The effect of radical innovation in/congruence on new product performance

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A B S T R A C T
Radical innovation is critical for many firms and for society. This research focuses on the impact of radical innovation congruence — the degree to which management values regarding radical innovation match radical innovation norms in the business unit. We offer a model and empirically test it to assess the impact of radical innovation congruence on new product performance. We find that radical innovation norms are positively associated with new product performance, whereas we find no such association for management values and new product performance. Contrary to our expectations, we did not find a significant effect of radical innovation congruence on new product performance; however, we did find that radical innovation incongruence can have a positive effect on new product performance but only when radical innovation norms are higher than management values. Thus, we suggest that the unintended situation of radical innovation incongruence may result in some positive consequences after all. Further, high radical innovation norms, far more than management values, seem to be critical determinants of new product performance.

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1. Introduction

Although relatively rare, radical innovation is at the heart of wealth creation for many firms and for society (Höyssä & Hyysalo, 2009; Kirchhoff, 1991; Story, O’Malley, & Hart, 2011). As such, radical innovation is a priority for some—though not all—firms, with the hope that radical innovation leads them to success. Prior research has focused primarily on the impact of radical innovation outcomes on new product success and firm performance (e.g., Chandy & Tellis, 2000; Han, Kim, & Srivastava, 1998; Sorescu, Chandy, & Prabhu, 2003; Sorescu & Spanjol, 2008). The main goal of this paper is to explore the effect of an understudied construct—radical innovation congruence—on firms’ new product performance. Specifically, our unit of analysis is the business unit.

We define radical innovation congruence as the degree of correspondence between management values regarding radical innovation in the firm and radical innovation norms of the firm. Both management values regarding radical innovation and radical innovation norms are perceived constructs, and radical innovation congruence relates to whether these perceived constructs are aligned. In reality, congruence represents the views of managers and employees in a firm. We measure it in this research accordingly. We define management values regarding radical innovation as the vision top management endorses and the anticipation it sets regarding radical innovation in the firm. Finally, we define radical innovation norms as a set of behaviors concerning radical innovation that employees and low- or mid-level management expect. Note that whereas the management level develops values, all employee levels in the firm develop norms and expect behavior in accordance with those norms. Setting the radical innovation values that are appropriate for the firm and then effectively disseminating those values are critical tasks for managers. These values may translate into norms (McNally, Durmusoglu, Calantone, & Harmancioglu, 2009; Slotegraaf & Dickson, 2004). Setting and disseminating values become especially important in the case of radical innovation where resources are critical to the development process (Carmona-Lavado, Cuevas-Rodriguez, & Cabello-Medina, 2010; Sorescu et al., 2003).

The literature recognizes the importance of congruence between different functions of the firm and the effect such congruence has on innovation (e.g., Colbert, Kristof-Brown, Bradley, & Barrick, 2008; Prabhu, Chandy, & Ellis, 2005). Moreover, the literature recognizes that an imbalance between radical innovation-related cultural aspects, such as...
values and norms, may be frequent and that it is likely to have negative organizational consequences (Colbert et al., 2008; Green, Covin, & Slevin, 2008; Moorman & Rust, 1999). Indeed, some firms’ management may have a predominant mental model of focusing efforts on a small set of highly innovative new products (Höyssä & Hyysalo, 2009). Management values regarding radical innovation may be difficult to realize, particularly when firms do not have the resources or market power to both develop and launch such innovations (Baker & Sinkula, 2005; Chandy & Tellis, 2000). At the opposite end of the spectrum, other firms may have highly skilled marketing and R&D functions but a conservative management that is hesitant or unwilling to pursue radical innovation (Christensen & Bower, 1996; Tripps & Gavetti, 2000). In both of these scenarios, considerable incongruence is present between the values of top management and the norms in functions of the firm. Such incongruence is likely to have a meaningful effect on firm performance. Still, despite the importance of such in/congruence, this effect has not been systematically studied.

In this context, prior research has focused on outside-in drivers of innovation, such as market orientation, or inside-out drivers of innovation, such as effective learning (Day, 1994). Previous research demonstrates the positive relationship between the cultural aspects of radical innovation in the firm, such as values and norms, and innovation-related performance (e.g., Stock, 2005, 2009; Zacharias, 2013; see also Baker & Sinkula, 2005, 2007). The primary contribution of the current research is the examination of the effect of congruence between radical innovation values and norms, above and beyond the effect of other central cultural aspects, such as market orientation, on new product performance of the firm. High congruence between radical innovation values and radical innovation norms is often the result of a deliberate firm effort. Conversely, high incongruence between radical innovation values and radical innovation norms is often unintended and undesired. These consequences of congruence or incongruence are likely to affect firm innovation performance. Moreover, in many cases, employees and low or mid-level managers do not appropriately disseminate radical innovation values that top management endorses. This scenario is even more likely in cases where the organizational structure is complex or in cases where the firm has a number of subunits. Indeed, prior research found that information flow inside firms might be limited especially when multiple units are involved (e.g., Tsai, 2001).

