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Theoretical lenses and domain definitions in innovation research

Theoretical
lenses

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Abstract

Purpose – This study aims to scrutinize the meaning and domain of “innovation” by providing an extensive theory-driven review of the new product literature in marketing, management and engineering. The overall objective is to classify the recent literature on innovation and to illustrate theoretically derived discourses in the study of innovation.

Design/methodology/approach – The paper organizes this literature by providing typologies of discourses, which define innovation. Based on our review of 238 articles from a comprehensive set of journals publishing innovation research, we propose a theoretical divide in the innovation literature.

Findings – Theoretical underpinnings, namely adoption/diffusion theory versus the resource-based/contingency theory view, form one dimension of the typology. Jointly considered with the other two dimensions – level of analysis and customer vs firm perspective – a framework is formed of the different discourses and conceptualisations in the innovation literature.

Originality/value – Past researchers have always proposed a definition of innovation that was embedded in a typology of innovation types; in contrast, the paper allows the theoretical discourses to unveil meanings of innovation and associated constructs (and hence it starts with theory specification, not construct definition). It argues for starting with theory as the basic division and proposes a theory driven typology. Through its theoretical genesis, the paper wishes to create a shared understanding among academics and practitioners of what constitutes innovation and constructs within the related theoretical net.

Keywords Product development, Innovation

Paper type Research paper

Introduction

The terms “radical, incremental, really-new, imitative, discontinuous, architectural, modular, improving, and evolutionary” innovations have been used to define innovation (Garcia and Calantone, 2002). These conceptualizations lack clear distinction in the literature however; the underlying reasons lie in the different discourses employing various levels of analysis and in the adopting of diverse perspectives (Danneels and Kleinschmidt, 2001; De Brentani, 2001). Distinct theoretical foundations have led to ambiguities in causal relationships. Innovation or innovativeness has been modelled as independent variable, dependent variable or moderator (Danneels and Kleinschmidt, 2001; Kleinschmidt and Cooper, 1991). The diverse labels, categorizations and causal roles have resulted in significant discrepancies in empirical results and difficulty in their interpretation (Garcia and Calantone, 2002; Kotabe and Swan, 1995).



Accordingly, our overall objective is to classify the recent literature on innovation and to illustrate theoretically derived discourses in the study of innovation. These discourses unveil what innovation *is* because the meaning of a construct is closely associated with its theoretical umbrella. Past approaches to conceptualizing innovation relied on typologies that assumed that construct specification comes first: i.e. the definition of innovation was embedded in an innovation typology. We have no quarrel with this way of grasping the meaning of innovation, and indeed organizing and understanding the literature according to a definitional typology such as Booz-Allen and Hamilton (1982) or Garcia and Calantone (2002) can offer useful insights. We took a different approach however.

We have collected and examined a database of 238 articles from a comprehensive set of journals publishing innovation research[1]. While past research has used innovation typologies in order to define innovation by delineating innovation types, our approach focuses on typologies of discourses of innovation. Such discourses reveal the meaning of the innovation construct but also the umbrella theoretical net of associated constructs. In general, typologies are qualitative classifications that depict how different types of a phenomenon are located on a list of specified dimensions; they describe diverse types and point to similarities and differences (Bailey, 1994). Based on our review, we then proposed a theoretical divide in the innovation literature: the diffusion/ adoption theoretical foundation (78 articles identified) versus the resource-based/contingency theory foundation (160 articles). Starting with this categorization based on theoretical genesis, we further classified each reviewed article as:

- focusing on a single new product/project versus focusing on a program, firm or SBU (and hence multiple products/projects); or as
- taking the customer's perspective versus the firm's perspective versus both firm and customer perspectives.

This results in ten discourses, each of which unveils a meaning of innovation, a domain, and a net of associated constructs.

The paper is organized as follows: we commence with a description of the method used to select the articles to include in our analysis. We proceed with a brief review of prevailing classifications of innovation types. We then present the typologies used to classify and analyze the innovation research. We elaborate on each of the discourses of the innovation literature by describing the research themes, conceptualizations and classification of the phenomenon presented in each discourse. We end with recommendations for future research.

The reviewed literature

Innovation has been associated with the terms radical, incremental, really new, imitative, discontinuous, architectural, modular, evolutionary, administrative, technical, innovativeness, advantage and newness. Thus, we performed a search, using the business database ProQuest (ABI Inform database), for articles published in scholarly and peer reviewed journals from 1989 to 2007 containing these keywords. Referring to journal ranking studies by Hult *et al.* (1997) and Linton and Thongpapanl (2004), we focused only on published refereed papers, including articles published in *Journal of Marketing*, *Journal of Marketing Research*, *European Journal of Marketing*, *Journal of the Academy of Marketing Science*, *Journal of Consumer Research*, *Journal of*

Consumer Marketing, Journal of Consumer Psychology, Advances in Consumer Research, Journal of Product Innovation Management, Creativity and Innovation Management, Journal of Management, Organization Science, Management Science, Academy of Management Journal, Administrative Science Quarterly, MIS Quarterly, Journal of Business Research, Strategic Management Journal, Journal of Marketing Management, Journal of Business and Industrial Marketing, Industrial Marketing Management, and IEEE Transactions on Engineering Management.

In order to conduct a more complete search, literature reviews were gathered and read for additional references. Therefore some articles published prior to our data range (back to the 1970s) were included because they were referenced in another article. Studies that were eliminated from consideration viewed innovation as culture. For instance, articles in the consumer behaviour literature that were based on cognitive processing without a focus on adoption behaviour were not included. In total, 238 articles were included. The reviewed articles are starred in the Reference list.

Typologies: based on construct definition or theory?

A review of innovation typologies

In the extant literature, conceptualisations or typologies of the innovation construct have focused primarily on newness to the market versus newness to the firm (i.e. newness of the technology) (Chandy and Tellis, 1998, 2000). Johnson and Jones (1957), in their seminal HBR article, are the first to mention the market and technology dimensions of “newness”. They state that a product is created by “the matching of a technology and a market, and therefore has two principal dimensions” (p. 52). It was then widely accepted that both the technological and the market perspectives are relevant when examining NPD strategies, processes, activities, and performance in studies of new product success factors. Furthermore, Johnson and Jones’s (1957) classification of new products (Figure 1) was one of the first taxonomies to combine newness to the market and newness to the firm and to reflect the dynamic interaction between the firm and the marketplace. However, it was the later Booz-Allen and Hamilton’s (1982) taxonomy that was widely adopted in the innovation literature. Six levels of product innovations are proposed, ranging from cost reductions (i.e. new products providing similar performance at lower cost) to new-to-the-world products that create an entirely new market. Some researchers building upon this classification reduced the matrix to three or four types (Bonner *et al.*, 2002; Kleinschmidt and Cooper, 1991; Olson *et al.*, 1995; Sethi, 2000).

