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Variability: The effects of variation in power relations within the firm, in its market performance, and in the evaluations of its products

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“The plague of mankind is the fear and rejection of diversity: monotheism, monarchy, monogamy... The belief that there is only one right way to live, only one right way to regulate ... is the root cause of the greatest threat to man. ”

— Thomas Stephen Szasz

5. The Marketing/R&D Interface and New Product Performance: the Effects of Relative Influence Changes and Integration⁶

Abstract

In this paper, we start with the premise that the relative influence of marketing and R&D in New Product Development (NPD) is an important part of the marketing – R&D interface that affects new product success. We show that changes in relative influence can lead to different performance outcomes and that these outcomes dependent on the history of prior influence changes in the company and the level of integration between marketing and R&D. Based on an international survey among 106 pharmaceuticals companies, we find that there is a significant positive relationship between radical influence changes and subsequent new product performance. Moreover, we find that a history of influence changes serves organizations to build up capabilities that, in turn, strengthen the positive effects of radical influence changes. Finally, we find that organizations that focus on integration without taking into account the radicalness and the history of relative influence changes can run into the ‘integration trap’.

Keywords: New Product Success, Marketing-R&D Interface, Relative Influence Changes, Integration Trap

5.1. Introduction

New Product Development (NPD) is a complex process that involves different functional areas, particularly R&D and marketing, which have to be aligned in order to achieve organizational goals (Gupta, Raj & Wilemon, 1986, Leenders). Marketing is generally more oriented towards commercial goals, while R&D is more oriented towards technical achievements (Griffin & Hauser, 1996; Gupta, Raj & Wilemon, 1986; Rosenbloom, 1985). Competence specialization and diversity allows the organization to better use information

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from different environmental sub systems, but at the same time creates organizational integration challenges (Lu & Yang, 2004; Saghafi, Gupta & Sheth, 1990; Troilo, De Luca & Guenzi, 2009).

In the literature of the marketing - R&D interface, a lot of attention has been paid to the concept of 'integration' between different functional areas (Griffin & Hauser, 1996; Leenders & Wierenga, 2008). Integration has been operationalized as a measure of quality of communication, for example, and of involvement and information flows in the NPD process (Griffin & Hauser, 1996; Henard & Szymanski, 2001; Troy, Hirunyawipada & Paswan, 2008). According to this stream of literature, integration plays an important role in producing more successful new products (Griffin & Hauser, 1996; Hoopes & Postrel, 1999; Ittner & Larcker, 1997). However, several studies suggest that integration has a weak, or at best conditional, relationship with new product performance (Henard & Szymanski, 2001; Troy, Hirunyawipada & Paswan, 2008) and that there may be costs involved (Cuijpers, Guenter, and Hussinger 2011).

The starting point of the argument of this article is that good communication and coordination, the essence of integration, is only one aspect of the marketing – R&D interface. In any joint decision process, each entity possesses some degree of relative influence, which refers to the power to enforce one's preferences over the other (Corfman & Lehmann, 1987). At a given time, the influence of marketing and R&D can be balanced or one side can be more dominant (Atuahene-Gima & Evangelista, 2000). As organizations evolve, the distribution of relative influence may change in different directions resulting in different change patterns across companies.

Changes in relative influence can be triggered by a great variety of causes, such as changes in the market environment or in the firm's NPD strategy. In addition, leadership changes – for instance, the appointment of a new CEO – can also lead to relative influence

changes since CEO background can affect firm orientation (Merlo 2011). In Philips Electronics, for example, there were important changes in relative influence when a marketing manager from the food company Sara Lee became CEO. In a more general sense, changes in relative influence indicate the search for the most productive relationship configuration that fits the organization's needs.

In this paper, we analyze the effect of relative influence changes on new product performance. Instead of focusing on the static relative influence balance, we focus on the dynamics of relative influence over time. While companies continuously balance the technological and market inputs to new product development, one can observe more or less radical changes and also characterize the history of the changes in relative influence. The question here is what type of influence change pattern is more productive in a broader marketing – R&D interface perspective? The broader goal of our study is to shed more light on marketing – R&D processes and study under what conditions symbiotic relationships emerge. Symbiotic relationships rely not only on cooperation, communication and involvement, but also on processes such as shifts and rotation in relative influence (Davis & Eisenhardt, 2011).

Next, we present the theoretical background from which a number of hypotheses are derived. Then, we explain the data collection method, measurement scales, and data. In the analysis, we provide a test of the hypotheses. Finally, we discuss our findings and provide managerial implications.

5.2. Theoretical background and hypotheses formulation

Specialization and integration are two fundamental dimensions to designing any organization. Specialization is needed to deal with complex sub systems in the environment (e.g., customers, competitors, policy makers, and technological communities) and the different units need to be aligned through integration because goals and orientations of different units tend to diverge (Griffin & Hauser, 1996; Gupta, Raj & Wilemon, 1986; Hirunyawipada, Beyerlein & Blankson, 2010; Rosenbloom, 1985; Shaw & Shaw, 1998; Shaw, Shaw & Enke, 2003).

The level of relative influence of the R&D department (relative to marketing or vice versa) has become an increasingly important subject in the literature. Verhoef and Leeflang (2009) suggest that a more influential marketing department is generally beneficial because a marketing department's influence is related to a stronger marketing orientation (see also Homburg, Workman & Krohmer, 1999). Advocates of an influential R&D department, however, would argue that more R&D influence would benefit the technological sophistication of the new products. As members of a technological community, R&D professionals will have preferences towards technological achievements or scientific recognition (Dietz & Bozeman, 2005). This may create a sustainable competitive advantage for the company as well (Dewar & Dutton, 1986). As a result, we do not focus on the relative influence of one department per se, but on the effects of *changes* in relative influence and the capabilities that are needed to make these changes more beneficial to the company.