The paper is organized as follows. We commence with a review of relevant literature on radical innovation and radical innovation congruence. We develop our set of hypotheses and then present the empirical work based on a study of 236 US-based companies. We conclude with the discussion of findings, their limitations, and avenues for future research.

2. Conceptual framework and hypothesized relationships

In this section, we present our conceptual framework and hypotheses. We first develop basic hypotheses regarding the impact of management’s radical innovation values and of radical innovation norms on new product performance. We then develop a set of hypotheses regarding the effect of in/congruence between radical innovation values and norms on new product performance.

Values and norms are both components of organizational culture (Berson, Oreg, & Dvir, 2008). As such, they can form the identity of either an entire organization or a business unit (De Brentani & Kleinschmidt, 2004). Despite the strong connection between them, values and norms are distinct, as we elaborate on later.

2.1. The importance of radical innovation

Prior research acknowledges that radically innovative firms have an advantage over less radically innovative firms. Radically innovative firms have greater value, stronger market power, and they are likely to be more profitable (Baker & Sinkula, 2007; Chandy & Tellis, 2000; Sorescu et al., 2003). In a meta-analysis, Henard and Szymanski (2001) also found radical innovation to be positively associated with new product success, and evidence suggests that high innovativeness enhances firm performance (e.g., Coad & Rao, 2008; Han et al., 1998; Hult, Hurley, & Knight, 2004). Empirical research has also found that firms with a specific focus on radical innovation can reap substantial benefits. For example, Kim and Mauborgne (1997) found that firms’ radical innovations are responsible for only 38% of their revenues yet are responsible for 61% of their profits. Also, firms committed to radical innovation are typically more highly valued in financial markets (Lee, Smith, Grimm, & Schomburg, 2000; Sorescu et al., 2003).

2.2. Management values regarding radical innovation

Radical innovation values consist of an innovativeness ideology that prioritizes some behaviors over others in order to promote innovation performance (Stock et al., 2013). Management values are behavioral patterns that the firm’s top management attempts to disseminate within the firm as desired (Berson et al., 2008; Schein, 1990). As such, values are intangible and tend to be abstract and represent aspects of the firm’s culture (Schein, 1990; Stock et al., 2013). Top management attempts to disseminate its values to employees as a way of molding their behavior and directing the firm according to management values (Enz, 1988). Accordingly, research suggests that management values have important implications for an innovation culture and overall performance (Berson et al., 2008). Prior research has found that values and managerial approaches are positively associated with firm performance (e.g., De Brentani & Kleinschmidt, 2004) and specifically with innovation-related performance. For example, Moorman (1995) suggests that management values are cultural antecedents of information processes, and as such, they affect innovation and new product performance. Deshpandé, Farley, and Webster (1993) find that management values are strongly associated with innovativeness. We expect this effect of management values in the context of innovation performance for the following reasons. First, management values affect the type of outcomes the firm seeks (Moorman, 1995). Management values that focus on radical innovation, for example, dictate firm objectives that reflect the desire to develop radical innovation, and objectives are strong determinants of performance (Thompson, Strickland, & Gamble, 2010). Second, management values determine the means to achieve objectives. Such means may include the structure of the organization, resource allocation, market orientation, execution of processes, and so forth (e.g., Deshpandé et al., 1993; Moorman, 1995), all of which contribute to innovation performance. Third, management values dictate data collection and information processing that are strongly linked to innovation performance (Moorman & Miner, 1997; Sinkula, Baker, & Noordewier, 1997). Fourth, management values affect the development of core capabilities that enable and facilitate new product performance (Leonard-Barton, 1992; Thompson et al., 2010). The above arguments and empirical findings in prior literature suggest the following:

H1. Management values regarding radical innovation in the firm are positively related to the firm’s new product performance.

2.3. Radical innovation norms

Values and norms are distinct organizational constructs. Whereas values reflect the desired, which influences the selection from available modes, means, and ends of action, norms reflect a higher degree of specificity and a higher relevance for actual behavior (Homburg & Pfleffer, 2000). One expects a causal relationship between values and norms, and a connection between those and innovation-related performance (e.g., Deshpandé & Webster, 1989; Stock et al., 2013). Indeed, norms are concrete expressions of the more ambiguous values and they stem from values (Katz & Kahn, 1978). This reasoning is also in line with the Theory of Planned Behavior, according to which basic values and
beliefs are correlated with norms (Ajzen & Fishbein, 1980). Prior research suggests that over time, employees and low- or mid-level managers adjust their personal orientation and actions according to the values of the organization and of management (Berson et al., 2008).

