firms) on creativity and product quality relationships to performance.

Final objective of this study as Ozer (2006) points out that in the opportunity identification and idea generation stages of the NPD process, Asia can be a valuable source of ideas on new products for the future, which is not only for the Asian market but also for the rest of the world. Hence, this study promotes each construct relationship more stable that select the Taiwan's high technology industry research sample. Furthermore, Siu, Lin, Fang, and Liu (2006), Tu and Yang (2008), and Yang and Kang (2008) state those high-technology firms in Taiwan are highly adept and aggressively competitive in their NPD capabilities. Under such highly competitive environment, the findings of this study will help to clarify the relationship between each construct.

Overall, this study is to address these oversights and present a framework that synthesizes the available knowledge in the creativity and new product quality by further understanding the path to performance of new products. Specifically, this study investigates two facets of creativity, namely, new product creativity and marketing program creativity. Then the paper proceeds with an assessment of the impact of each facets of creativity on the new product quality component, and further path to the new product performance in a select number of industrial and consumer products.

## 2. Theoretical background and hypotheses

There is no shortage of examples in the academic literature that illustrate innovation (or creativity) and product quality relationship (Cho & Pucik, 2005). However, most prior studies dealt with the impact of product quality on innovation (or creativity) and performance. These were conducted using the quality management perspective to discuss how product quality affects innovation and performance (e.g., Lin & Lu, 2006; Perdomo-Ortiz, lez-Benito & Galende, 2006).Other studies were done using the strategic management perspective to examine the relationship among creativity, product quality, and performance using the resource-based view (Cho & Pucik, 2005). Most researchers posit the effect of product quality on creativity. However, these results were not consistent and consequently may mislead managers and researchers. The main reason for this is that they may fail to consider creativity as an important exploration activity for product quality. Hence, the value of this current analysis lies in clarifying the role that creativity exerts as an important antecedent factor influencing new product quality. This study attempts to employ March's (1991) exploration and exploitation viewpoint to examine the effect of product on creativity, and likewise attempts to render a richer industrial contextual setting.

### 2.1. Internal/ external product quality: Definition and classification

According to Garvin's (1984a) definition,[1] high-quality goods can be ranked by customers or buyers according to the number of desired attributes that they possess. Therefore, product quality involves not only improvements in product-related functions but likewise the enhancement of the aesthetical presentation of product-related aspects. Basing on previous studies' definitions and discussions, the current study thus classifies two types of product quality, namely, *internal product quality* and *external product quality*. There were some similar descriptions and definitions have existed in the prior literature (e.g., Garvin, 1984a,b; Kano, Seraku, Takahashi, & Tsuji, 1984). For instance, Kano et al. (1984) stated that product quality may be understood from two perspectives: the "must-be quality" of a product should involve superior functions, whereas its "external quality" involves its ability to satisfy customers' needs which is influenced by individual customers' preferences and their impressions on the good image or the popularity of a company. Another similar dichotomous concept appeared in an organizational behavior field research, like the work of Amabile (1996) which dealt with "technical quality" and "aesthetic appeal quality." However, in previous studies, there is an absence of a clear definition and the failure to explore the depth of its significance.

Therefore, current study used product quality categories by—the internal product quality and external product quality. "Internal product quality" is defined as the essential function of a product which can provide customers with the best value. On the other hand, "external product quality" refers to the impression that consumers have regarding a product, which is not related in any way to that product's practical function. Likewise, it raises the image of the product itself and attracts consumers on its external product quality. The internal versus external distinction captures the fundamental dichotomy in the competitive product quality construct and encompasses the concept of the two levels. Therefore, this study particular pertinence to the research framework that investigating how creativity affects new product quality under such a dichotomy.

### 2.2. The relationship between creativity and new product quality

Before going any further, it is important to explain why this current study uses the construct of creativity rather than that of innovation to understand the creativity and new product quality relationship. There are three reasons for this. First, creativity is a more concrete construct than innovation and has generally been viewed as a construct that precedes innovation (Im & Workman, 2004). Amabile and colleagues (1996) state that "all innovation begins with creative ideas … creativity by individuals and teams is a starting point for innovation; the first is a necessary but not a sufficient condition for the second." Second, innovation may involve creativity as in the discovery and development of a new process, but not all innovations will be creative (West & Farr, 1990). Therefore, research relating to a new product which employs creativity constructs instead of innovation constructs should be able to concretely determine the relationship between creativity and new product performance. Third, this study also adopts the opinions of Im and Workman (2004) that creativity should be used in a more specified context (i.e., in industrial or consumer product firms), thereby avoiding overly general responses that may result when innovation is measured at the more abstract SBU level. Moreover, from different viewpoints on the marketing of creativity, the relationship between new product quality and new product performance is examined.