NPD involves a range of interdependent tasks for which the organization builds routines to bridge different functional areas. A change in the relative influence structure of the organization may disrupt these routines and make the organization more vulnerable to failure (Stinchcombe, 1965). In particular, more radical changes in the distribution of

influence between marketing and R&D may be harder to accept for the other side and lead to more conflicts and little agreement on what is good for the organization as a whole. These interface frictions may potentially lead to a waste of resources, the creation of insecurities for the employees, and a stifling of creativity (Brettel, Heinemann, Engelen & Neubauer, 2011).

However, one can also argue that more radical changes in relative influences between marketing and R&D in the NPD process can be beneficial. Davis and Eisenhardt (2011) present a discussion of leadership rotation between two actors that have different expertise and orientations (e.g. a hardware manufacturer and a software developer). If the circumstances in which the collaborative venture operate change, a shift of influence to the side that can best deal with the situation can be beneficial. They also argue that there may be unidirectional shifts that do not have this beneficial effect.

Building in Davis and Eisenhardt (2011), we introduce the concept of a more radical influence change and define it as the degree to which the organization experiences a change in relative influence relative to the base change pattern in a certain period. Since earlier research has also shown that radical innovations play an important role in new product performance in general, more radical changes in relative influence may be beneficial (Tellis, et al. 2009). As a counter argument, it can be proposed that organizations in rapidly changing environments such as high-tech fields that do not experience radical changes in influence will on average perform less well because they cannot respond to dramatic changes in technologies, customer demands and regulations (Leenders & Voermans, 2007). The reconfigurations of relative influence allow a transformation of the way people interact in the NPD process. The department that loses relative influence will – per definition – be forced to adopt to a greater extent the perspective of the other department, which can broaden their view, and help them to escape equilibrium traps and tunnel vision (Amabile, 1998; Davis & Eisenhardt, 2011). Firms that increase the relative influence of the marketing department

substantially may gain new insights about the market and competitors, or the other way around, firms that shift from marketing influence towards R&D influence would be able to gain new insights about emerging technologies which may benefit the early adoption of new technologies (Tellis et al. 2009), as well as the development of new products and the establishment of, or entry into, new markets (Christensen & Overdorf, 2000).

Change in general is often linked to creativity because it resets the organizational clock (Amburgey, Kelly & Barnett 1993) and decreases the strength of inertia that is detrimental to individual creativity (Ford & Gioia, 2000) and firm innovativeness (Meus & Oerlemans, 2000; Pierce & Delbecq, 1977). A radical change would force the organization to reset its current perspective and learn about new possibilities, knowledge, or ideas, all of which can improve performance, especially in respect to new product development. More radical changes of relative influence may redirect marketing and R&D personnel towards more productive areas and more diverse ideas (Burkhardt & Brass, 1990) and improve creativity (Amabile, 1998). Thus the hypothesis is as follows:

H1. *More radical changes with respect to relative influence of marketing and R&D have a positive relationship with new product performance.*

Of course, the level of change cannot be increased so far that the organization becomes itself unstable or threatens to fall apart. It is likely that too much change – also in the area of relative influence - can mitigate the beneficial aspects of any change event. At very high levels of change the relationship may even top-off or become inverted U-shaped and we will explore these relationships in our analysis and results section.

Having change as a regular activity is beneficial for organizations (Klarner & Raisch, 2013). Previous study has shown that extended period of stability leads to organizations inertia (Hannan & Freeman, 1984). Regular changes help managers to overcome inertia before they are trapped in spirals of complacency.

As firms change over time, they may develop a 'routine to learn new routines' (Eisenhardt & Martin, 2000; Eng & Quaiia, 2009; Teece, Pisano & Shuen, 1997). In other words, organizations learn to change by changing and the more an organization changes its relative influence balance, the more likely it is to develop modification routines and competencies in that area that build a capacity for adaptive change (Amburgey et. al., 1993). Such changes do not necessarily need to be radical, but organizations may differ in the degree to which they experience continuous - and to some extent regular and automatic - rates of change (Klarner & Raisch, 2013). These changes can produce adaptive capabilities that affect the relationship between a more radical change and new product performance positively. Without regular changes across time, organizations would not be able to relate to the experience gathered from executing past changes (Levitt & March, 1988), and during such a long period of stability, inertia may become too strong, ultimately reducing organization's ability to undertake subsequent changes (Hannan & Freeman, 1984).

So, we not only argue that stability in relative influence is less productive than relationships that experience substantial changes in influence above the base rate of change, but also that longer term change patterns may create adaptive capabilities that make radical changes more productive in terms of new product performance. Thus the hypothesis is as follows:

H2. *The positive effect of more radical changes with respect to relative influence of marketing and R&D on new product performance is more positive for organizations with a richer history of relative influence changes*

A key characteristic for many decisions in NPD is that they involve tradeoffs that require some judgement (Hauser, 2000). Exercising an informed judgement implies the need for in-depth information from different sides. So, apart from relative influence, concepts such as 'integration between marketing and R&D' related to cross functional communication and involvement play an important role in the broader marketing-R&D interface. In the area of channel management and retailing, for example, relative influence is studied in connection with communication patterns between producers and retailers as well. Communication is needed to coordinate the actions of channel members and relative influence is needed to resolve potential conflicts that arise from different preferences and to maintain commitment (Boyle, Dwyer, Robicheaux & Simpson, 1992).

Lawrence & Lorsch (1969) defined integration as organizations' efforts to achieve unity between various organization subsystems. Gupta et al. (1986) further refined this concept by suggesting that integration exists if there is a continuous exchange of information between two parties creating trust and harmony (Troy, Hirunyawipada & Paswan, 2008). In addition to this, achieving integration is argued to reduce the possibility of opportunistic behavior, as well as to promote trusting relationships, and the compatibility of individuals (Tsai & Ghoshal, 1998). Consequently, integration is often considered as an important factor in improving time to market, creativity and new product performance in general (Amabile, 1998).