Other examples of such (market) X (technology) typologies are in Figure 1. Chandy and Tellis’s (1998) typology is one of the most prevalent. “Newness of technology” is defined as the extent to which the technology is different from prior technologies; “customer need fulfilment” refers to the extent to which the new product fulfils key customer needs better than existing products. Similarly, Veryzer (1998) provides a four-fold typology based on technological capability (the degree to which the product involves expanding firm capabilities beyond the existing ones) and product capability (benefits of the product as perceived and experienced by the customer or user). Lynn and Akgun’s (2001) is based on market uncertainty versus technology uncertainty. Finally, Garcia and Calantone (2002) (see Figure 1) used market versus technology as well as a macro-level versus micro-level dimension. The latter clarifies the term “newness” by specifying to whom and from whose perspective. “Macro-level” includes

Johnson and Jones (1957)

		TECHNOLOGY UNCERTAINTY		
		NO TECHNOLOGICAL CHANGE	IMPROVED TECHNOLOGY	NEW TECHNOLOGY
INCREASING MARKET NEWNESS	NO MARKET CHANGE		REFORMULATION	REPLACEMENT
	STRENGTHENED MARKET	REMERCHANDISING	IMPROVED PRODUCT	PRODUCT LINE EXTENSION
	NEW MARKET	NEW USE	MARKET EXTENSION	DIVERSIFICATION

Garcia and Calantone (2002)

	MICRO LEVEL	MACRO LEVEL (COMPLETE ON MICRO LEVEL)	BOTH
MARKET	INCREMENTAL	REALLY NEW	REALLY NEW
TECHNOLOGY	INCREMENTAL	REALLY NEW	REALLY NEW
BOTH	INCREMENTAL	RADICAL	

Chandy and Tellis (1998, 2000)

		NEWNESS OF TECHNOLOGY	
		LOW	HIGH
CUSTOMER NEED FULFILLMENT	LOW	INCREMENTAL	TECHNOLOGICAL BREAKTHROUGH
	HIGH	MARKET BREAKTHROUGH	RADICAL

Veryzer Jr. (1998)

		TECHNOLOGICAL CAPABILITY	
		SAME	ENHANCED
PRODUCT CAPABILITY	SAME	CONTINUOUS	TECHNOLOGICALLY CONTINUOUS
	ADVANCED	COMMERCIALY CONTINUOUS	TECHNOLOGICALLY AND COMMERCIALY CONTINUOUS

Lynn and Akgun (2001)

		TECHNOLOGY UNCERTAINTY	
		LOW	HIGH
MARKET UNCERTAINTY	LOW	INCREMENTAL	EVOLUTIONARY TECHNOLOGICAL INNOVATION
	HIGH	EVOLUTIONARY MARKET INNOVATION	RADICAL

Figure 1.
Innovation typologies based on market and technology

the world, industry and market, which are all exogenous to the firm, whereas “micro-level” is within the firm. This results in one radical, four levels of “really new” and three levels of incremental innovation. For example, radical innovations embody a new technology that results in a new market infrastructure.

There are also innovation typologies that are not based directly on products or on (market) X (technology) dimensions. These typologies frequently take a distinct perspective and may be broader or narrower in scope, as the following three examples illustrate. First, in his meta-analysis on organizational innovation, Damanpour (1991) broadly delineated technological innovations pertaining to products, services and production process technology versus administrative innovations involving organizational structure, administrative processes and human resources. Second, taking the somewhat narrower perspective of product platform architecture, Henderson and Clark (1990) provided two dimensions: the change in core concepts versus their linkages with components. Radical innovations establish a new dominant design (a new set of core design concepts), whereas incremental innovations refine and extend an established design. With a similar logic, Tidd (1995) identified four models of technological innovation: incremental, architectural, fusion and breakthrough. Third, taking the perspective of uncertainty for the firm in implementing a project, Tatikonda (1999) defined platform projects as highly uncertain, whereas derivative projects are more certain. Uncertainty arises from task unfamiliarity, goal difficulty, and greater interaction among organizational and technological elements. Clearly, these perspectives and hence the typologies proposed differ fundamentally.

The purpose of typologies

Typologies such as those discussed previously serve as groundwork for both theory and empirical research, and transform the complexity of diverse cases into organized sets of a few homogeneous types based on important dimensions (Bailey, 1994). All of these innovation typologies attempt to provide structure to the body of innovation research by specifying the meaning of the innovation construct and its domain(s). In general, constructs should first make sense (i.e. have face validity) and second be clearly defined so that both intended meaning and the operationalization implications are clear (Varadarajan, 1996). MacKenzie (2003) notes that poorly defined or conceptualized constructs cause multiple problems such as reliability, validity, fitting data to a causal model, and drawing substantive conclusions in the face of confounding. This undermines both the credibility of hypotheses and hypothesis testing. In the case of innovation research, theoretical and practical implications of the results, as well as the conduct of the research itself, may depend on the specific type of innovation under consideration. Note that the very purpose of proposing (market) X (technology) dimensions or of distinguishing technological versus administrative innovations is to highlight the implications of the definitional typology (usually the practical implications).

There is widespread agreement that constructs and theory are interrelated, but disagreement over what, if anything, comes first. However, all the typologies previously reviewed assume that construct specification comes first and hence the literature should be organized and understood according to the divisions of the construct. MacKenzie (2003) and Summers (2001) argue that developing theory is impossible without well-developed constructs because constructs are the building

blocks of theory. Yet Varadarajan (1996, p. 4) states that “the study of specific constructs in a particular context must be grounded in theoretical reasons . . .”, which implies that theory must come first. Theory can emerge from qualitative research (Summers, 2001); borrowing theory is another common avenue (Varadarajan, 1996). If theory does not engender the construct, the researcher should present a logical explanation for why that construct might help explain the research question (Varadarajan, 1996). Finally, according to Hunt (1991), theory, constructs and empirical sophistication should evolve together: he likens theory to a “net” that allows work with new ideas, but ensures sound philosophical logic. In summary: Researchers have always started with a definition embedded in an innovation typology; in contrast, we take the approach of theoretical discourses (and start with theory).