Norms incorporate specific action expectations in the organization – often based on prior behavior – and are more relevant to actual behaviors than values (Homburg & Pflesser, 2000; Stock et al., 2013). Specifically, in the context of radical innovation, prior research suggests that norms affect radical innovation-related outcomes for the following reasons. First, norms predict certain actions that affect innovation. For example, Cardinal (2001) finds that norms of R&D personnel critically affect their innovation outcomes. Similarly, Godoe (2000) finds that strong innovation norms drive radical innovation in the telecommunications sector, and Markard and Truffer (2006) find that norms affect radical innovation outcomes in large technical systems. Second, radical innovation norms dictate prioritizing radical innovation actions over less radical innovation actions. For example, in a recent study, Stock et al. (2013) find that innovation-oriented norms are positively associated with product program innovativeness. Third, norms reflect why things happen the way they do compared with what happens (Deshpandé et al., 1993). Accordingly, radical innovation norms motivate radical innovation actions. As such, they propel individuals to engage in actions designed to achieve the cultural objective, that is, the appropriate radical innovation performance. In accordance, Baker and Sinkula (2007) demonstrate a direct positive relationship between radical innovation norms and innovation performance. The above argumentation and evidence suggest the following:

H2. Radical innovation norms in the firm are positively related to the firm’s new product performance.

2.4. Radical innovation in/congruence and new product performance

Prior research on radical innovation has not directly addressed the role of radical innovation congruence. The de facto assumption has been that high levels of innovation-related performance are the result of management values regarding radical innovation that top management appropriately disseminated within the firm. These values, in turn, when translated into norms of behavior, led to high levels of performance (Homburg & Pflesser, 2000). This notion is supported by research on management teams, which emphasizes their role in determining the strategic goals of the firm in general and their impact on firm innovation-related performance in particular (e.g., Harmanciglu, Grinstein, & Goldman, 2010; Yadav, Prabhu, & Chandy, 2007).

Although the causal connection between values and norms exists in theory, it is not always the reality. The literature discusses possible incongruence between management values and their representation as norms in the firm (e.g., Enz, 1988). For example, a mismatch between management goals and the capabilities required to achieve those goals is common and is often assumed to have negative individual and organizational consequences (Colbert et al., 2008; Green et al., 2008). In the specific case of radical innovation congruence, although scholars may be well aware of the potential for incongruence between management’s radical innovation values and radical innovation norms, researchers have neither theoretically modeled nor empirically tested this discord. Fig. 1 illustrates the types of congruence and incongruence that may exist between radical innovation values and norms.

Following Mintzberg (1987), we refer to congruence scenarios as “deliberate.” Congruence in the lower right quadrant in Fig. 1 (high radical innovation values and high radical innovation norms) reflects a match between management vision to pursue radical innovation and radical innovation norms of the firm. This congruence is indicative of top-down firm-inclusive commitment to act on opportunities to develop radical innovations and pursue radical innovation-related activities. Apple and Sony are two companies that closely match this strategic approach (Edwards, Hall, & Grover, 2008). Congruence in the upper left quadrant (low radical innovation values and low radical innovation norms) reflects the reality that many firms execute product–market strategies that do not require strong commitments to radical innovation (Slater & Olson, 2001; Walker & Ruekert, 1987). This approach is quite frequent. Even in high-tech industries, where radical innovations are a critical driver of competitive advantage, radical innovations represent only approximately 6% of the total innovation output (Sorescu & Spanjol, 2008). Examples are companies that adopt low-cost or defender strategies, which reflect more careful, less risky approaches that are associated with a preference for incremental innovations but are often accompanied by the willingness to learn from a lead competitor’s mistakes and glean efficiencies that result in better product success (Slater, Olson, & Hult, 2006). Incremental innovation born out of a top-down incremental innovation value system complemented by a company-wide alignment with management values in terms of innovation norms makes sound strategic sense for conservative firms.

Compared with innovation stemming from congruence, innovation activities that are the result of incongruence are often expected to be less successful. For example, Moorman and Rust (1999) suggest that gaps often exist between management priorities and the behavior of the firm. In the context of innovation, two cases of radical innovation incongruence are possible. The first of these, “underachieved radical innovation” (lower left quadrant), occurs when radical innovation values exceed radical innovation norms in the firm. In this situation, management’s values and expectations regarding radical innovation exceed the norms established in the firm’s marketing functions (e.g., channel management) and/or in its R&D and manufacturing functions. An example is the Osborne Computer Corporation, which assumed a highly innovative position in the market by introducing the first portable computer. Adam Osborne, the founder of the company, rushed into declaring his expectations to market new portable computer models. However, the company’s capabilities supported neither the development nor the production and marketing of its founder’s ambitious vision (Hill, 2012).

The second case of incongruence, “pent-up radical innovation” (upper right quadrant), occurs when firms’ radical innovation norms exceed management’s radical innovation values. This situation exemplifies management’s relative reluctance to support radical innovation programs, even when the established norms in the firm enable higher-order innovation. It is likely to occur when management’s values reflect commitment to satisfying explicit wants of current customers (Christensen & Bower, 1996) and/or to rigidly adhere to core technologies that defined prior success (Sinkula, 1994). At Ford, for example, product designers exceeded management’s objectives by being the first to conceive of the minivan. Ford executives, however, balked at launching it (Sethi, Smith, & Park, 2001). Another example is Xerox’s
management. Whereas Xerox’s research center was responsible for developing radical innovations such as the computer mouse, laser printer, and the GUI (graphical user interface), Xerox’s management failed to assume the radical innovation values suited for the firm, and advocated marginal innovations, which were more in line with its existing paper-based cash-cow business (Smith & Alexander, 1988; Tellis & Golder, 2002).