Interestingly, there are several studies that question the effectiveness of integration in specific situations. For example, Leenders and Wierenga (2008) showed that if organizations have small resource stocks with respect to the development and commercialization of new products, integration between marketing and R&D in itself may not have the expected positive effects on new product performance. In addition, integration seems to have less positive effects for companies that operate in a broad range of product markets. In the context of radical innovation, some authors have argued that integration may exert at least some potentially detrimental effects; for example marketing and R&D may focus too much on the status quo (Brettel, Heinemann, Engelen & Neubauer, 2011). In the same vein, 'too good friends' (e.g., Souder 1980, 1988) can constitute a danger to careful decision making regarding tradeoffs. When group members get along well and experience strong interpersonal interactions with each other, they may resist stating their concerns about issues found during NPD. In these cases, team members may fail to challenge each other's theories and conclusions (Brockman, Rawlston, Jones & Halstead, 2010).

Extending the previous discussion on the pros and cons of integration into our discussion of relative influence changes in the NPD process, one can argue that the capability to maintain high levels of integration between marketing and R&D while experiencing a rich history of influence changes may help to improve new product performance outcomes even further. As the relative influence of marketing and R&D rotates over time, the organization develops capacities to handle more radical changes more effectively (H2). Particularly in the event of changes in technological or market priorities, a lot of rivalry may occur between marketing and R&D. This may even lead to R&D becoming ignorant regarding marketing information and marketing being ignorant about long term R&D contributions to competitiveness (Maltz, Souder & Kumar, 2001). Therefore, high levels of integration, together with low levels of historical changes in relative influence may indicate a state of 'too

good friends' more than true integration. Such organizations are not equipped to handle more radical influence changes and organizational members would rather maintain a state of stability than focus on making the change productive for the organization (Brettel, Heinemann, Engelen & Neubauer, 2011). One illustration may be that in the case of R&D generating a potential technological breakthrough while marketing is not able to evaluate its commercial viability as customer reactions can hardly be foreseen due to a lack of market intelligence and experience. In this situation, a radical change of relative influence may have extraordinary benefits, but since the organization has not build sufficient adaptive capabilities to handle such changes, the outcome will likely be suboptimal. Thus the hypothesis is as follows:

H3. *The effect of more radical changes in relative influence of marketing and R&D is less positive for companies with a stable history of relative influence changes together with a high level of integration (and more positive for companies with a rich history of relative influence changes together with a high level of integration).*

5.3. Research method

5.3.1. Research context and data collection

The pharmaceutical industry was selected as a research setting for this study This industry is often taken as a subject in empirical studies because of the transparency and well-documented conditions that lend themselves very well to analyzing NPD and innovation processes (e.g. Nerkar & Roberts, 2004; Rafiq & Saxon, 2000; Sorescu, Chandy & Prabhu, 2003). Data were collected through an international mail survey among senior managers involved in Marketing and/or R&D at the corporate level. If the company was multidivisional, we chose the manager from the pharmaceutical division. These senior

executives were expected to possess the best knowledge regarding the issues being researched (Campbell, 1951; Seidler, 1974). In addition to the questionnaire data, we collected factual data through desk research on the company's new product performance in terms of the actual sales generated by new products (less than 5 years on the market).

A total of 700 questionnaires were sent out to pharmaceutical companies using ESOMAR's database on pharmaceutical companies worldwide. We focused on companies with annual revenues above \$50 million, thereby deleting small and specialized biotech companies from the sample. All the companies possess considerable marketing and R&D operations and this was further verified in the questionnaire. After a reminder and an additional wave, 136 usable questionnaires from knowledgeable managers were returned (19.4%), which is acceptable considering the average single digit response rate of international mail survey in other studies (Dillman, 1999; Jobber, Allen & Oakland, 1985; Menon, Bharadwaj & Howell, 1996). The level of NPD knowledge of the responding executive was assessed by means of a question that asked whether the respondent was able to assess corporate new product development decisions and success over the last 12 years. This reduced the effective response set to 106, or 78 percent of the initial sample.

We tested for possible non-response bias by comparing late (the last one-third) and early responses (the first one third) in terms of missing values and means and variances of the major measures and this revealed no significance differences at the $\alpha = .05$ level indicating that non-response bias is not an issue of concern here (Theodosiou, Kehagias & Katsikea, 2012).

The final sample consists of responses from Europe based companies (51%), US based companies (36%), and Japan based companies (13%). The companies in the sample have average annual revenues of \$3.2 billion and an average of 10,400 employees of which

1,580 are R&D employees and 1,100 are marketing employees. The average budget allocated to marketing and R&D is \$1.04 billion on average. Interestingly, the mean marketing budget is quite similar to the mean R&D budget (both close to \$500 million).

5.3.2. Measurement

We measured constructs using multi-item scales obtained from the literature as much as possible. In line with Loch, Stein and Terwiesh (1996), we define new product performance in terms of output and market performance. A list of four items was collected from the literature (e.g., Griffin & Page, 1993). For a description of the items see Appendix A. In the questionnaire, respondents were asked to assess the performance (based on a scale of 1 to 5) of their company, compared to companies of similar size over the period of the past five years. This method tends to produce scores that are consistent with factual measures while directly controlling for size (Dess & Robinson, 1984). A score of "5" on the question "The performance of the products that have been launched in the last five years" means the company is in the top performing 20% of similar companies.

In line with Homburg, Workman and Krohmer (1999), *Relative Influence* is defined as the extent to which a functional area has an impact on NPD and it was measured using a constant sum scale. Following Homburg, Workman and Krohmer (1999), respondents were asked to score the balance of influence between marketing and R&D. The score of R&D's influence (relative to marketing) lies between 0 and 100 (the sum of both scores equals to 100) and the higher the score on the relative influence scale, the higher the relative influence of R&D is in NPD.