Previous studies conducted on the creativity in the marketing field have gained increasing attention (e.g., Sethi et al., 2001). On the other hand, in this field, attention has been heaped on exploring various concepts such as new product development (NPD) team affective tone (e.g., Tu, 2009), performance management (e.g., Merlo, Bell, Menguc, & Whitwell, 2006), marketing strategies (e.g., Sethi et al., 2001), and integration of new product creativity and marketing program creativity (e.g., Im & Workman, 2004). However, the impact of creativity on product quality has been neglected in some standpoints in these studies. Sethi (2000) notes that in the high-technology industry where technology is rapidly evolving, firms may need to focus on product innovativeness rather than on the continuous improvement of quality. Furthermore, Amabile's (1996) study suggests that creativity is indeed correlated with technical quality (i.e., internal quality), and that it may be most highly correlated in expert-level works.

To further clarify the relationship between creativity and new product quality, this study on creativity adopts the definition set forth by Im and Workman (2004). Their research object focused on the high-technology manufacturing industrial firms perspective to explore two

[1] Following Garvin (1984a) product-based definition that refer to product quality as the "differences in quality reflect differences in the quantity of some ingredient or attribute possessed by a product."

strategy components—new product creativity and marketing program creativity. They presented the following hypotheses and definition. First, new product creativity considers creative ideas in new product development, and is defined as "the extent to which the product is different from competing alternatives in a way that is valued by customers (Sethi et al., 2001)." New product creativity emphasizes the development of new and original products to be able to give customers a new experience and value. This is because it can resolve the product quality capability rigidity paradox, especially for the product's function for internal upgrade. Another reason is a high internal product quality capability which increases customers' view of the product's function or performance. In addition, new product creativity plays a critical role in generating new ideas and stimuli in the initiation stage of NPD (Im & Workman, 2004). Let us consider the case of iPod that is produced by Apple.com. It continuously emphasizes on improving the product's function but also aims to come up with an attractive marketing program to promote the external product quality. Therefore, new product creativity not only improves a new product through its own functions by upgrading its internal product quality but also its external product quality. Thus, it comes up with the following Hypothesis 1.

**Hypothesis 1.** New product creativity has a positive impact on both internal and external product quality.

Next, marketing program creativity is defined as "the extent to which the actions taken to market a [new] product… represent a meaningful difference from marketing practices in the product category" (Andrews & Smith, 1996, p. 175). Marketing program creativity stimulates the formation of a new idea and a novel method which attract customers and causes them to patronize products. Indeed, marketing program is very important in order to be successful in introducing a new product into the market. The marketing program creativity practice can be expanded to have significant influence on external product quality. This includes development and creativity in packaging through original and novel promotion methods. These are essential for a high external quality. Marketing program creativity helps to successfully commercialize new products in the implementation stage of the new product launch. An example of this would be Intel's requirement that PC makers mention their products' use of Intel chips, and hence the famous "Intel Inside" sticker. The using of advertising promotions helps customers better understand new products through their function improvement. Moreover, these programs strengthen a new product's external attractiveness. On the other hand, this increases customers' purchasing desire and matches customer satisfaction. Therefore, marketing program creativity not only enhances a new product's internal product quality but also its external product quality.

**Hypothesis 2.** Marketing product creativity has a positive impact on both internal and external product quality.

### *2.3. The relationship between new product quality and new product performance*

Prior studies on the determinants of new product performance have emphasized the importance of a product's superiority more than competitive products (e.g., Andrews & Smith, 1996; Im & Workman, 2004). A superior product is one that delivers superior value to customers and financial benefits for companies, and the product quality is relative to their customers' perceptions of product value and performance. From the product functional perspective, product quality refers to the capability of the product to meet customers' needs, hence leading to its success in the marketplace. However, from a marketing perspective, product quality by means of each element of the product marketing that aimed at stimulating customers' expectations and evaluations component of product quality. The reason for this is that it will contribute to their purchase decisions as well as to their satisfactory evaluation of the products (Spreng, Mackenzie, & Olshavsky, 1996; Urban & Hauser, 1993). Prior literature related to the quality demonstrates that quality helps a firm gain competitive advantage by delivering goods to the marketplace that meet customer needs, that operate in their intended manner, and that are continuously improved on all quality dimensions in order to "surprise and delight" customers. Thus, the following hypothesis is formed:

**Hypothesis 3.** New product quality (internal and external product quality) has a positive, direct impact on new product performance.