We contend that radical innovation congruence has a significant effect on new product performance because it determines the extent to which firms effectively align values and behavioral norms concerning innovation. Such an alignment indicates top-down firm-inclusive commitment to develop innovations and pursue innovation-related opportunities. Importantly, new product performance is a combination of both radical and non-radical innovation. Previous research found that the cultural aspects of radical innovation affect both types of innovation and therefore are expected to affect new product performance, whether radical or not (e.g., Baker & Sinkula, 2005, 2007). Accordingly, we expect even medium levels of management values regarding radical innovation coupled and congruent with medium levels of radical innovation norms to outperform higher levels of values or higher levels of norms with no congruence. We discuss the issue of radical and non-radical new product performance in more detail in the Discussion section.

Either exceeding or falling short of management’s expectations can create problems in the planning, coordination, and execution of product-development programs (Day, 1991, 1994). Put another way, both cases of incongruence reflect a lack of top-down coordination of firm resources and capabilities. And both cases of congruence reflect sound top-down coordination of firm resources and capabilities (Barney, 1991). High radical innovation congruence is also likely to facilitate a supportive environment for employees and low- or mid-level managers (Berson et al., 2008), encouraging them to pursue radical innovation norms and take the expected innovative actions—radical or incremental. We thus hypothesize the following:

H3a. Radical innovation congruence is positively related to the firm’s new product performance.

H3b. Radical innovation incongruence is negatively related to the firm’s new product performance.

3. Methods

3.1. Sample and data collection

We collected data from a commercially acquired (Dun & Bradstreet) sample of marketing executives in the United States. Respondents held at least a vice-presidential level of responsibility in their business unit. We used vice presidents as informants because of their organizational knowledge and access to strategic and financial information. Past research has used similar key informants to represent the prevailing opinion of the organization (Gatignon & Xuereb, 1997; Moorman, 1995).

We took specific steps to increase external validity and accuracy of responses. First, we selected firms from the sample frame to provide a 50–50 split between large (at least $500 million in sales) and small organizations (greater than $100 million but less than $500 million). Second, about half of the sampled firms were upstream suppliers, whereas the other half included end-user product manufacturers or service firms. Finally, respondents were instructed to refer to activities of their business unit rather than to refer to activities at the firm level.

Over a period of 9 months, we sent a direct mail questionnaire to the sample of 2000 companies in three waves. Based on a sample of telephone follow-ups to verify the contact person in the firm and non-deliverable mail, we found that 19.5% of the questionnaires did not reach the intended party. The resultant pool of 236 completed questionnaires yielded an effective response rate of 14.7%. We found no evidence of non-response bias when we compared all the studied variables across early and late responders (all p-values exceeded .138; Armstrong & Overton, 1977). Given this result, the rank of the respondent, the length and difficulty of the questionnaire (particularly a series of scenario-based questions), and similar studies involving comparable response rates (e.g., Gatignon & Xuereb, 1997; Homburg & Pflesser, 2000), the sample seems adequate.

3.2. Measures

3.2.1. Management values regarding radical innovation, radical innovation norms, and their congruence

We used a scenario-based approach to establish the business unit’s primary innovation style: innovation that is primarily radical in nature, innovation that is incremental in nature, and innovation that is mostly driven by imitation of competitors. We adopted these scenarios from Baker and Sinkula (2005). We preferred the scenario-based approach because it forces respondents to explicitly trade-off the extent to which their business unit leans toward innovation styles. For a similar approach, see Deshpandé et al. (1993). Respondents read scenario descriptions of three non-mutually-exclusive innovation styles of incremental innovation, radical innovation, and competitor-led imitation processes (see Appendix). The questionnaire asked them to rate the extent to which each style is “endorsed by management” (reflecting management values regarding radical innovation) and is “the norm in my unit” (reflecting radical innovation norms). For each question, respondents allocated 100 points across the three innovation styles. We used the extent of radical innovation style as our measure of management values regarding radical innovation and of radical innovation norms, correspondingly.

Because of problems associated with the use of difference scores (Edwards, 1994; Edwards & Parry, 1993), rather than operationalizing radical innovation congruence as “management values regarding radical innovation” minus “radical innovation norms,” we operationalized it using a polynomial regression (Vidyarthi, Liden, Anand, Erdogan, & Ghosh, 2010), as we detail below.

3.2.2. New product performance

We adopted the measure of new product performance from Baker and Sinkula (1999), and queried the business unit’s new product introduction rate, if it was the first to market with new applications, the degree of product differentiation, and a subjective measure of new product success. The items utilized 7-point scales with anchors at “low” and “high.” We instructed respondents to answer the items respective to their business unit’s “principle served market segment over the past three years.” The coefficient alpha for the scale was .85.