Proposing a theory driven typology

Based on our extensive review of the literature, we have observed two distinct theoretical streams: many researchers have grounded their studies either in adoption/diffusion tradition or in the resource-based view of the firm (possibly with contingency theory aspects). The former investigates the diffusion of innovations across nations, industries, organizations, or individuals whereas the latter focuses on the influence of resources, organizational structures, processes and people on the development and marketing of new products (Li and Atuahene-Gima, 2001). This theory driven distinction is not obvious from any of the typologies defining innovation that were discussed earlier. The conceptualizations of the innovation construct in these two theoretical views do not necessarily correspond; measurements within each view signal further diverse discourses. Thus instead of beginning with market versus technology driven innovation (for example) as the basic distinction in a construct specification approach, we begin with a division based on theory stream (i.e. theoretical genesis).

We first differentiate innovation as viewed from the diffusion/adoption tradition and innovation as viewed from the resource-based view: these are indicated by “D” and “R” respectively in the references for every article reviewed. We then built two typologies of the innovation research employing “D” versus “R” as one dimension, while the other dimension is:

- (1) Level of analysis in the first typology (i.e. project/product level vs organization/SBU/program level, indicated by “P” and “O” respectively in the references).
- (2) Perspective in the second typology (i.e. customers’ versus firm’s perspective, indicated by “C” and “F” respectively in the references, or by “B” meaning “both”).

Thus, in the references after the full reference is given, every article reviewed has a three part descriptor code attached in parentheses saying (D or R), (P or O), and (C or F or B). Table I shows the number of articles reviewed per category for each of the three dimensions examined. We begin our discussion with an overview of the dimensions themselves and the discourses that emerge when “innovation” is viewed through these lenses.

Theoretical foundation	Number of studies (total = 238)	Level of analysis	Number of studies (total = 238)	Perspective	Number of studies (total = 238)
Diffusion/ adoption theory	78 = 32.8%	Organization/SBU/program	124 = 52.1%	Customer perspective	36 = 15.1%
Resource-based view	160 = 67.2%	New product/project	114 = 47.9%	Firm perspective	137 = 57.6%
				Both	65 = 27.3%

Note: In the references, every article reviewed has a three part descriptor attached in parentheses saying D or R, P or O, and C, F or B: (1) diffusion/adoption versus resource-based view are indicated by “D” and “R” respectively; (2) project/product level versus organization/SBU/program level are indicated by “P” and “O” respectively; (3) customers’ versus firm’s perspective is indicated by “C” and “F” respectively or by “B” meaning both

Theoretical
lenses

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Table I.
Counts for theoretical
foundation, level of
analysis, and perspective

Overview of the dimensions*Dimension: theoretical foundations*

The adoption/diffusion theory and resource-based theory of the firm are the two dominant streams existing in the innovation literature (Brown and Eisenhardt, 1997; Danneels and Kleinschmidt, 2001); we reviewed 78 and 160 articles respectively (32.8 and 67.2 percent). The most prevalent frameworks employed in the adoption/diffusion stream and borrowed from other fields to study individual adoption and usage behaviour include the theory of reasoned action (Azjen and Fishbein, 1975) and the technology acceptance model (Davis *et al.*, 1989). In the theory of reasoned action framework, behavioural intention is the key dependent variable (usually, intention to adopt the innovative product): it is determined by attitude (perhaps the entire attitudinal belief structure) and subjective norm (normative belief structure). This framework suggests that the proximal cause of behaviour is intention to engage in this behaviour (Azjen and Fishbein, 1975; Boone *et al.*, 2001; Kim and Chhajer, 2001; Olshavsky and Spreng, 1996; Pae and Hyun, 2002; Plouffe *et al.*, 2001; Rogers, 1976; Sahay and Riley, 2003; Ziamou, 2002). The basic assumption of the technology acceptance model, on the other hand, is that two beliefs in particular – perceived usefulness and perceived ease of use – influence technology adoption through attitudes and intentions. According to Davis *et al.* (1989), other external variables (such as social net, system/product, or individual variables) can also influence use; however, no study scrutinizes these variables collectively to determine which type of external factor has the most influence on acceptance, and how it influences acceptance.

The resource-based view (RBV), our second stream, can be considered a paradigm backed by a vast amount of research from scholars from diverse areas (Grant, 1991; Peteraf, 1993). The *Journal of Management* devoted entire issues to RBV in 1991 and 2001, for example. According to the RBV, firms gain competitive advantage if their resources and internal capabilities are matched appropriately to environmental opportunities (Day, 1994). The basic assumption of the RBV is that resources and capabilities are heterogeneous across firms, and the firms that have superior resources (i.e. rare, non-imitable and non-substitutable) gain sustainable competitive advantages (Peteraf, 1993). Firms utilize their capabilities to cultivate these rent-generating resources and match them to external conditions to generate supra-normal profits. Correspondingly, innovation researchers who draw upon RBV have advocated creating a superior, unique and novel product to enjoy competitive advantage in the market and hence commercial success (Atuahene-Gima and Ko, 2001; Friar, 1995; Gatignon and Xuereb, 1997).

Dimension: level of analysis

The innovation literature consists of studies at two distinct levels of analysis, namely, project/product level (114 or 47.9 percent reviewed articles fall in this class) versus firm/SBU/program level (124 articles = 52.1 percent). The importance of this dimension lies in its ability to differentiate studies that focus on project success versus program/firm success (Johns and Snelson, 1988). In general, researchers employing the project/product level of analysis have attempted to examine all the activities needed to design, produce and deliver a new product to the market and all product/project characteristics that determine the success of these activities. The independent variables studied at this level include:

- product characteristics, that is, product superiority, complexity, advantage, newness, degree of customization; and
- project characteristics, such as the way firms organize new product development (NPD) projects, the formality of the NPD process, the extent of actual use of the innovation, NPD management and application of NPD tools (Bonner *et al.*, 2002; Kessler and Chakrabarti, 1999; Sethi *et al.*, 2001; Song and Montoya-Weiss, 1998; Spivey *et al.*, 1997; Srinivasan *et al.*, 2002).