## 3. Methods

### *3.1. Participants and procedures*

Consistent with past studies, this work classifies the electricity and electronic appliance manufacturing industry as a high-technology industry (Bregman, Fuss, & Regev, 1991). Particularly, the high-technology manufacturing industry as defined in this study includes 12 two-digit SIC industries. According to this selection criterion, a total of 305 companies which met the requirements of this study were involved. The questionnaires were thus administered to these public companies listed in the Taiwan Economic Journal (TEJ). In addition, this study according to the industrial characteristics classified the sample as industrial product firms and consumer product firms, and the result identified 175 firms in the industrial product firm group and 130 consumer product firms in the group.

The survey was pretested to 20 persons who were involved in NPD activity on NPD or R&D teams and industrial practitioners. They were asked to specifically comment on the clarity of the items and their relevance. The wordings of some statements were modified to improve their clarity. In the data collection process, this study followed Huber and Power's (1985) guidelines on how to obtain high-quality data from the key informants.

In addition, this studies empirical sets following by the theoretical triangulation and investigator triangulation. In social science triangulation is defined as the mixing of data or methods so that diverse viewpoints or standpoints cast light upon a topic (Denzin, 1970). With this analysis approach, the research objective is to refine and develop the model based on practitioners' experiences. Semi-structured in-depth interview are conducted with those involved with marketing creativity related high-level marketing managers or R&D managers. Divergent observations identified in in-depth interviews were also examined and the limits of generalization tested. The theoretical framework resulting from the field-based phase was empirically tested in the empirical phase. A total of 10 in-depth interviews were conducted with practitioners. Participants were primary mid-to senior-level managers who had been involved in the new product, marketing program, and marketing strategy decision. There were four persons working in the computer manufacturing firms, three persons working in the chemical manufacturing firms, two persons working in the electrical related manufacturing firms, and one person working in the semi-conductor manufacturing firms.

Thus, 305 team-based sets of questionnaires were sent to these informants along with a personal letter that provided a brief introduction and a general explanation of the study's intent. Each set of questionnaire includes 10 copies[2] of the questionnaire for team

[2] This study sample frame is focused on the team level. Previous studies argue that an appropriate team member size is 3 to 5 employees (Andrews & Smith, 1996). In actuality, team-level research involves a certain degree of difficulty with regard to the successful collection of adequate samples. Therefore, in order to address this, we used an adequate sample size and pre-sent 10 copies of questionnaires to each team. After we collected the samples, we selected the valid ones based on the degree of each member's involvement in the new product development process in his or her respective team. If the team member's degree of involvement in the new product development process is lower than the average, we disregard his or her answered questionnaire.

members, one copy for the team leader, one copy for the advertising/marketing department managers, another copy for R&D manager, and a large postage-paid return envelope. This study also instructed the informant to set up a central collection box where the respondents could drop off their sealed envelopes more convenience. One month after the initial mailing, a follow-up mail were sent with the same materials as those in the initial mail in order to increase the response rate.

The current study collected data from two sources: NPD team leader (including position titles is NPD team leader, or advertising/marketing or R&D department manager), and their team members. The NPD members filled out the questionnaire that included items soliciting demographic data and measuring the team-level independent variables (new product and marketing program creativity, and new product quality) which were used in the present study. On a separate form, each NPD team supervisor or the marketing/R&D manager also rated the team-level independent variables (new product and marketing program creativity, and new product quality) to test whether or not the self-reported responses of the team members were consistent with those of the supervisor, and to increase the responses' cross-validity (Chen, Farn, & MacMillan, 1993; Phillips, 1981). In addition, a new product performance questionnaire was also filled out by these supervisors. Finally, for industrial product firms, a total of 182 responses were collected which represents a 10.4% response rate; another, for consumer product firms, a total of 207 responses were collected which represents a 15.9% response rate. All in all, there were 96 NPD teams, which included 45 teams from the industrial product firms and 51 teams form consumer product firms. The average age of the respondents was 40.66 years (ranging from 26 to 63 years), the average NPD team size was 4.21 (ranging from 3 to 9 persons), and the average team tenure was 8.64 years (ranging from 3 to 15 years).

Since nonresponse bias is always a concern in survey research, the *t*-test results on major constructs will confirm if there are significant differences between early and late respondents (Armstrong & Overton, 1997). With the collected samples, no significant differences were found between early and late responders on all measures in this study.