We asked the respondents to provide their scores on relative influence at different points in time (12 years ago, 8 years ago, 4 years ago, and present). Other studies in the pharmaceutical industry, have taken similar time spans (e.g., Cardinal, 2001). From other

research it is also clear that memory does not degrade gradually when assessing the past, but that there can be periods of vivid memory related to important events (Rathbone, Mouline & Conway, 2008). Since relative influence changes are important to the NPD process as a whole and the managers involved in particular, our setting is quite suitable to obtain reliable and valid responses. In addition, if the respondent could not judge all periods, we deleted the company from the sample because of a lack of knowledge of the respondent.

A *radical change (RC)* is defined as the magnitude of a change in a specific period divided by the company's average baseline change (*CAC*). We focus on the radicalness of the change between t-0 and the t-1 (covering 4 years). Radical changes that refer to eight or twelve years ago are considered less relevant for now but these changes can be explored as well as we can use the same formula for other periods and timeframes. A more radical relative influence change for company *j* (RC_j) is measured as follows:

$$RC_j = \frac{|RI_{j,t=0} - RI_{j,t=-1}|}{CAC_j} \quad (1)$$

$RI_{j,t=0}$ = the level of relative influence of company *j* in the most recent period (t0)

$RI_{j,t=-1}$ = the level of relative influence of company *j* in the earlier period (t-1)

$$CAC_j = \frac{|RI_{j,t=-3} - RI_{j,t=-2}| + |RI_{j,t=-2} - RI_{j,t=-1}| + |RI_{j,t=-1} - RI_{j,t=0}|}{3}$$

Later in this study, we will explore different operationalizations using a pre-determined cut-off point to classify as a radical influence change to validate the robustness of our findings.

The history of changes (HC) is measured by the cumulative changes in relative influence across all periods that we measured for a specific company (*j*). The absolute change

between the initial and final period is used as the denominator of HC because then our measure behaves in such a way that if organizations experience a one-directional shift in relative influence they score lower than organizations that have more rotations (see Davis & Eisenhardt, 2011). We specify the degree to which an organization has a rich history of changes (HC_j) using the following formula:

$$HC_j = \frac{\sum_{i=0}^2 |RI_{j,t=i} - RI_{j,t=i-1}|}{|RI_{j,t=0} - RI_{j,t=-3}|} \quad (2)$$

Integration of marketing and R&D is defined as communication, joint goals and good relationships between marketing and R&D and is measured using an existing 15 item scale (Pinto, Pinto & Prescott, 1993). *Resources* were defined as NPD knowledge, relationships and assets and we collected items from earlier studies (Dierickx & Cool, 1989; Dutta, Narasimhan & Rajiv, 1999; Teece, Pisano & Shuen, 1997; Leenders & Wierenga, 2008). The scale of NPD resources can be interpreted as a formative (formed) scale, in which the elements cover different aspects of the overall resource pool that are summed up to obtain the current state of an organization's NPD resources (see also Rossiter, 2002). *Strategic focus* was defined as the product and market scope of the company and measured using an existing scale (Cool & Schendel, 1987; Leenders & Wierenga, 2008). The *centralization* and *formalization* measures were taken from Hage and Aiken (1967), and Zaltman, Duncan and Holtbek (1973). Finally, in line with other studies, we control for *geographic location* of the company's headquarters (Garrett, Buisson & Yap, 2006).

5.4. Empirical results

5.4.1. Reliability and validity

Confirmatory factor analysis (CFA) was used to assess the overall measurement model. The CFA containing all the measures and all the items resulted in an adequate fit (RMSEA = .072). However, there may be some concerns regarding the number of data points per parameter. Therefore, we constructed a partially disaggregated model that comprises of aggregated composites for the measures (Bagozzi & Edwards, 1998). Analysis on the disaggregated model resulted in a good fit as well (RMSEA = .08, CFI = .92, TLI = .91).

Internal consistency was verified by calculating Cronbach's α coefficients and AVE's. The results are the followings: integration of R&D and marketing (15 items, $\alpha = .91$, AVE = .59), strategic focus (3 items, $\alpha = .77$, AVE = .64), formalization (4 items, $\alpha = .76$, AVE = .55), centralization (6 items, $\alpha = .78$, AVE = .64). All AVE's exceed the suggested level of 0.50, indicating convergent validity (Fornell & Larcker, 1981). The AVE value can also be used to assess discriminant validity (Fornell & Larcker, 1981), which is evident in our results because the largest shared variance among two constructs is .45, lower than the least AVE value (.53) for any single factor. Afterwards, we also conducted sensitivity analysis by only using 3 items per construct. The alpha coefficient of each constructs still exceeded the .70 level and the AVE's were still above .5. Therefore, composites were constructed by averaging the scores of all items for each construct.

The correlation matrix regarding the main constructs is presented in Table 5.1. R&D influence and new product performance show an insignificant correlation ($r = .11$, $p > .10$). A more radical influence change has a significant positive correlation with new product performance ($r = .21$, $p < .01$). The history of changes also has a significant correlation with

new product performance ($r = .24, p < .01$). The correlation between integration and new product performance is relatively small but significant ($r = .16, p < .05$).

We explored the data for possible non-linear relationships such as an inverted U-shape relationship between radical influence changes and new product performance. However, we were not able to find any significant inverted U-shaped relationships and only a few data points where the magnitude of the radical influence change exceeded two standard deviations of the sample's overall mean. The scores of R&D's relative influence for the most recent period lie between 40 and 75 (out of 100) with an average of 58.3, which shows that R&D on average has more influence in NPD compared to marketing in our dataset covering pharmaceutical companies.