On the other hand, the program, firm or SBU approach encompasses more than one product or project. Researchers have analyzed product innovation as, for example, a dimension of the entrepreneurial strategic posture of firms (Brown and Eisenhardt, 1997; Calantone *et al.*, 1994; Damanpour, 1991; Hultink *et al.*, 1997; Ozsomer *et al.*, 1997). Overall, researchers have investigated the effect of firm or R&D strategies, orientations, firm or program resources, capabilities, size, and innovation environment on innovation or program/firm performance (possibly with the interaction or moderation of innovativeness and/or market environment).

Dimension: customer versus firm perspective

The “perspective” dimension emphasizes to whom innovation has relevance and from whose perspective innovation is identified. It comprises two major discourses that appear distinct (Garcia and Calantone, 2002), but 65 articles reviewed (= 27.3 percent) took both perspectives. First, the customer perspective (36 articles reviewed = 15.1 percent) is evident in studies of customer usage patterns (for example, Danneels and Kleinschmidt, 2001; Gatignon and Xuereb, 1997). It seeks to differentiate types of innovation by how drastically the product was changed from the point of view of the customer: either evolutionary versus revolutionary innovation (Lynn and Akgun, 2001) or radical versus incremental (Ettlie *et al.*, 1984). Overall, a customer perspective focuses on the degree to which new products are perceived as different and requiring major changes in customers’ thinking, attitudes and behaviours (Atuahene-Gima, 1996; Micheal *et al.*, 2003; Sengupta, 1998). The market perspective is not necessarily identical to the customer perspective because some authors use “market perspective” to mean the customer’s perspective as defined from the firm’s perspective; thus, for example, a market can be new to the firm, but the customer do not perceive the firm’s products as particularly new.

Within the firm perspective (taken in 137 articles reviewed; 57.6 percent), major innovations are acknowledged to require a great variety of resources and a departure from existing technology and practices; hence, they are inherently more uncertain than incremental advances (Dewar and Dutton, 1986; McDermott and O’Connor, 2002). An innovation for a firm can be “a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members” (Damanpour, 1991, p. 536). Studies in this perspective have strived to delineate the extent to which the technology involved is different from prior technologies and requires new skills, levels of market understanding, processing abilities and systems throughout the organization (Ottum and Moore, 1997; Sethi, 2000; Veryzer, 1998). Based on this logic, most of the studies within this perspective have scrutinized the impact of NPD processes, different types of strategic orientations, and organizational capabilities on either product innovation (e.g.

Atuahene-Gima and Ko, 2001; Gatignon and Xuereb, 1997; Lukas and Ferrell, 2000) and/or on performance or success (either firm or project), perhaps moderated by really new versus incrementally new products (e.g. Bonner *et al.*, 2002; Olson *et al.*, 1995; Song and Montoya-Weiss, 1998).

Summary: the ten discourses created by the dimensions

Table II presents studies in the literature that are representative of each of the proposed theoretical discourses. In Table III (theoretical foundation) \times (level of analysis) produces four basic discourses; Table IV shows an additional four discourses determined by (theoretical foundation) \times (customer vs. firm vs. both firm and customer perspectives). Tables III and IV give the number of reviewed articles that belong to each of the discourses; the total number is also broken down into five-year time intervals for 1990-2007. The increase in the number of articles written from the resource based/contingency point of view from the first to the second of these five-year periods is striking (for example, 5 to 22 and 8 to 29 from Tables III and IV respectively). Articles prior to and including 1989 are listed in a separate column (recall that articles appearing prior to 1990 were included only if a literature review tagged them as important). We proceed by scrutinizing these different discourses of innovation within the two theoretical streams.

Adoption and diffusion theory

Previous research on adoption and diffusion of innovations highlighted the role of the users' perceptions in the definition of an innovation (Boone *et al.*, 2001; Kim and Chhajed, 2001; Lowrey, 1991; Pae and Hyun, 2002; Ziamou, 2002). Rogers (1976), one of leading scholars of the field, has defined innovation as "an idea perceived as new by the individual". In the same vein, Rogers and Shoemaker (1971) emphasized the subjective and the perceived notion of the "newness" of an idea. The adoption and diffusion of innovation literature demonstrates that the greater discontinuity of an innovation, the more difficult it is for the user to adopt. Another common construct related to innovations is "fit", which indicates how well the internally available knowledge and/or resources fit the requirements for the use of the technology or product (Atuahene-Gima and Ko, 2001; Danneels and Kleinschmidt, 2001). Based on this view, highly innovative products face significant threats to their adoption since their degree of fit with both the existing knowledge structures of consumers and the design, manufacturing and marketing practices of firms is likely to be very low.

Adoption/diffusion \times level of analysis (Table III)

In the adoption/diffusion literature, at the product/project level, product innovation has been defined as a technology that a firm or a customer is using for the first time, whether or not other organizations or users have previously adopted it (Brown and Eisenhardt, 1997; Li and Atuahene-Gima, 2001; Sethi *et al.*, 2001). Studies at the product level have scrutinized the impact of various variables on the likelihood of adoption; these variables include learning costs, relative advantage, perceived utility and ease of adoption, perceived ease of use, need fit, compatibility, image, visibility and trialability of the technology.

At the program or firm level, innovation usually refers to new technologies for improving operational efficiencies and/or enabling the production of products and

	Diffusion/adoption theory	Contingency theory/resource-based or dependency theory
Project level	Customer perspective	Rogers (1976); Dickerson and Gentry (1983); Foxall and Haskins (1986); Davis <i>et al.</i> (1989); Midgley and Dowling (1993); Kumar <i>et al.</i> (1998); Kohli <i>et al.</i> (1999); Steenkamp and Gielens (2003); Shih and Venkatesh (2004) Hayward <i>et al.</i> (1977); O'Callaghan <i>et al.</i> (1992); Waarts <i>et al.</i> (2002)
	Firm perspective	Yoon and Lilien (1985); Johne (1984); Ettlire <i>et al.</i> (1984); Song and Montoya-Weiss (1998); Sethi (2000); > McDermott and O'Connor (2002)
	Both perspective	Kleinschmidt and Cooper (1991); Atuahene-Gima (1995); Hultink and Robben (1999); Danneels and Kleinschmidt (2001); De Brentani (2001); Garcia and Calantone (2002); Im and Workman (2004)
Program/firm/SBU level	Customer perspective	Hultink and Robben (1995); Gatignon and Xuereb (1997) Friar (1995); Banbury and Mitchell (1995)
	Firm perspective	Covin and Slevin (1989); Slater and Narver (1993); Moorman (1995); Iltner and Larcker (1997); Han <i>et al.</i> (1998); Hurley and Hult (1998); Bharadwaj and Menon (2000); Li and Atuahene-Gima (2001); Calantone <i>et al.</i> (2003)
	Both perspective	Atuahene-Gima (1996); Chandy and Tellis (1998); Schmidt and Calantone (1998); Lukas and Ferrel (2000)