### 3.2. Measures

The instruments for measuring all constructs were tested for their validity and reliability. This study first examined internal consistency. All major constructs showed reliabilities ranging from .83 to .89, which are higher than the 0.7 criterion used in the work of Nunnally (1978). Moreover, this study also examined the convergent validity of the constructs as recommended by Bagozzi and Yi (1988) and Bagozzi, Yi, and Phillips (1991). The result suggests that all indictors are significantly and positively loaded on the subjective latent constructs. Thus, all measurement constructs have good convergent validity with all indicators. Furthermore, this study also conducted chi-square tests to confirm discriminant validity by following Anderson and Gerbing's (1988) suggestion. The significant results from the tests favor unrestricted models over restricted ones, which prove that all constructs had sufficient discriminant validity. This study also evidenced by the average variance extracted indication (AVE) computed as in Fornell and Larcker (1981). AVE gives the amount of variance captured by the construct in relation to the amount of variance due to measurement error. In this study, most AVEs are greater than .5 that indicating the variance of the composite scales due to measurement error is greater the trait trying to measure. This tends to be an extremely stringent hurdle, strengthening evidence of the robust construct validity.

#### 3.2.1. New product and marketing program creativity

New product and marketing program creativity is conceptualized as the degree to which it has creative new ideas. In this study adopted Im and Workman's (2004) measure of creativity and domain-specific measure of new product creativity and marketing program creativity is tailored to assess creativity in both NPD and launch contexts in high-technology firms. This study revised some statements in the questionnaires in order to focus not only on NPD and launch contexts but also match our research purpose. New product and marketing program creativity was measured using a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). These two constructs both have high reliability coefficients ($\alpha = .91$ and .90).

The measure for new product and marketing program creativity was thus derived from the assessment of NPD team members themselves. The instrument is a quasi self-reported measure. Self-reported measures are often criticized mainly through the argument that some people are unable to report themselves accurately due to reasons of poor introspection (Locke, Latham, & Erez, 1988). Consequently, a paired-samples *t*-test was conducted to check the difference between the two samples (team members' average score versus the team supervisor's score), and it showed no statistically significant difference between the two ratings (new product creativity $t = .19$, $p < .97$; marketing program creativity $t = .21$, $p < .87$).

Furthermore, in order to investigate whether or not there were certain teams in which the difference between the supervisor and team member ratings was large, the absolute deviations between the scores of the NPD team members and the team supervisors were calculated (Locke et al., 1988). The absolute deviations in new product creativity varied between 0 and .61, with a mean of .12. Meanwhile, the absolute deviations in marketing program creativity varied between 0 and .76, with a mean of .17. In total, the ratings by the team members themselves did not greatly differ from those by the team supervisors.

#### 3.2.2. New product quality

Garvin (1984b) remark that there has been a diversity of measurement methods for new product quality. To comply with the research objective, this study thus integrated the user-based perspective with the manufacturing one, which is often applied in the marketing field (e.g., Menon, Jaworski, & Kohli, 1997). Specifically, this study adopted and revised as appropriate some items from the scale used in the study of Menon et al. (1997). These items were designed to evaluate the firms' new product quality as well as how their products compare with competitors offerings (e.g., "the quality of our new products is better than that of our competitors."). According to prior literature (e.g., Garvin, 1984b; Menon et al., 1997) and two times focus group discussion, new items were added into the scale, while some items were revised, with the phrases and writing style polished by senior marketing scholars and related experts in this field (see new measurement items in Appendix A). After confirmatory factor analysis (CFA), two types of new product quality were determined: internal and external quality validity, which both has high reliability coefficients ($\alpha = .87$ and .91).

A paired-samples *t*-test was also conducted to check the difference between the two samples with new product quality measure, and it also showed no statistically significant difference between the two-side rater ratings ($t = .11$, $p < .98$). The absolute deviations varied between 0 and .22, with a mean of .10. The new product quality measure ratings by the team members themselves did not greatly differ from those by the team supervisors.

#### 3.2.3. New product performance

Prior scholars who generally evaluated new product performance usually divided the results into two fields: finance and non-finance measures (Kleinschmidt & Cooper, 1991; Page, 1993; Song & Parry, 1997). In order to get a more accurate whole picture of new product performance, multiple measures were used to assess different perspectives of performance that combined market measures, financial measures, and customer-based measures. For the measurements of new product performance, including market and financial measures relative sales, relative market share and relative profitability were

adopted from Song and Parry (1997) and Im and Workman (2004). In addition, customer-based measures from Kleinschmidt and Cooper (1991), Page (1993), Griffin and Page(1996), and Im and Workman (2004) were revised. Furthermore, self-reported performance measures were used rather than objective financial measures because objective financial data were often inaccurate or unavailable for specific new product performance (Han, Kim, & Srivastava, 1998; Song, Montoya-Weiss, & Schmidt, 1997; Song & Parry, 1997). This study averages the scores of these three types of performance measures into a single score to represent the new product performance. After CFA constructs have high reliability coefficients ($\alpha = .94$).