Table 5.1 Correlation Matrix

Variable Name	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	
1 NPP	3.17	0.90	1											
2 Radical Changes	1.18	0.92	.21**	1										
3 History of Changes	5.12	4.08	.24**	-.13	1									
4 Integration	3.56	0.56	.16*	-.07	-.04	1								
5 R&D Influence	58.32	18.87	.11	.02	.15	-.19*	1							
6 Resources	35.21	6.15	.71***	-.04	-.10	.09	-.01	1						
7 Strategic Focus	2.92	1.23	.13	.06	-.09	-.06	.05	.08	1					
8 Formalization	2.75	0.71	.03	-.07	.10	-.14	.01	-.07	.25***	1				
9 Centralization	2.87	0.64	.14	.10	.08	.16	.07	.13	.01	.37**	1			
10 US HQ	0.36	0.48	.33***	-.14	-.07	.12	.06	.17*	.02	.17*	.07	1		
11 Japan HQ	0.13	0.34	-.01	.03	-.06	-.06	.12	-.21*	-.04	-.13	-.08	-.29***	1	
12 European HQ	0.51	0.50	-.31***	.11	.11	-.08	-.13	-.02	.01	-.08	-.02	-.77***	-.39***	1

* Significant at $p < .05$ (two-sided)

** Significant at $p < .01$ (two-sided)

*** Significant at $p < .001$ (two-sided)

5.4.2. Hypotheses testing

We devised incrementally more comprehensive regression models and estimate the nested models using the Ordinary Least Square (OLS) method. Because of potential multicollinearity between the interactions and its component variables, we mean-centered the variables nested in the interaction (Jaccard, Wan & Turissi, 1990). Table 5.2 shows the results of the regressions.

Our models explain up to 69 percent of variance in new product performance. The VIF values are below 2, indicating that multicollinearity is not a major concern in our analysis. Although we can only use Model 3 to test our hypotheses (the other models are incomplete), the nested models provide interesting insights in the underlying relationships. In all models, the radical change variable obtains a positive and significant coefficient ranging from $\beta = .21, p < .01$ to $\beta = .14, p < .05$. Therefore, we find support for H1.

Moving on to the next hypothesis (H2), the results show that the effect of radical influence changes on new product performance is stronger when the organization has a richer history of relative influence changes. The coefficient of the interaction between the two variables is positive and significant in all models ($\beta = .13, p < .05$). The relationship is visualized in Figure 1. Separate relationships are plotted for organizations with a different history of relative influence changes (based on a median-split). One group of organizations ($n = 53$) has a relatively rich history of changes and one group ($n = 53$) has a more stable history of changes. The Figure shows that radical influence changes produce most new product performance for companies with a rich history of changes (steeper slope). H2 is supported.

Table 5.2 The determinants of New Product Performance

Variable	Model 1		Model 2		Model 3	
	beta	VIF	Beta	VIF	beta	VIF
<i>Marketing/R&D Interface</i>						
Radical Changes (RC)	.21 **	1.09	.14 *	1.12	.14 *	1.31
R&D Influence	.08	1.36	.08	1.45	.09	1.49
History of Changes (HC)	.14 *	1.24	.13 *	1.25	.13 *	1.42
Integration (INT)	.17 **	1.22	.17 **	1.89	.14 *	1.92
<i>Org. Characteristics (Controls)</i>						
Resources	.70 **	1.72	.70 **	1.75	.70 **	1.77
Formalization	.09	1.28	.09	1.30	.08	1.31
Centralization	-.03	1.31	-.04	1.36	-.05	1.38
Strategic Focus	.17 **	1.68	.16 **	1.75	.16 **	1.76
US HQ	.23 **	1.27	.22 **	1.28	.23 **	1.29
Japan HQ	.22 **	1.14	.22 **	1.18	.24 **	1.19
<i>2-way</i>						
HC*INT			.03	1.74	.03	1.84
RC*INT			-.05	1.21	-.04	1.34
HC*RC			.13 *	1.20	.13 *	1.31
<i>3-way</i>						
INT*RC*HC					.12 *	1.42
N	106		106		106	
R ²	.65		.67		.69	
Adjusted R ²	.63		.64		.66	
F-value	29.68 **		22.48 **		18.80 **	

* Significant at $p < .05$ (two-sided)
 ** Significant at $p < .01$ (two-sided)
 *** Significant at $p < .001$ (two-sided)

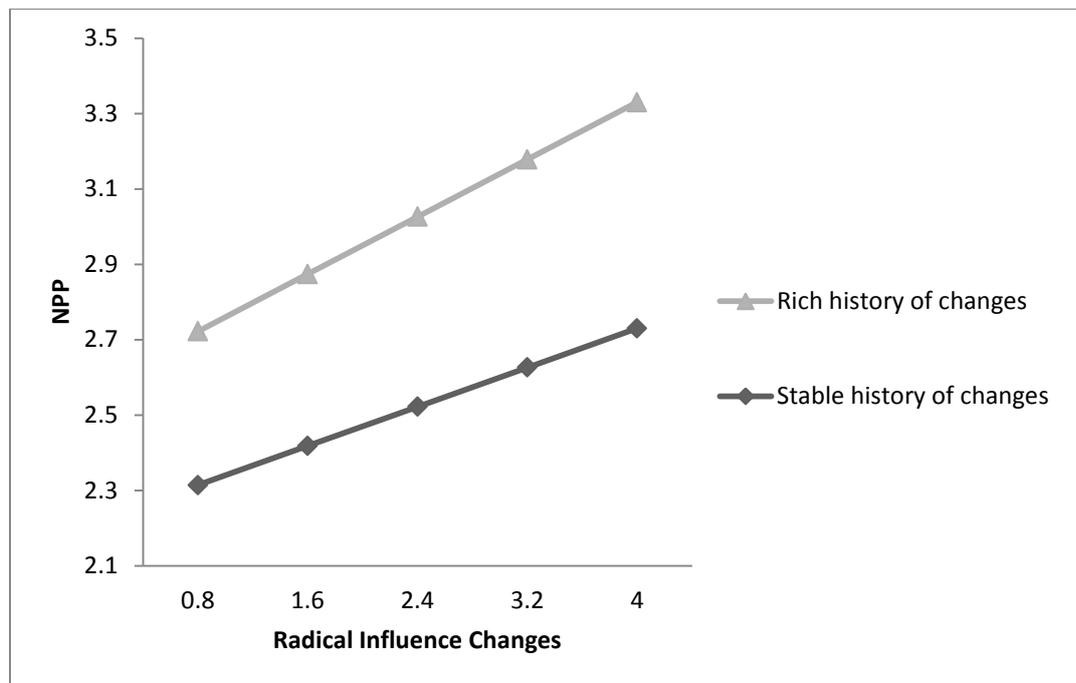


Figure 5.1. The relationship between more radical influence changes and new product performance under different ‘history of influence change’ conditions