Table II.
Typology based on theoretical foundation and level of analysis dimensions

Table III.
Typology based on
theoretical foundation
versus level of analysis
(*n* = 238): number of
articles appearing over
time

	Diffusion/adoption theory					Resource-based view/contingency theory				
	1989 and prior	1990-1994	1995-1999	2000-2007	Total	1989 and prior	1990-1994	1995-1999	2000-2007	Total
New product/project	12	5	14	13	44	11	5	22	32	70
SBU/organization/program	13	4	7	10	34	9	7	26	48	90

	Diffusion/adoption theory				Resource-based view/contingency theory					
	1989 and prior	1990-1994	1995-1999	2000-2007	Total	1989 and prior	1990-1994	1995-1999	2000-2007	Total
Customer perspective	8	2	10	8	28	0	0	6	2	8
Firm perspective	16	6	3	9	34	11	8	29	55	103
Both	1	1	8	6	16	9	4	13	23	49

Table IV.
Typology based on
theoretical foundation
versus perspective
($n = 238$): number of
articles appearing over
time

services; these lead to a significant restructuring or improvement in a process (Bhoovaraghavan *et al.*, 1996; Johne, 1984; Meyers *et al.*, 1999). Innovations are often *process* innovations, which lower the manufacturing costs of existing products and follow product innovation (Johne, 1984), or administrative innovations, which involve organizational structures and administrative processes related to the basic work activities of an organization (Damanpour, 1991; Han *et al.*, 1998). At the program or firm level, variables employed to evaluate the adoption of innovations include the complexity and compatibility of the new process technology, perceived performance gain and lag, environmental factors and management factors.

Adoption/diffusion × perspective (Table IV)

From a customer perspective, research relies on consumer perception and accepts the majority customer opinion of what is and what is not an innovation (Robertson, 1967). Typically, the adoption and diffusion of innovation have been analyzed according to Rogers' (1976) scheme: it proposes that the innovation's relative advantage, compatibility with potential adopters, trialability and observability are positively related to adoption while complexity and perceived risk are negatively related to adoption. The likelihood of adoption and the rate of diffusion of innovations have been related to the specific nature of the innovation and to the specific characteristics of the adopters (Kohli *et al.*, 1999; Olshavsky and Spreng, 1996; Pae and Hyun, 2002; Plouffe *et al.*, 2001). The latter included sociocultural values and beliefs, user needs, attitude towards innovation, and the perceived value or utility compared to existing products (Boone *et al.*, 2001; Kim and Chhajed, 2001). Innovation, in this perspective, depends on relative advantage as perceived by the customer, because an innovation that has attributes similar to existing products cannot be highly differentiated and therefore cannot have relative advantage over existing products.

The studies on adoption of innovation in the extant literature expanded the domain of innovation to include "new products, technologies, practices or significant restructurings of processes that consumers or firms utilize for the first time, whether or not other organizations or users have previously adopted it" (Bhoovaraghavan *et al.*, 1996; Brown and Eisenhardt, 1997; Dhebar, 1995; Kohli *et al.*, 1999; Kumar *et al.*, 1998). For a firm, innovation is "an idea, practice or a material artifact perceived to be new by the relevant unit of adoption" (Damanpour, 1991). Most studies have introduced the notion of risk and uncertainty in adopting innovations; for example, three dimensions of risk are performance risk, social risk and uncertainty (Schmidt and Calantone, 1998). Other researchers have examined the antecedents of technology or innovation adoption in a firm such as the type and characteristics of the innovation, the attitudes of adopting groups and the overall value the innovation constitutes for them (O'Callaghan *et al.*, 1992; Sahay and Riley, 2003; Waarts *et al.*, 2002).

The resource-based view

The RBV, which is considered one of the robust theories in the organizational literature, takes into account the influential internal and external factors on the conduct of firms' business and competitive actions. In studies that have relied upon this theory, innovation has been broadly identified as response(s) to market and/or technological changes, including the attitude taken and adjustments made in an organization (Damanpour, 1991; Garcia and Calantone, 2002). To be more innovative and develop

products that are new to both the firm and the market, more learning and change are required, the right resource mix is necessary, and more uncertainty is involved. This uncertainty can be reduced through external orientation (for example, partnering) and market information processing. Despite these challenges, the innovating firm has a higher likelihood of achieving a differentiated position and success than its less innovating competitors. In this stream, conceptualizations of innovation are built mainly on the degree of familiarity organizations or users have with a product, process and/or actions (Danneels and Kleinschmidt, 2001; De Brentani, 2001; Song and Montoya-Weiss, 1998).

RBV/contingency × level of analysis (Table III)

Studies at the project level conceptualized innovation as an iterative process initiated by the perception of a new market and/or service opportunity for a technology-based intervention; the process comprises development, production, and marketing tasks striving for commercial success (Garcia and Calantone, 2002). At this level, innovation is linked to product-related variables (such as product superiority, relative advantage, newness, degree of customisation) and process related variables (namely, the formality of the NPD process and NPD management).

At the firm/SBU or program level, researchers have analyzed innovation on a broader scale as “a means of changing an organization, whether as a response to changes in its internal or external environment or as a pre-emptive action taken to influence an environment” (Damanpour, 1991, p. 536). This definition includes both actions taken by the firm (such as the number of and changes in new products or services introduced), and the attitude of the firm toward innovation as indicated by the emphasis on R&D, technological leadership and innovation (Brown and Eisenhardt, 1997; Calantone *et al.*, 1994; Hultink *et al.*, 1997; Ozsomer *et al.*, 1997). Variables examined include both market-related variables such as market turbulence, market attractiveness, and competition, and company-related variables, such as strategies, capabilities, resources of the firm, and competitive advantage (Montoya-Weiss and Calantone, 1994).