*3.2.4. Covariate*

This study controls for potential intervening variables to ensure a stable relationship between the study variables. Particularly, three dimensions were measured in this paper, namely, *market turbulence*, *technological* turbulence, and *firm size*, based on the works of Jaworski and Kohli (1993) and Olson, Slater, and Hult (2005). *Market turbulence* is defined as the potential demand for new product or process in the target market (Han et al., 1998; Narver & Slater, 1990; Song & Parry, 1997), and is used to control for the environmental impact on organizational performance. Meanwhile, *technological turbulence* is defined as a rapid rate of technological change, and is considered as an important environmental factor that influences organizational performance (Jaworski & Kohli, 1993; Narver & Slater, 1990; Song & Montoya-Weiss, 2001). Lastly, *firm size* is defined as the number of employees in a firm (Chandy & Tellis, 2000; Narver & Slater, 1990).

## 4. Results

### 4.1. Descriptive statistics and correlation analyses

Table 1 contains *means, standard deviations, and intercorrelations* among all the variables. As these relationships were largely consistent with theories about empirical evidence based on the prior related studies, and the analysis results also provided criterion-related validity evidence for the new product and marketing program creativity—internal and external product quality—new product performance in industrial products firms and consumer products firms.

### 4.2. Results of structure equation model analyses

This study uses Maximum Likelihood (ML) estimation in the structural equation modeling methods (Bollen, 1989), path coefficients were estimated. The ML estimation result forms the confirmatory measurement model show goodness-of-fit indicators greater than .95 signification loadings, and high squared multiple correlation values (SMC, equivalent to $R^2$; lowest SMC = .15), thus confirming convergent validity for all indicators. Because interpretational confounding from the measures is no longer an issue, simultaneous estimation of the measurement and structural sub-models was performed to test the hypotheses.

This study examines the hypotheses procedure by SEM analysis as following two steps: First step was an examination of the overall model fit and all the baseline comparison indicators (NFI, IFI, RFI, and TLI) were over .92, and the RMSEA value of .11 indicate an acceptable fit of the data, according to Browne and Cudeck's (1993) cut-off criteria. To assess the differential effects of this model, standardized coefficients are used as path coefficients throughout this paper. Next step, from industrial characteristics viewpoint, this study also compares the relationship between new product/marketing program creativity with internal/external product quality in industrial product firms and consumer product firms. This investigation includes the SEM path coefficient comparison analysis, and the results in the Fig. 1.

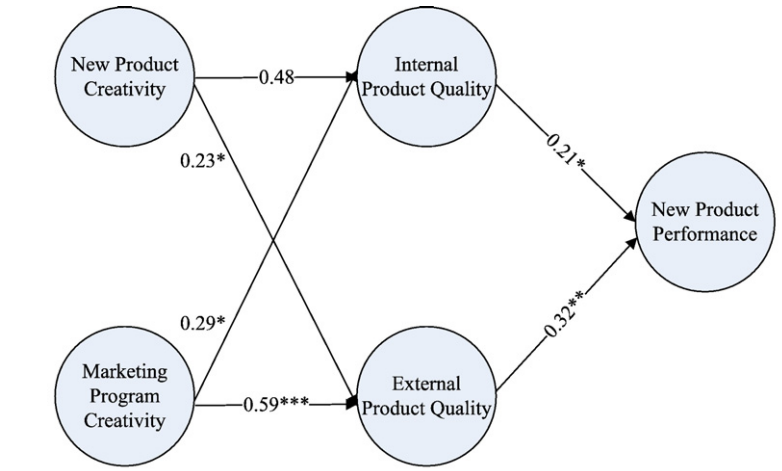
Hypothesis 1 examined the impact of new product creativity on internal and external new product quality. In industrial products firms, the estimation results $\gamma_{NPC \rightarrow IPQ} = .61$ was significant at the .01 level, but $\gamma_{NPC \rightarrow EPQ} = .11$ was non-significant. In consumer product firms, the estimations results $\gamma_{NPC \rightarrow IPQ} = .48$ was significant the .05 level and $\gamma_{NPC \rightarrow EPQ} = .23$ was significant at the .1 level. Overall, Hypothesis 1 is partial supported. Hypothesis 2 examined the impact of marketing program creativity on internal and external new product quality. In industrial products firms, the estimation results $\gamma_{MPC \rightarrow IPQ} = .09$ was non-significant but $\gamma_{MPC \rightarrow EPQ} = .21$ was significant at the .1 level. Another, in consumer products firms, the estimation $\gamma_{MPC \rightarrow IPQ} = .29$ was significant at the .1 level and $\gamma_{MPC \rightarrow EPQ} = .59$ was significant at the .01 level. Thus, Hypothesis 2 is also partial supported. The results show that the indirect effects of new product creativity through internal and external product quality in consumer product firms are less dominant than in industrial product firms. In contrast with the results show that the effects of marketing program creativity through only *external* product quality in industrial product firms are less dominant than in consumer product firms.