On Figure 5.1, we also observe a main effect from having a richer history of changes (the slope is not only steeper but new product performance is higher across the board for companies with a rich history of changes). Even though we did not hypothesize this particular relationship, our result seems to support Davis and Eisenhardt (2011) arguments that the practice of reconfiguration of power has a positive effect on performance in general.

The third hypothesis describes the most comprehensive relationship and is concerned with the effect of radical influence changes, considering the moderation of the history of changes and the level of integration between marketing and R&D. The full model shows that the interaction between radical changes and the history of changes is still significant ($\beta = .13, p < .05$). In addition, the three-way interaction between radical change, the history of changes and integration is positive and significant after controlling for the main effects and the two-way interactions that are nested ($\beta = .12, p < .05$). To visualize this interaction, we first divide the sample using a median-split on the degree to which the organization had a rich

or stable history of changes and second whether the organization has a high or low level of integration between marketing and R&D.

Figure 5.2 and Figure 5.3 visualize the moderating effects of integration for different types of organizations. Interestingly and as hypothesized, companies that score high on integration do not necessarily outperform companies with low integration if these companies have a stable history of relative influence changes. However, the positive moderation effect is visible for companies with a rich history of influence changes. Based on the significant three-way interaction in the full model and the exploratory visualizations of the nature of the interaction, we find support for H3.

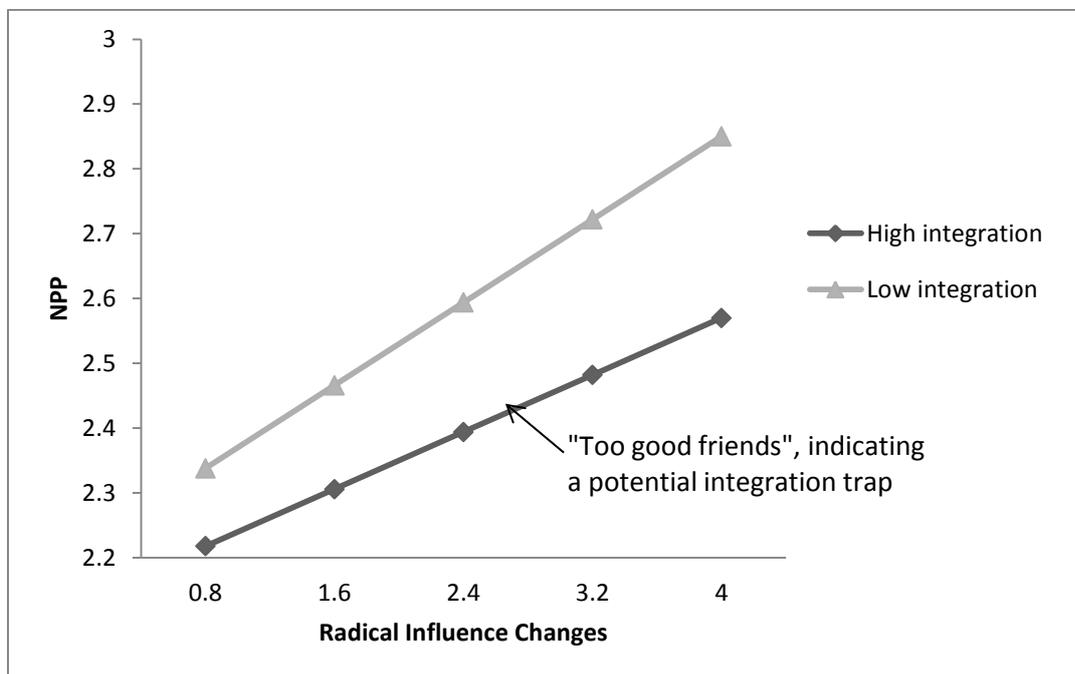


Figure 5.2. The relationship between more radical influence changes and new product performance (NPP) for companies with a stable history in terms of influence changes (n=53) under different integration levels.