RBV/contingency × perspective (Table IV)

Within the customer/market perspective, the definition of innovation newness has focused on the degree to which the new product/service varies from current customer consumption requirements and experiences, and thus the degree of learning and adoption effort required by customers (Micheal *et al.*, 2003; Sengupta, 1998). The greater the discontinuity of an innovation, the greater product benefits customers perceive and the less familiar they are with product attributes (Lilly and Walters, 1997; Veryzer, 1998); thus consumers must expend resources such as time and effort in order to grasp them.

Within the firm perspective, major innovations are acknowledged to require a great variety of resources and a departure from existing technology and practices (McDermott and O'Connor, 2002). They require more learning and unlearning, the development of new skills, and the adjustment of existing capabilities (Kessler and Chakrabarti, 1999; Ottum and Moore, 1997; Sethi, 2000; Sivadas and Dwyer, 2000). Accordingly, radical innovations involve a greater proportion of experimentation, and require more flexibility and learning. In contrast, incremental innovations are

extensions to existing knowledge, refinements or modifications of established designs. Newness, most generally, has been defined in terms of the degree of familiarity, indicating the departure from existing resources, capabilities or orientation. Consequently, the notion of newness indicates the extent to which the core technologies of a new product are consistent with those used in the firm's existing products.

Discussion

The overall objective of this research has been to provide an extensive review of the new product/innovation literature in marketing, management and engineering organized by means of a theory-driven typology that illuminate the different discourses on innovation. The primary dimension of our typology of discourses is theoretical underpinnings, namely adoption/diffusion theory versus the resource-based/contingency theory view (RBV); our secondary dimensions are level of analysis (product/project versus program/firm/SBU) and firm vs. customer perspective. These dimensions serve to frame the discourses and conceptualisations in the innovation literature and to provide a parsimonious categorization of the phenomenon. In general, there is no "one to one" mapping of the discourses discussed in this paper to the cells in standard (market) X (technology) matrices (as in Figure 1); nor is there meant to be. The natures of these discourses were described in detail in previous sections; what follows summarizes our conclusions overall.

We reviewed a database of 238 articles from a comprehensive set of 22 journals publishing innovation research. Out of these 238, 21 were from 1990-1994, 69 were from 1995-1999, and 103 were from 2000-2007 (and the rest appeared in 1989 and prior). Our first observation is that there appears to have been an explosion of innovation research beginning in about the mid-1990s.

All articles were classified according to the discourses identified. In the "References", the classification codes of the articles are listed. We provide these codes because the discourses are fairly distinct, and thus we recommend that research within a discourse encompasses as its potential literature base at least those articles identified as belonging to that discourse. In other words, we propose that the relevant literature that needs to be reviewed in any particular research is determined by the discourse to which that particular research belongs.

Theoretical foundation: adoption/diffusion versus resource-based/contingency view

The increase in innovation research published based on the resource-based/contingency view in the last twelve years is clear: of all 238 articles reviewed, 160 (= 67.2 percent) took this theoretical perspective, but of the 172 articles published in the last twelve years, 128 (= 74.4 percent) were grounded in the resource-based/contingency foundation. One reason for this increase may be that many RBV review articles or journal issues on RBV were published in the early and mid-1990s (especially in management). Thus the increase may be reflective of a classic case of diffusion of ideas across disciplines (in this case, the idea is RBV). Another reason may be that the scope of RBV is very broad (perhaps too broad): some articles claim to be under the RBV umbrella but really do not measure or discuss key RBV constructs such as non-substitutability.

A somewhat different reason for the increase in this theoretical stream is that research has matured to the point that numerous articles now examine contingent

relationships among constructs. In particular, moderation by some environmental contingency seems to be a popular and productive avenue for research, especially moderation by marketing or technological uncertainty/turbulence in firm level research (Day and Wensley, 1988; Song and Parry, 1996). Justification for moderation by marketing or technological characteristics is grounded at least in part in the definitional typologies of innovation (Figure 1): these typologies imply that innovations are fundamentally different depending on where they fall in a matrix of (market) X (technology) dimensions, and thus moderation by marketing or technological uncertainty/turbulence is a logical extension.

Not a single study used a comprehensive construct of product type as a moderator however, even though most product innovation typologies discern at least four different types: most empirical research that made a distinction distinguished only between “not radical” versus radical innovation. Other moderators such as firm size are also rarely examined (although firm size has been examined as an antecedent, often serving as a *de facto* proxy for resource availability).

Level of analysis: product/project versus firm/SBU/program

In our research, we distinguished the product/project level from the firm/SBU/program level (see Table III); i.e. we differentiated those studies focusing on one product or project from those that focus on multiple products or projects, on entire programs, or on firms/SBUs. We did not separately table program level distinct from firm/SBU level. Our reason was that the two levels of analysis considered in this research produce different discourses; for example, the performance measures used are usually different, and associated constructs such as “innovativeness” or “process”/“administrative” innovation are common in one discourse but not the other. However, distinguishing program from firm/SBU (or perhaps even firm and SBU separately) does not produce significantly different research discourses in the current literature.

A deeper examination of program level research reveals the following. Out of the total of 238 articles reviewed and analysed, only 22 (about 9 percent) were at the program level: one before 1989, two in 1990-1994, three in 1995-1999, and 15 in 2000-2007. Within the diffusion/adoption theoretical foundation (78 articles reviewed), there were 44 articles (= 56.4 percent) dealing with product/projects and 34 (= 43.6 percent) at the firm/SBU/program level; of these 34, only three (= 9 percent) were at the program level while the rest were at the firm/SBU level. Within the resource-based/contingency theory foundation (160 articles reviewed), there were 70 articles (= 44 percent) dealing with product/projects and 90 (= 56 percent) at the firm/SBU/program level; the 90 were split 19 at the program level (= 21 percent) and 71 at the firm/SBU level (= 78 percent). Despite a recent increase, it is quite clear from this analysis that there is a lack of program level research in general (for example, where the unit of sampling and analysis is “the program”); but even for the program level research published, there does not seem to be a focus on constructs unique or specific to programs (as opposed to constructs generally applicable across programs, SBUs and firms). Another very interesting area that deserves future research is the differential effects of various antecedent factors (e.g. customer orientation, organizational structure) on program versus project success.