Hypothesis 3 possesses a positive influence of product quality on measures of new product performance. The estimation results showed that all paths from internal product quality to the outcome dimension was significant over at the .1 level ($\gamma = .21$) in consumer product firms, and significant over at the .05 level ($\gamma = .32$). In addition, paths from external product quality to the outcome dimension was also significant over at the .1 level ($\gamma = .32$) in consumer product firms, and significant over at the .1 level ($\gamma = .19$). Thus, this two product

**Table 1**
Descriptive statistics and correlations.

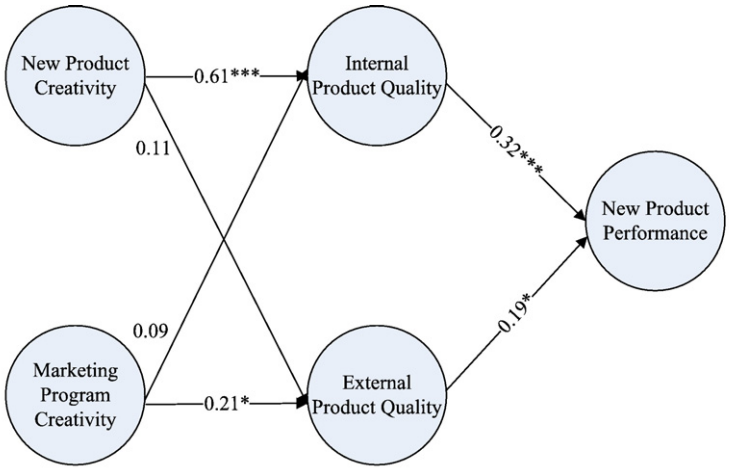
| Variables | Means | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2.90 | 3.24 | 368.21 | 2.35 | 3.24 | 3.41 | 2.16 | 2.81 |
| | | | .83 | .75 | 362.21 | 1.75 | 1.62 | 1.84 | 1.73 | 1.86 |
| 1. Market turbulence | 3.10 | 0.86 | 1 | .02 | .03 | .13* | .15* | .04 | .02 | .08 |
| 2. Technological turbulence | 3.20 | 0.96 | .06 | 1 | .04 | .14* | .20* | .03 | .06 | .10 |
| 3. Firm size | 487.27 | 526.11 | .01 | .04 | 1 | .19* | .22* | .01 | .01 | .12 |
| 4. New product creativity (NPC) | 3.20 | 1.61 | .19* | .16* | .21* | 1 | .29** | .33** | .25** | .43*** |
| 5. Marketing program creativity (MPC) | 3.62 | 1.21 | .17* | .18* | .15* | .32** | 1 | .17* | .41*** | .46*** |
| 6. Internal product quality (IPQ) | 3.51 | 1.61 | .05 | .01 | .08 | .45*** | .07 | 1 | .26** | .29** |
| 7. External product quality (EPQ) | 2.98 | 1.95 | .01 | .07 | .10 | .31** | .11 | .31** | 1 | .37*** |
| 8. New product performance (NPP) | 4.21 | 1.45 | .01 | .04 | .00 | .32** | .52** | .46*** | .61*** | 1 |

Below the diagonal are correlations for the industrial product firms ($n = 45$).
Above the diagonal are correlations for the consumer product firms ($n = 51$).
* $p < .05$.
** $p < .01$.
*** $p < .001$.




Fit Statistics:$\chi^2$= 4936.21 ***NFI= .93 RFI= .94 IFI= .92 TLI= .91 RMSEA= .21
*Significant at the .10 level; **Significant at the .05 level; *** Significant at the .01 level

**Fig. 1.** (a) Industrial Product Firms Model: Standardized Coefficients.




Fit Statistics:$\chi^2$= 4529.61 ***NFI= .92 RFI= .95 IFI= .91 TLI= .90 RMSEA= .19
*Significant at the .10 level; **Significant at the .05 level; *** Significant at the .01 level

**Fig. 1.** (b) Consumer Product Firm Model: Standardized Coefficients.

quality have positive significant influence on new product performance, Hypothesis 3 is supported.