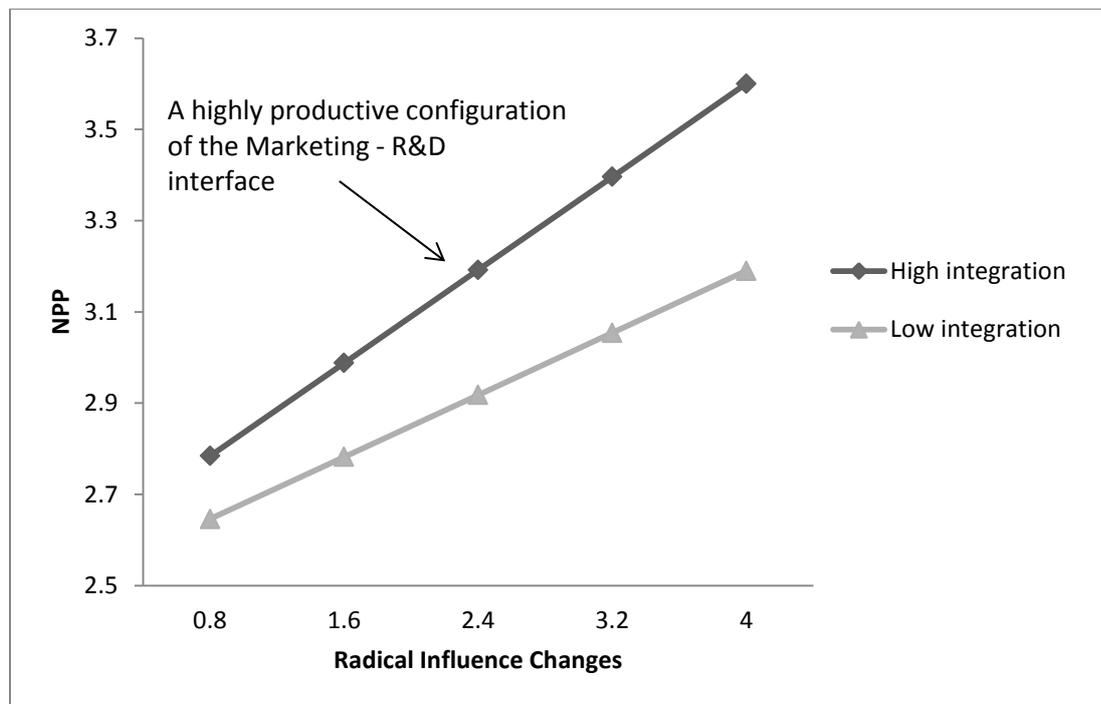


Figure 5.3. The relationship between more radical influence changes and new product performance (NPP) for companies with a rich history in terms of influence changes (n=53) under different integration levels.

5.4.3. Robustness tests

In addition to our proposed metric of more radical influence changes, we also tested two alternative measures. The first alternative has a longer time horizon compared to equation 1. In this measure, we count the number of occasions where relative influence changes exceed a certain cut-off point. First, we define the indicator function and set the cut-off point to 10 (remember we have a constant sum scale between 0 and 100, which means that a decrease of one area's influence of 10 points results in a shift of 20 points), which is likely to be quite radical. We define the indicator function:

$$1_A : |\Delta RC_j| \rightarrow \{0,1\}$$

$$1_A(|\Delta RC_j|) = \begin{cases} 1 & |\Delta RC_j| \geq 10 \\ 0 & |\Delta RC_j| < 10 \end{cases} \quad (3)$$

The output of indicator function 1_A can be either 0 or 1. The output of the function is equal to 1 if the input is larger or equal to 10, or 0 otherwise. We measure radical change ($RC1_j$) of company j by counting the number of periods where the relative influence change exceeds the cut-off point of the indicator function.

The second alternative is to calculate the extent to which the current change of the level of relative influences in the organization is radical compared to the sample's average.

$$RC2_j = \frac{|RI_{j,t=-1} - RI_{j,t=0}|}{SAC} \quad (4)$$

SAC = Sample average influence change (i.e. the sum of all the changes or relative influence of all companies in the sample between period $t-1$ and $t0$, divided by the number of companies in the sample).

Table 5.3 Tests for alternative operationalization of Radical Change

Variable	Model 3 with Alternative 1 (RC1)		Model 3 with Alternative 2 (RC2)	
	beta	VIF	beta	VIF
<i>Marketing/R&D Interface</i>				
Radical Changes (RC)	.14 *	1.74	.10 †	1.92
R&D Influence	.09	1.39	.04	1.40
History of Changes (HC)	.11 †	1.41	.18 **	1.50
Integration (INT)	.11 *	1.90	.15 *	1.94
<i>Org. Characteristics (Controls)</i>				
Resources	.69 ***	1.76	.70 ***	1.77
Formalization	.08	1.32	.07	1.31
Centralization	-.01	1.33	-.03	1.37
Strategic Focus	.10 †	1.76	.25 **	1.81
US HQ	.21 **	1.29	.21 **	1.28
Japan HQ	.27 **	1.19	.25 **	1.18
<i>2-way</i>				
HC*INT	.02	1.60	.03	1.22
RC*INT	-.03	1.26	-.02	1.11
HC*RC	.13 *	1.76	.13 *	1.81
<i>3-way</i>				
INT* RC *HC	.11 †	2.11	.12 *	1.84
N	106		106	
R ²	.66		.68	
Adjusted R ²	.63		.65	
F-value	17.3	***	18.1	***

† Significant at $p < .10$ (two-sided)
 * Significant at $p < .05$ (two-sided)
 ** Significant at $p < .01$ (two-sided)
 *** Significant at $p < .001$ (two-sided)

We estimated model 3 (full model) from Table 5.2 using the two alternative measures for more radical changes and the results are provided in Table 5.3. The results show that the model with our original metric and the model with the two alternatives do not differ substantially. The VIF values are similar and the coefficients of the three way interaction between the history of influence changes, radical changes and integration are very similar (RC1: beta = .11, $p < .1$; RC2: beta = .12, $p < .05$; versus the original RC: beta = .12, $p < .05$).

Similar relationships also occur when the interaction is visualized in plots. Overall we find support for the robustness of our measure.

We also collected factual data on the new product performance of the companies in the sample ($n = 57$). A correlation analysis between NPP and the sales from products less than 5 years on the market is high ($r = .59, p < .001$). When we ran Model 3 again with this factual indicator as the dependent variable, the results were again quite similar ($\beta = .14, p < .1$). Overall, it seems reasonable to claim that our subjective NPP measure reflects factual new product performance of the company and that the results across different measures are quite similar.

In addition, a pooling test on all constructs of the model revealed no significant differences between respondents with a senior marketing background (61%) and respondents with a senior R&D background (39%) and similar results occurred when only senior marketing respondents were used in the analysis.

5.5. Discussion

Earlier research has paid a lot of attention to cooperation, communication and integration in the marketing – R&D interface in relationship to new product performance (Griffin & Hauser, 1996, Gemser & Leenders 2011). This study is an attempt to further open the black box of the marketing – R&D interface and to go beyond what is normally described as integration. In particular, we focus on the balance of influence between marketing and R&D and, more importantly, how this balance changes over time and what the effects are in terms of new product success.