3.2.3. Covariates

We included in the analysis a number of covariates deemed to be important determinants of radical new product performance. We took the measures from Kohli, Jaworski and Kohli (1993), Narver and Slater (1990), Jaworski and Kohli (1993), and Baker and Sinkula (1999). Most importantly, we control for market orientation—a culture-related key factor influencing innovation (Henard & Szymbanski, 2001). We used a subset of measures in the MARKOR scale to measure this construct (Kohli, Jaworski, & Kumar, 1993). Due to practical considerations, including the complexity of the scenario portion of the questionnaire, we did not administer the entire scale. The results of a prior study that employed the entire MARKOR scale were used to select six measures.5

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5 We chose two measures from each of MARKOR’s three components: “We are slow to detect changes in our customers’ product preferences” and “We frequently review the likely effect of changes in our business environment on customers’ represented information acquisition.” “When something important happens to a major customer or market, the whole business unit is informed about it within a short period” and “When one department finds out something important about competitors, it is slow to alert other departments” represented information dissemination. “For one reason or another, we tend to react slowly to changes in our customers’ product or service needs” and “Several departments get together periodically to plan a response to changes taking place in our business environment” represented information responsiveness.
4. Results

4.1. Measure validation assessment

We used structural equations modeling (SEM) to establish our measurement model (Arbuckle, 2006). The scales used in our study—new product performance and market orientation—were modeled as latent reflective constructs, and management values regarding radical innovation and radical innovation norms were modeled as observed variables. A CFA of the measurement model suggested an acceptable fit to the data ($\chi^2 = 103.2, df = 48, p < .05, CFI = .944, TLI = .908, NFI = .902, and RMSEA = .070$).

Per accepted practices for established scales (Matsuno & Mentzer, 2000), new product performance was conceptualized as a first-order construct from which new product introduction rate, first to market with new applications, the degree of product differentiation, and new product success emanate. The CFA revealed that all individual item loadings exceeded .65; all t-values exceeded 10.45 ($p < .001$).

Market orientation was conceptualized as a second-order factor from which information generation, information dissemination, and information responsiveness emanate. We summed the scales for information generation, information dissemination, and information responsiveness to create a single measure of each. The CFA further revealed that all individual item loadings exceeded .52; all t-values exceeded 6.18 ($p < .001$).

Table 1 reports the means, standard deviations, and correlations among the three key model constructs. Except for the expected relatively high correlation between management values regarding radical innovation and radical innovation norms ($r = .656$), all other interconstruct correlations do not exceed .319, and thus discriminant validity does not appear to be a concern. As additional support, however, we compared each potential pair of constructs to one another in a series of confirmatory factor models in which their correlations were constrained or not constrained to 1. In each comparison, the unconstrained model was a significantly better fit than the constrained model ($p < .01$), an indication of discriminant validity (Bagoski & Phillips, 1982).

4.2. Common method bias

To check for common method bias, we first conducted a Harman’s one-factor test (i.e., factor analysis without rotation). Results indicated that no single general factor existed (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Next, following Podsakoff et al.’s (2003) and Netemeyer, Boles, McKee, and McMurrian’s (1997) guidelines, we incorporated a “same-source” factor (i.e., single-common-method-factor) to the indicators of all constructs. For all cases, the hypothesized relationships were not influenced by the same-source factor, and retained their influence and direction. Moreover, the indicator loadings to the theoretical constructs remained significant. Finally, none of the indicator loadings on the same-source-factor were significant at the 5% level (two were marginally significant at the 10% level). We thus concluded that there were no grounds for concern regarding common method bias in our analysis.

4.3. Polynomial regression analysis

The general form of a polynomial regression equation is $Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + Covariates + e$, where $Z$ is a dependent variable (new product performance), $X$ is Predictor 1 (management values regarding radical innovation), and $Y$ is Predictor 2 (radical innovation norms). Thus, the outcome variable is regressed on each of two predictor variables ($X$ and $Y$), the interaction between the two predictor variables ($X Y$), the squared terms for each of the two predictors ($X^2$ and $Y^2$), and a set of covariates.

Rather than directly interpreting the results from the polynomial regression analysis, we use the coefficients from the analysis to examine what is called the “response surface pattern” (Edwards, 1994; Shanock, Baran, Gentry, Pattison, & Heggestad, 2010; see also graphical illustrations in those papers). The slope and curvature of two lines represent the response surface pattern (labeled a1, a2, a3, and a4; see Shanock et al., 2010). The “line of perfect agreement” depicts $X = Y$. When considered in relation to the outcome variable, the slope (a1) of the line of perfect agreement represents how agreement between two predictor variables relates to an outcome. That is, the slope of the line of perfect agreement shows the various levels of the outcome variable for firms whose levels of the two predictor variables are essentially the same across the continuum from low ratings on both predictors to high ratings on both predictors. The test for a curvature (a2) along the line of perfect agreement (as related to height of the outcome variable) examines whether the relationship between ratings that are in agreement and the outcome is linear or nonlinear. The line perpendicular to the line of perfect agreement is often called the “line of incongruence” ($X = − Y$, i.e., when the $X$ and $Y$ variables are not in agreement). Significant curvature (a4) along this line (as related to height of the outcome variable) captures how the degree of discrepancy between the two predictor variables affects the outcome variable. For example, significant negative curvature would mean that the outcome variable decreases as the levels of the two predictor variables diverge and move away from the line of perfect agreement. The slope along the line of incongruence (a3), as it relates to height in the outcome variable, indicates the extent to which the direction of the discrepancy matters, such that the

<table>
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<th>Variables</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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<td>na</td>
<td>na</td>
<td>.079</td>
<td>.040</td>
<td>.007</td>
<td>−.032</td>
<td>−.078</td>
<td>−.084</td>
<td>−.008</td>
<td>.037</td>
<td>.008</td>
<td></td>
</tr>
</tbody>
</table>

* $p < 0.05$.