Finally, the model was re-assessed after three control variables: market turbulence, technological turbulence and firm size were added. Overall, these control variables generally did not influence the new product performance at the .05 level (Table 2).

## 5. Discussion

This research focuses on providing theoretical and practical insights into how new product quality, as influenced by creativity, affects new product performance that integrates dynamic capability and March's (1991) exploitation and exploration viewpoint. This research provides the foundation for straightforward but powerful managerial and theoretical guidelines without misleading oversimplifications and without compromising the richness of the contextual setting. This study finds some interesting patterns of significant relationships among new product/marketing program creativity, internal/external product quality, and new product performance.

First, by summing up the overall relations among the variables, this study finds that new product creativity has a positive impact on both internal product quality and external product quality. From the resource-based view, it suggests that firms can develop their internal resources by enhancing their product quality in order to establish a SCA and niche. Although the path from new product creativity to external quality is not strong, this means that enhancing new product creativity results in greater internal quality. As such, the customer is the focus of concern (e.g., a faster or better performance of the central

**Table 2**
Summary the hypothesis testing and results.

| | Hypothesis | Expected direction | Industrial characteristics | |
|---|---|---|---|---|
| | | | Industrial product firms | Consumer product firms |
| Hypothesis 1 | New product creativity has a positive impact on both internal and external product quality. | + | Partially support | Partially support |
| Hypothesis 2 | Marketing program creativity has a positive impact on both internal and external product quality. | + | Partially support | Partially support |
| Hypothesis 3 | New product quality (internal and external product quality) has a positive, direct impact on new product performance. | + | Support | Support |

processing unit is more important than the “Intel inside” sticker). What is more, in relating marketing program creativity to product quality, though the significant positive effect of marketing program creativity on external product quality is strong, it is not usually the case in internal product quality. This means that marketing program creativity results in greater external product quality than internal product quality.

For managers, the implication is clear: there is a need to carefully identify and exploit the core capability according to the consumer. The focus of attention is essential for competency (capability) exploration. Managers should implement new product creativity or marketing program creativity to achieve different capabilities' exploration efficiently by following internal product quality or external product quality. For example, in the case of Harley-Davidson Motor Company, its buyers take into consideration the extraordinary external features or the products' external quality instead of the functions. Therefore, attracting consumers' interest on the products and improving such products' external image and quality through marketing program creativity are very important. This is contrary to Intel Corporation's practice in which the “Intel inside” sticker merely reflects the company's meticulous planning for a highly marketing program creativity performance. However, the company was not able to improve their products' performance (CPUs), so despite the fact that they managed to keep some loyal customers, they failed to attract potential consumers, including the establishment of a more long-term cooperation with manufacturers (Edwards, 2003). From this experience, enterprises should therefore pay attention not only on increasing marketing program creativity but also new product creativity which can bring core competitive advantages by providing consumers with real benefits.

Next, by analyzing the comparative results of the characteristics of these two product firms, this study found that the effect of new product creativity on product quality is stronger in consumer product firms than in industrial products firms. Conversely, the effect of marketing program creativity on product quality in industrial products firms is stronger than in consumer products firms. These results show that managers should focus on the new product and marketing creativity of different types of product quality (internal and external product quality). Meanwhile, according to industrial characteristics (e.g., industrial/ consumer products firms), managers should enhance a different dimension creativity to activate the different dimensions of product quality.

The conclusion herein is reflected in once again prior studies' findings that discussed the dichotomy between industrial product markets and consumer product markets (e.g. Cooke, 1986; Day & Herbig, 1990; Herbig, Milewicz, & Golden, 1994). Such as Gulbro and Herbig (1995) found that industrial product firms included more rational buying behaviors that focused on the product's functional quality (i.e. internal product quality). On the other hand, consumer product firms included more emotional buying behaviors (the attention was on marketing program creativity) that focused on the product's external packages and design (i.e. external product quality).

This study verified some model assumptions. An additional analysis was done to examine whether product quality in this model plays an intermediary role. The results showed that the impact of creativity on firm performance was mediated by product quality. Specifically on consumer product firms, external product quality positively affects new product performance because quality was affected by marketing program creativity. Likewise, in industrial product firms, the result of this study showed that the impact of new product creativity on new product performance was mediated by internal product quality. These two results may explain why the results of previous studies on creativity and product quality have been inconclusive owing to did not consider examining the under different industrial characteristics.