On a stand-alone basis, we found that radical influence changes are generally beneficial for new product performance. However, there are certain conditions that make this effect more pronounced. In particular, a rich history of changes together with a high level of integration between marketing and R&D is the most symbiotic interface configuration that produces the highest performance of new products.

This paper also offers a new way to interpret the mixed results of integration that have been found and reviewed in meta-studies (c.f. Henard & Szymanski, 2001, Troy, Hirunyawipada & Paswan, 2008). Our study suggests that one should expect mixed results if one do not take into full account that integration is only one aspect of the relationship between marketing and R&D. Integration, or other cooperative constructs, is likely to be a moderator on other relationships (Troy, Hirunyawipada & Paswan, 2008). Specifically, we found different effects of integration in companies with a rich history of relative influence changes versus companies with a stable history of relative influence changes. For companies with a stable history of relative influence changes, a high level of integration may be detrimental for the productivity and signaling the 'too good friends syndrome' (Souder 1980, 1988). This finding suggests that there is an 'integration trap' and that the benefits of integration may be lessened by the underlying stability in the organization in general, and in particular, by the stability of its relative influence structure. In such circumstances, stronger integration could easily lead to both departments looking for areas of agreement and a disinclination to 'rock the boat' leading to less experimentation and more inertia (Fiol & Lyles, 1985; Pfeffer, 1981; Brettel, Heinemann, Engelen & Neubauer, 2011).

Organizations that have a rich history of influence changes may have developed a 'routine to adapt and learn' (c.f. Eisenhardt & Martin, 2000; Davis & Eisenhardt, 2011; Klarner & Raisch, 2013). The results of our study demonstrate that through past series of changes, organizations are better able to handle more radical future changes. The capabilities

that may result from past changes enable the organization to more easily endeavor to depart from routines and benefit from opportunities to explore new territories (c.f. Klarner & Raisch, 2013). In order to be beneficial, there are also needs for constructive conflict (e.g., Souder 1988). So, even in the absence of integration, organizations may be capable to handle more radical changes more effectively, especially if they have a broader experience with change. If, in that situation, the organization also has a high level of integration between marketing and R&D, the practice of a more radical influence change can provide even further benefits to the organization.

The managerial implication from our study is that research managers should aim for NPD processes and internal structures that allow for regular influence changes while at the same time sustaining a high level of integration, precisely to enable the organization to benefit more optimally from more radical changes. The process of change may be a bitter pill for certain participants in the NPD process because of resistance to change. However, if they are able to experience changes while maintaining a symbiotic and trusting relationship, both marketing and R&D department have a better chance to reach the shared goal of achieving superior new product performance.

Our study has a number of limitations. First, we based our analysis to a large extent on self-reported data. This type of data might be prone to certain types of biases such as memory, managerial background, expertise, time pressures, etc. Although we paid quite some attention to measurement validation, future research may complement our findings by using additional scales (e.g., for new product performance efficiency for example) and different types of data. Second, although not uncommon, we asked informants to look back in time and score past relative influence balances in different period. Ideally, future research should try to measure relative influence as it progresses in time. Third, research on relative influence is still in an early stage and fewer measurement scales are available compared to, for example,

integration. In this study we assess relative influence in multi-year time intervals and more detailed measures covering more functional areas may provide additional insights. Fourth, as we do not have detailed panel data on the changes in relative influence that occur in the company, we cannot conduct panel data analysis regarding company-specific effects. Fifth, there could also be a concern for industry specific biases because our data is gathered from a single industry. However, the pharmaceutical industry is a typical example of a highly innovative and technology driven industry. Further studies, especially also of industries that focus on non-technological innovations, are necessary to find out whether our results are fully generalizable.

Appendix 5.A. The list questions used for the latent constructs used in this study

New product performance

The performance of the products that have been launched in the last five years
The number of new products in the last five years
The number of breakthroughs in the last five years
The quality of the R&D pipeline in the last five years

Integration of R&D with marketing

A friendly attitude exists between R&D and marketing
Open communication of relevant information occurs between R&D and marketing
R&D and marketing intentionally provide each other with misleading information
R&D and marketing search for solutions that are agreeable to each other
R&D and marketing are more like teammates than competitors
If disagreements arise between them, R&D and marketing are usually able to resolve the disagreements
R&D and marketing openly share their ideas with each other
R&D and marketing help each other to more effectively perform their tasks
R&D and marketing often fail to communicate information to each other (Reverse)
R&D and marketing are always blaming each other for failures (R)
It is difficult for R&D and marketing to contact each other (R)
Conflicts between R&D and marketing are of a constructive kind
R&D and marketing perceive their problems as mutual problems
R&D and marketing recognize each other's talents and expertise
R&D and marketing share resources to complete tasks

NPD Resources

The sophistication of R&D equipment
Goodwill at medical institutes
Database and library facilities
Contacts with universities
Worldwide market information
Top scientists
Contacts with top medical specialists
Cooperative R&D relationships
Relationships with governmental bodies
Knowledge of competitors

Strategic focus

Narrow product range–broad product range
Few market segments–many market segments
The number of therapeutic areas that the company is involved in with respect to marketing (e.g., cancer, antibiotics, cardiovascular)

Formalization

In my company, formal procedures are followed before making a decision
In my company, many paper forms are used
In my company, decision-making responsibilities within a job are described in detail
In my company, employees have detailed task descriptions

Centralization

My company has a flat organizational structure (R)
In my company, departments have a large degree of autonomy (R)
In my company, many decisions are taken low in the
Hierarchical structure of the organization (R)
The organization of my company is very centralized
Making decisions in my company is strongly bound to hierarchical lines
In my company, most decisions have to be approved by higher management