** $p < 0.01$. 

The coefficient alpha for the three higher-order scales was .77. The items utilized 7-point scales with anchors at “low” and “high.” Additional controls include seller concentration, buyer power, market turbulence, and government control. We also used two other categorization variables as covariates: the size of the business unit (below or above $500$ million) and business type (manufacturer or other). All covariates, except the last categorical variables, utilized single-item 7-point scales with anchors at “low” and “high.”
outcome is potentially affected more when the discrepancy is in one direction (e.g., Y larger than X) or the other (X larger than Y).

To make sure polynomial regression is indeed relevant for our sample (i.e., it will be appropriate only if our sample contains enough discrepancies between values and norms of radical innovation), we examined the percentages of “in agreement” values and the percentages of discrepant values in either direction in our sample (Shanock et al., 2010). Table 2 summarizes the results. Based on our data, we can conclude that exploring the impact of incongruence between radical innovation values and norms through polynomial regression makes practical sense, as the number of discrepancies is substantial.

4.4. Tests of hypotheses

Tables 3 and 4 report the results of the polynomial regression analysis and the surface patterns. Table 3 reports the main effect of management values regarding radical innovation and radical innovation norms on new product performance (H1 and H2). Table 4 reports the effect of congruence/incongruence (H3a,b). We square-root transformed our two predictors (management values regarding radical innovation and radical innovation norms) before conducting the polynomial regression analysis, because these two predictors are essentially proportions (Sih & Watters, 2005).

We first test H1 and H2, which predicted a positive impact of the two cultural radical innovation aspects – management values regarding radical innovation and radical innovation norms – on new product performance. The results suggest that whereas management values regarding radical innovation are not significantly related to new product performance ($\beta = -0.203$, p > .1), radical innovation norms are positively and significantly associated with new product performance ($\beta = 1.762$, p < .05). These results support H2 but not H1.

We next test the effect of congruence between management values regarding radical innovation and radical innovation norms on new product performance. We perform this test not by directly interpreting the results from the polynomial regression analysis, but by using the coefficients, their standard errors, and the covariances from the analysis to examine the response surface patterns (Shanock et al., 2010; see Table 4).

First, our results suggest an unexpected insignificant relationship along the line of perfect agreement with respect to new product performance, because neither $a_1$ nor $a_2$ are significant. This result suggests that when management values regarding radical innovation and radical innovation norms are completely congruent, the effect on new product performance is insignificant.

Second, we interpret how the degree of incongruence between values and norms affects new product performance by assessing the curvature along the line of incongruence ($X = Y$) as exhibited with $a_4$. We find a significant negative $a_4$ (curvature = $-5.373$, p < .05) that indicates a concave surface. That is, as incongruence increases, new product performance decreases non-linearly: lower levels of incongruence negatively affect product performance in a moderate manner, but high levels of incongruence have a considerable negative effect on new product performance. The polynomial regression analysis enables testing congruence and incongruence as separate aspects, and our results suggest that whereas congruence does not significantly affect new product performance, incongruence does.

Third, still, $a_3$ exhibits a significant negative slope (slope = $-1.965$, p < .05), indicating that some levels of incongruence may be beneficial for the firm (Kristof-Brown & Stevens, 2001). Specifically, new product performance increases when the incongruence is such that radical innovation norms are higher than management values regarding radical innovation, and not the other way around.

Thus, our results suggest that the high levels of new product performance in some firms may be the result of the lack of incongruence rather than the presence of congruence, and more so the presence of radical innovation norms. We further consider this point in the Discussion section.

5. Discussion

This section presents the key findings of this research and discusses the importance of radical innovation norms, the role of management values, and limitations and future research opportunities.

5.1. Key findings

This paper highlights the role of radical innovation in/congruence—an important aspect of radical innovation that studies have thus far largely overlooked. The key findings of this research are as follows:

- Within the business unit, radical innovation norms are positively associated with new product performance, whereas we found no similar association between management values regarding radical innovation and new product performance.
- Radical innovation congruence is not per se significantly associated with new product performance.
- Radical innovation incongruence is beneficial for new product performance only in cases where radical innovation norms are higher than management radical innovation values.

An important finding of this research is that radical innovation congruence and incongruence are not necessarily opposites. Surprisingly, we find that radical innovation congruence does not significantly affect new product performance. However, radical innovation incongruence may have a positive effect on new product performance, depending on circumstances. This finding is surprising because the literature notes cultural problems that may be associated with incongruence between firm functions (e.g., Enz, 1988; Moorman & Rust, 1999).