This study's analysis would show that though creativity influences a product's performance, it does not ultimately depend on it. Product quality plays a mediating role on creativity in a new product's successful performance in the market. It is obvious that if companies would try to balance creativity with product quality improvement, this will create a virtuous cycle of market value in consumer and industrial product firms. Furthermore, these findings also imply that we need to recognize creativity as having a limit in terms of being a sole driver of product quality. In other words, creativity without a corresponding commitment to superior quality of products will limit a new product's competitive advantage. Likewise, product quality improves without creativity would also limit its competitive advantage development.

Furthermore, since the firm's performance was relatively high when both creativity and product quality were high, companies would be well served if they promoted the development of both sets of intangible resources (or capabilities) simultaneously. Thus, this study enjoins that focus should be amply given on both creativity and commitment to the quality of products. This dual focus may not be easy to achieve since organizational practices and resources that support creativity is not necessarily the same as those that support the quality of products.

Therefore, for managers, the implication is clear: based on the resources limitation view, they should attentively manage each capability deployment and evaluate the tradeoffs between the effects of new product and marketing program creativity on the different dimensions of product quality, instead of assuming that creativity is a panacea for enhancing performance. In addition, this result also supports the dynamic capabilities view which contends that the balance between exploitation and exploration can be struck and which specifies under what conditions this would occur (Siguaw et al., 2006). Thus, this current study concludes that a firm's capability to balance creativity with product quality is in itself an intangible resource critical for new product performance, and all these elements will contribute to obtain SCA. Overall, while creativity and product quality can contribute to superior new product performance, every superior organization has to solve the paradox of how to achieve great product quality and great creativity leading to excellent performance at the same time. Therefore, how to foster and motive appropriate degree of creativity to help and improve product quality effectively, as well as enhance new product performance is an important issue that needs to be considered by NPD team leaders or marketing managers within firms.

### 5.1. Limitations and future research directions

As in most fields of research, this study is not without limitations. The first limitation was that this research was not able to examine how managers allocate resources. Since the benefits of exploration are distant and uncertain, managers tend to put more resources into exploitation than into exploration (March, 1991). The resource-based view (RBV) and prior management theory suggest that a firm's capabilities are functions of its interactions with the market, the opportunities available to it, and the limitations of its current capabilities (Schroeder, Bates, &

Junttila, 2002). Thus, though many firms are adept at exploiting existing capabilities, they appear to falter in simultaneously developing new ones (Dougherty, 1992; O'Reilly & Tushman, 2004). Thus, this study would like to see future studies that cover all breadths and diverse aspects within creativity and product quality, especially how these capabilities respective and integrating influence on the new product performance under different industrial contexts.

The second limitation was that the sample frames used in this study were selected only from high-technology industries, while other industries involved in providing creative ideas through innovative processes were excluded. Though single industry studies can provide some degree of control over environmental peculiarities that confront individual organizations and also enhance a study's internal validity (McKee, Varadarajan, & Pride, 1989), this sampling perhaps diluted the findings for a multi-industry study. Therefore, it is suggested that future research should study creativity in the context of other industries, such as the new service development industry.

Finally, the levels of analysis of creativity could be different in the individual, group, and organizational (e.g., Tu, 2009), but this study focused only on project-level creativity. Thus, it is further recommended that future research assignments subdivide the next categories of analysis into individual, group, and organizational levels. Additionally, studies that examine the topic at hand using multilevel analysis (e.g., Yang, Tu, & Yang, 2009) as the research design would be viable.

## Appendix A. New measurement items (IPQ and EPQ)

| Constructs | Sources | Respondent | Items |
|---|---|---|---|
| | | | Compared to your competitors, the *new product quality* you selected |
| Internal product quality (IPQ) | Garvin (1984b); Menon, Jaworski, and Kohli (1997); Sethi (2000) | Team members for the main test, and their supervisors for validation. | 1. Our customers often praise our product new function<br>2. The safe of our products is better than that of our major competitors<br>3. Our customers are firmly convinced that we offer works well products. |
| | | | Compared to your competitors, the *new product quality* you selected |
| External product quality (EPQ) | Garvin (1984b); Menon, Jaworski, and Kohli (1997); Sethi (2000) | Team members for the main test, and their supervisors for validation. | 1. Our customers often praise our product quality and services have long life.<br>2. Our customers are firmly convinced that we offer very attractive quality products. |

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