Perspective: customer versus firm

Firm research accounted for 57.6 percent of all 238 articles reviewed, customer research accounted for 15.1 percent and research accommodating both was at 27.3 percent; if only the last 12 years are examined, the corresponding numbers are firm = 55.8 percent, customer = 15.1 percent, and both = 29.1 percent. However, these overall numbers hide one trend. Firm research within the diffusion/adoption foundation appears not to be increasing over the years (16 prior to 1989, six in 1990-1994, three in 1995-1999, and nine in 2000-2007); but firm research in the RBV/contingency foundation has increased from 11 prior to 1989 and eight in 1990-1994 to 29 in 1995-1999 and 59 in 2000-2007. A similar increase is seen in research on both, with nine, four, 13, and 23 in the respective time periods. Thus a major source of the explosion of research articles over the years appears to be articles written from the RBV/contingency view and the firm perspective. The customer perspective does not seem to have benefited from a parallel infusion of new theoretical ideas or perspectives; such an infusion may have been able to generate additional new research over the years from the point of view of the customer.

Conclusions and implications

We contribute to the literature by number of ways. First, we tackle the issue: “what is really an innovation?”. Is it an organization-wide focus on new product generation and bold actions, or is it the actual novel product entity that changes how people live and think? To address these questions, we provided an extensive review of the innovation literature, initially with a particular focus on the proposed innovation typologies. We studied the purpose of these typologies, their similarities and differences. We found that most typologies were based on (market) X (technology) dimensions (e.g. Chandy and Tellis, 2000; Johnson and Jones, 1957), but that some took a more distinct perspective (e.g. Damanpour, 1987; Henderson and Clark, 1990). Overall, these typologies in the literature serve to specify the meaning of the innovation construct and its domain(s); we argue that all attempt to define and classify innovations without reference to the underlying theory. In the controversy over what comes first, theory or construct specification, all these typologies assume that construct specification comes first and hence that the literature should be organized and understood according to the divisions of the construct. As our second contribution, we argue for starting with theory as the basic division and propose a theory driven typology.

While not obvious from any of the typologies existing in the literature, we identified two distinct theoretical streams on innovation: the adoption/diffusion tradition and the resource-based view (possibly with contingency theory aspects). Within these two theoretical views, the perspectives taken in the conceptualization of the innovation and the operationalizations of the construct also differed, bringing about further diverse discourses. Through our division based on theory stream (i.e. theoretical genesis), we wish to create a shared understanding among academics and practitioners of what constitutes innovation and constructs within the related theoretical net.

Based on our extensive review of the literature of the innovation literature, we have a number of suggestions for future research. First, we recommend a number of research areas that have received little attention, followed by various moderation analyses that can be employed in contingency studies. Our review of innovation research revealed two important areas in which there is paucity of studies: program

level research *and* innovation studies linking the firm with the market perspective. Program level innovation, both within its unique context and from the point of view of its differences from organizational and project-level innovation, deserves further research attention. Such a focus may also benefit practitioners because it may provide new insights on how to reflect corporate/firm strategies on innovation teams and processes and/or how to manage innovation programs for higher productivity.

Since innovation requires a match between technology and market dimensions, the analysis of moderation by different levels of marketing and technological uncertainty within innovation models derived from the discourses identified may provide interesting results. Moreover, we recommend that researchers employ a (market) X (technology) taxonomy that discerns at least four levels of innovativeness in investigations of these moderating effects. Firm size or available resources may be examined as moderators rather than antecedents to the innovation process.

Finally, we identified an emerging stream of literature for the study of innovation, which deserves further research interest: innovation through relationship management. Rising environmental turbulence due in part to intensive competition has increased the rate of innovation required to survive and has generated impetus to enter into strategic collaborations. The increased complexity and cost of developing innovative products have led firms to search for expertise lacked internally and to engage in joint new product development arrangements (Kotabe and Swan, 1995; Varadarajan and Cunningham, 1995). Some more recent studies have focused on new product alliances (Amaldoss and Rapoport, 2005; Rindfleisch and Moorman, 2001; Sivadas and Dwyer, 2000), as well as a very few on networks (Alves *et al.*, 2007) through which firms acquire and utilize information and know-how.

Note

1. The following references included in our classifications are indicated by D = diffusion/adoption theory, R = resource based view, O = organization/SBU/program, P = project/product level, C = customer perspective, F = firm perspective, B = both firm and customer perspective. Abetti, 2000; Aiken *et al.*, 1980; Akgun *et al.*, 2006; Alam, 2003; Ali, 1994; Ali *et al.*, 1995; Allocca and Kessler, 2006; Alves *et al.*, 2007; Amaldoss and Rapoport, 2005; Astebro, 2004; Atuahene-Gima, 1995, 1996, 1997, 2005; Atuahene-Gima and Ko, 2001; Atuahene-Gima *et al.*, 2005, 2006; Avlonitis *et al.*, 1994, 2001; Azjen and Fishbein, 1975; Bagozzi and Lee, 1999; Bailey, 1994; Baker and Becker, 1997; Baker and Sinkula, 2005; Baldrige and Burnham, 1975; Banbury and Mitchell, 1995; Barczak and Wilemon, 1991; Bearden *et al.*, 1985; Berthon *et al.*, 2004; Bharadwaj and Menon, 2000; Bhoovaraghavan *et al.*, 1996; Bonner *et al.*, 2002; Boone *et al.*, 2001; Booz-Allen and Hamilton, 1982; Bradley and Stewart, 2003; Brockhoff and Chakrabarti, 1988; Brockhoff and Pearson, 1992; Brown, 1991; Brown and Eisenhardt, 1997; Bruce, 1988; Calantone and Cooper, 1981; Calantone *et al.*, 1994, 1995, 2002, 2003, 2006; Chandy and Tellis, 1998, 2000; Chiesa *et al.*, 1996; Cho and Pucik, 2005; Cooper, 2000; Cooper and De Brentani, 1991; Cooper and Kleinschmidt, 1995; Costanzo *et al.*, 2003; Covin and Slevin, 1989; Cowell, 1988; Crawford, 1989; Daft, 1978; Daghfous *et al.*, 1999; Damanpour, 1987, 1991, 1996; Danneels and Kleinschmidt, 2001; Darroch and McNaughton, 2003; Davis, 1989; Davis *et al.*, 1989, 2002; Day, 1994; Day and Wensley, 1988; De Brentani, 2001; De Brentani and Kleinschmidt, 2004; Debruyne *et al.*, 2002; Dewar and Dutton, 1986; Dhebar, 1995; Dickerson and Gentry, 1983; Droge and Calantone, 1996; Elenkov *et al.*, 2005; Enkel *et al.*, 2005; Ettlie *et al.*, 1984, Ettlie and Rubenstein, 1987; Fennell, 1984; Firth and Narayanan, 1996; Foxall, 1988; Foxall and Haskins, 1986; Foxall *et al.*, 1985; Friar, 1995; Fritz, 1989; Garcia and Calantone, 2002; Gatignon and Xuereb, 1997; Gatignon