Table 2

<table>
<thead>
<tr>
<th>Agreement groups</th>
<th>Percentage</th>
<th>Mean management radical innovation values</th>
<th>Mean radical innovation norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values higher than norms</td>
<td>37.9</td>
<td>50.46</td>
<td>25.78</td>
</tr>
<tr>
<td>In agreement</td>
<td>43.8</td>
<td>29.88</td>
<td>29.88</td>
</tr>
<tr>
<td>Norms higher than values</td>
<td>18.3</td>
<td>22.78</td>
<td>45.93</td>
</tr>
</tbody>
</table>

Note: N = 219 (missing = 17).

Table 3

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>New product performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management values regarding radical innovation</td>
<td>$-0.203$ **</td>
</tr>
<tr>
<td>Radical innovation norms</td>
<td>$1.762$ **</td>
</tr>
<tr>
<td>Management values regarding radical innovation</td>
<td>$-0.654$</td>
</tr>
<tr>
<td>Management values regarding radical innovation X radical innovation norms</td>
<td>$2.565$ **</td>
</tr>
<tr>
<td>Radical innovation norms</td>
<td>$-2.154$ **</td>
</tr>
</tbody>
</table>

Covariates

| Market orientation | $0.220$ ** |
| Buyer power | $0.090$ |
| Market turbulence | $0.093$ |
| Government control | $-0.156$ * |
| Firm size | $-0.118$ |
| Firm industry | $0.136$ |

$R^2 = .329$; N = 236.

** $p < .05.$
* $p < .10.$

contribution of the current study is therefore twofold: (a) we discuss and empirically test the impact of radical innovation congruence on new product performance, and (b) we suggest that the unintended situation of radical innovation incongruence may result in some positive consequences after all, provided that radical innovation norms exceed management values regarding radical innovation.

5.2. Pent-up radical innovation

Prior research suggests that successful firms may ironically shift into radical innovation incongruence because management becomes rigid and overly cautious regarding innovation, whereas the capabilities are unchanged and R&D employees continue to produce innovation (e.g., Christensen & Bower, 1996). Our research suggests that pent-up radical innovation may have its advantages. Although we do not test it directly, we can suggest that two scenarios or a combination of both are possible: (1) pent-up radical innovation comes into realization despite management reservations, and fosters new product performance once management buys into the benefit of the innovation, or (2) because radical innovation is pent-up, non-radical innovation materializes and drives new product performance.

As we mentioned earlier, new product performance is a combination of both radical and incremental new products. Our findings provide additional support to previous research suggesting the radical innovation-related actions—not the incremental ones—foster both kinds of new product performance. For example, Baker and Sinkula (2007) demonstrate a positive correlation between radical innovation in the firm and new product program success, and no correlation between incremental innovation in the firm and new product program success. They too refer to new product programs that are both radical and non-radical. Baker and Sinkula (2005) found a similar effect. The absence of a direct effect between incremental innovation and performance in these studies does not suggest that incremental innovations are not important. Incremental innovations may not improve performance, but they certainly may maintain performance by keeping product portfolios up to date and in line with competitor actions.

5.3. The importance of radical innovation norms

The findings of this research emphasize the importance of radical innovation norms because such norms affect new product performance not only directly, but also indirectly, as is the case where greater norms co-exist with lower levels of radical innovation values of management. It seems fair to suggest that far more than management values, high radical innovation norms are critical determinants of new product performance. That is, if management can cultivate either low or high radical innovation norms, high norms appear to be superior for new product performance. If management's radical innovation values are low, the incongruence may reflect management rigidity, but it may also simply reflect an understanding that the market does not accept all radical innovations. Such innovations are high risk and high reward, and management may wish to maintain a pipeline of incremental innovations that keep firms competitive while at the same time striving to be first or early to market with game-changing radical innovations that the market will accept. By placing too much emphasis on radical innovation, management may create an innovation culture that puts too much emphasis on breakthrough innovation and too little on keeping pace with evolving customer needs and competitor actions.

Note that our results may indicate a mediation process, such that management's radical innovation values are meaningful to new product performance only through radical innovation norms. Indeed, our findings show that management’s radical innovation values per se have no significant impact on new product performance, that radical innovation norms have a positive impact on this dependent variable, and finally, that values and norms are highly correlated.

The results of this research underscore the need for firms not only to carefully construct and cultivate appropriate radical innovation norms and to pursue the resources and capabilities needed to materialize these norms, but also to balance these norms with the understanding of the important role of both incremental and radical innovation. This message is important to send not only to top management teams but also to low- or mid-level management, who are typically closer to the location of the materialization of such norms, especially in firms with multiple business units. Suitable actions will enable firms to derive further benefits from their own innovation.

5.4. Why management values don’t translate into norms

What is the role of management values regarding radical innovation? The literature suggests a positive effect of radical innovation values on new product performance, but we do not find such an effect. Moreover, coupled with low levels of radical innovation norms, high levels of radical innovation values of management have no significant effect on new product performance. This result may reflect norms as mediating the effect of values. However, other explanations are possible for why values and norms do not correspond more closely. Management needs to ensure a significant radical innovation effort but must also prudently manage an incremental–radical innovation balance. Another reason for the null effect of management values is the conceptual distance between the executive suite and the unit where things are actually happening. For example, in many firms, departments operate within the policy advocated by firm structure and top management policy (e.g., Bunderson & Sutcliffe, 2003). However, in firms where departments and functions are autonomous, low- or mid-level management can foster norms slightly different than the ones top management expects. In other firms, communications between top management and departments or functions may be amiss. In such cases, the department may not follow firm policy—not because of its autonomy but because of poor communication with top management. Here, top management values will also matter less. Another possible explanation related to poor communication is that the individuals who often disseminate radical innovation values in the firm are marketing executives. Unfortunately, a growing number of studies point to the decrease in the influence of the marketing department in many firms (e.g., Nath & Mahajan, 2008; Verhoef & Leeflang, 2009; Webster, Malter, & Ganesan, 2005). Here, the result may be that the radical innovation values of management no longer affect the firm’s actions. The characteristics of top management teams may also matter: management teams with better skills do not always positively affect firm performance (e.g., Bunderson & Sutcliffe, 2003). Research has also established that
business units’ innovation-related performance depends on the business unit’s position in the firm’s network and the extent to which intra-firm networks are functioning (Tsai, 2001).

5.5. Limitations and future research opportunities

A key issue for future research is to verify and explain why management value–firm-norm congruence regarding radical innovation—does not positively relate to new product performance and, more specifically, why the scenario in which norms exceed values is positively related to success. We offer potential explanations above, and future research can test our explanations.

Certain constraints may limit the conclusions of this study. We sampled relatively large, primarily well-established firms. An examination of radical innovation congruence in smaller firms where communication—and thus top-down processes and dissemination—may be quite different might be interesting. Future research can also focus on specific industries, for example, dynamic industries versus those that are not. The cross-sectional nature of our data limits our ability to explore organizational change. Future research on radical innovation congruence might take a longitudinal approach. In addition, firm capabilities other than those included in our model may affect new product performance. Future efforts, particularly those that take a prescriptive approach, should strive to include other possible antecedents of new product performance in their models. We use single informants. One may argue that single informants might have limited perceptions of both management values and actual norms. Our informants were at least vice presidents that are likely to possess deep organizational knowledge and access to both executive information and actual practices.

One could argue that the measurement of congruence should be direct; that is, instead of addressing the agreement between the measurements of values and norms, one should directly measure the congruence between values and norms. However, because of the nature of the present study, measuring congruence directly would be subject to bias, because respondents report how much they (and their colleagues) implement the values of their management. Moreover, prior research suggests that comparing two constructs indirectly enables an evaluation of the congruence between these constructs (e.g., Enz, 1988). Finally, this study is a first attempt to operationalize the innovation-process constructs of management’s radical innovation values, radical innovation norms, and radical innovation congruence. Future research efforts may use different measures and further explore the nature of the findings. Especially valuable may be the use of a multi-item approach to the study of radical innovation values and norms.

5.6. Conclusion

The purpose of this research was to study the impact of the congruence of management values and firm norms regarding radical innovation on new product performance. We expected a positive relationship between congruence and new product performance. However, no such relationship emerged. Firm norms regarding radical innovation were positively related to new product performance, but management values regarding radical innovation and the congruence of management values and firm norms regarding radical innovation had no impact. Instead, a certain type of incongruence, in which radical innovation norms exceeded management values toward radical innovation, was positively related to new product performance. This finding qualifies prior expectations and raises questions regarding how top management can best balance firms’ innovation programs.

Acknowledgment

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Appendix A. Innovation scenarios

Below are three types of innovation processes that a firm may employ. Please evaluate the extent to which each process is practiced in your business unit.

Innovation style 1: competitor led imitation

The firm prefers to follow the lead of its direct competitors by copying or closely approximating the innovations that they make. As examples, (1) a firm seeks to copy or closely approximate the most successful sport utility styles developed by their competitors, or (2) a firm selects spokespersons that have successfully endorsed other products.

Innovation style 2: incremental innovation

The firm doesn’t prefer to simply follow the lead of its competitors; however it does prefer to innovate within well-established paradigms. As examples, (2) a firm is constantly searching for unique ways to improve its sport utility vehicle, but does not want to stray far from the prototypical sport utility design utilized by most manufacturers, or (2) a firm is willing to use spokespersons that have not been used by other advertisers, but does not want to depart from well-accepted methods to evaluate spokesperson potential.

Innovation style 3: radical innovation

The firm doesn’t prefer to follow the lead of its competitors. It strives to innovate by developing new paradigms to satisfy customer needs. As examples, (1) a firm is not only willing to introduce a radically new design to the sport utility vehicle category; it searches for ways to create a totally unique category that has the potential to replace the SUV market like the minivan replaced the station wagon, or (2) a firm is willing to risk spokespersons that do not conform to the accepted norms for judging spokesperson potential, or completely scrap the plan to use a spokesperson to build brand credibility.

References


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