and Robertson, 1989; Gatignon *et al.*, 2002; Grant, 1991; Gebert *et al.*, 2003; Gimenez, 2000; Gopalakrishnan and Damanpour, 2000; Griffin, 1997; Griffin and Page, 1996; Hage and Dewar, 1973; Han *et al.*, 1998; Hayward *et al.*, 1977; Henard and Szymanski, 2001; Henderson and Clark, 1990; Hirschman, 1987; Hua and Wemmerlov, 2006; Huber, 1998; Hult *et al.*, 1997, 2004; Hultink and Robben, 1995, 1999; Hultink *et al.*, 1997; Hunt, 1991; Hurley and Hult, 1998; Im and Workman, 2004; Ittner and Larcker, 1997; Jin, 2000; John, 1984; John and Pavlidis, 1995; John and Snelson, 1988; Johnson and Jones, 1957; Kamath *et al.*, 1993; Kessler and Bierly, 2002; Kessler and Chakrabarti, 1999; Kim and Chhajer, 2001; Kimberly and Evanisko, 1981; Kleinschmidt and Cooper, 1988, 1991; Knight, 1987; Kohli *et al.*, 1999; Kotabe and Swan, 1995; Kumar *et al.*, 1998; Kusunoki, 1997; Lancaster and White, 1976; Langerak *et al.*, 2004; Larsen and Lewis, 2007; Lassen *et al.*, 2006; Lee and Na, 1994; Li and Atuahene-Gima, 2001; Liker *et al.*, 1999; Lilien and Yoon, 1989; Lilly and Walters, 1997; Linton and Thongpapanl, 2004; Lockett and Littler, 1997; Lowrey, 1991; Lu and Yang, 2004; Lukas and Ferrell, 2000; Lynn and Akgun, 2001; MacKenzie, 2003; Malik, 2000; Manimala *et al.*, 2005; Manning *et al.*, 1995; Manu and Sriram, 1996; Marinova, 2004; Markham and Griffin, 1998; Martinez *et al.*, 1998; Matear *et al.*, 2002; Matthews, 1997; Mathur, 1999; Matsuo, 2005; Mavondo *et al.*, 2005; McDermott and O'Connor, 2002; McGowan and Durkin, 2002; Medina *et al.*, 2005; Meyers *et al.*, 1999; Micheal *et al.*, 2003; Midgley, 1987; Midgley and Dowling, 1993; Miller and Friesen, 1982; Miller *et al.*, 1988; Millman, 1982; Mishra *et al.*, 1996; Moenaert and Caeldries, 1996; Moenaert *et al.*, 1995; Montoya-Weiss and Calantone, 1994; Moorman, 1995; Moorman and Miner, 1997; Morgan *et al.*, 2003; Nabih *et al.*, 1997; Nakata *et al.*, 2006; Narver *et al.*, 2004; Naude *et al.*, 1998; Nerkar and Roberts, 2004; Nijssen and Frambach, 2000; O'Callaghan *et al.*, 1992; O'Connor, 1998; O'Connor and Veryzer, 2001; Olshavsky and Spreng, 1996; Olson *et al.*, 1995, 2005; Oltra and Flor, 2003; Ottum and Moore, 1997; Ozsomer *et al.*, 1997; Pae and Hyun, 2002; Peteraf, 1993; Phillips *et al.*, 1994; Plouffe *et al.*, 2001; Polk *et al.*, 1996; Prescott, 1986; Raju, 1979; Rindfleisch and Moorman, 2001; Ritter and Gemünden, 2004; Robertson, 1967; Robertson and Gatignon, 1986; Robinson, 1990; Rogers, 1976; Rogers and Shoemaker, 1971; Rothwell, 1986; Rothwell and Gardiner, 1988; Sahay and Riley, 2003; Salavou and Lioukas, 2003; Salavou *et al.*, 2004; Sandberg, 2007; Saxena and Richards, 1997; Scarbrough and Lannon, 1989; Schmidt and Calantone, 1998; Sengupta, 1998; Sethi, 2000; Sethi *et al.*, 2001; Shankar, 2006; Sharma, 1994; Sherman *et al.*, 2005; Shih and Venkatesh, 2004; Simpson *et al.*, 2006; Sivasdas and Dwyer, 2000; Slater and Narver, 1993; Song and Dyer, 1995; Song and Montoya-Weiss, 1998; Song and Noh, 2006; Song *et al.*, 1996, 2001; Song and Parry, 1996; Song and Thieme, 2006; Soosay and Hulland, 2004; Spivey *et al.*, 1997; Srinivasan *et al.*, 2002; Steenkamp and Gielens, 2003; Summers, 2001; Swink, 2000; Tajeddini *et al.*, 2006; Tatikonda, 1999; Tatikonda and Rosenthal, 2000; Tidd, 1995; Troy *et al.*, 2001; Tzokas and Saren, 1992; Utterback and Abernathy, 1975; Van Riel *et al.*, 2004; Varadarajan, 1996; Varadarajan and Cunningham, 1995; Venkatesh and Brown, 2001; Veryzer, 1998, 2005; Voss *et al.*, 2006; Waarts *et al.*, 2002; Wakasugi and Koyata, 1997; Weerawardena and O'Cass, 2004; Weerawardena *et al.*, 2006; Wilton and Pessemier, 1981; Yoon and Lilien, 1985; Zain *et al.*, 2002; Zhou, 2006; Zhou *et al.*, 2005; Ziamou, 2002; Zmud, 1982.

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