INNOVATION TYPOLOGIES

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**ABSTRACT**

The following questions concerning typologies of innovation are discussed: a) What types of innovations exist in the literature? b) What key dimensions underlie these varied types of innovation? We suggest that the many types of innovation described in the literature can be classified along two dimensions: 1) whether the basis of an innovation is the *concept* underlying the innovation, the *customers* who might buy the innovation, or the *company* that faces or implements the innovation, and 2) whether the innovation is exemplified by its *features* or by the *effects* it has on the status quo.

Keywords: Breakthrough, Platform, Disruptive Innovation, Architectural Innovation
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Innovation, like love, is a many splendored thing. Whether in the form of a shiny new gadget sought out by eager consumers, or a new technique that saves businesses time and money, or a new service that destroys the value of existing services, innovations come in many forms and affect our lives in many different ways. This article examines the many dimensions of innovation, and presents a means of classifying innovations.

By definition, all innovations have an element of novelty in them: they are different from what existed before. Yet all innovations are not the same. Indeed, scholars have over the years proposed a number of different innovation typologies, or ways of classifying innovations. By distinguishing among the many typologies of innovations, we can better manage their development and better predict their sources and their impact. To this end, this article first describes and defines some of the prominent typologies of innovations that scholars have highlighted in the literature. These typologies have generally existed in isolation from each other in the literature. We note some of the commonalities among these typologies, and then propose a meta-typology (or typology of typologies) that might serve as a unifying framework for the study and management of innovation. (See also WIEM05-003, WIEM05-025, WIEM05-047.)

WHAT TYPES OF INNOVATION EXIST IN THE LITERATURE?

Table 1 presents a listing of the prominent types of innovation that have been described in the literature. In this section, we define each of the types of innovation listed in Table 1, and illustrate them with examples. This section highlights the sheer variety of innovations that exist, and have been studied in the literature.

A product innovation involves the commercial introduction of a product that is new to customers (see Schumpeter 1934). A service innovation involves the commercial introduction of a service that is new to customers (see WIEM05-016). The introduction of the Kodak Brownie in 1900 is an example of a product innovation: it offered cheap and easy use of photography to adults and children alike. FedEx and UPS are examples of service innovations: they enabled customers to deliver documents and packages overnight. A process innovation is one that involves the use of a new approach to creating or commercializing products or services (see WIEM05-050). An example of a process innovation is Henry Ford’s use of the assembly line in the manufacture of automobiles.

A technological breakthrough is a product, service, or process that involves scientific principles that are substantially different from those of existing products, services, or processes (Chandy and Tellis 1998). An alternate label for such an innovation is platform innovation (Tellis and Sood 2008, p. 153). The first electronic cameras were technological
breakthroughs, since they used a core technology - electronic imaging - to take photographs, in contrast to existing cameras that relied on celluloid roll technology to take photographs.

A component innovation is a new product, service, or process that uses new parts, modules, or materials, but relies on the same core technology as existing products, services, or processes (Tellis and Sood 2008). For example, in the field of data recording, magnetic tapes and floppy disks differed in the components and materials they used, though they were both based on the core technology of magnetic recording.

An architectural innovation (Henderson and Clark 1990) or design innovation (Tellis and Sood 2008) involves the reconfiguration of the linkages and layout of components, but relies on the same core technology as existing products, services, or processes. For example, floppy disks decreased from 14 to 8 inches in 1978, to 5.25 inches in 1980, to 3.5 inches in 1985, and to 2.5 inches in 1989, though each was based on magnetic recording (Christensen 1993; Tellis and Sood 2008).

A business model innovation involves systemic changes to the value proposition offered by a product or service, and to the cost structure incurred by the firm offering it (Velu, Prabhu and Chandy, 2009). These changes are systemic as they involve changing multiple elements of the marketing mix and cost structure at the same time. An example of a business model innovation is Amazon.com. Amazon.com is an innovation that, relative to bricks and mortar bookstores, involves changes to the product (a far greater assortment than any bricks and mortar book retailer), distribution (books available everywhere all the time through the Internet), price (lower prices in general) and promotion (access to online customer reviews). It also involved a reduction in the cost of the firm’s offering through lower overheads and greater economies of scale.

A drastic innovation (Reinganum 1985) or revolutionary innovation (Caselli 1999; Rosen 1991) is one that makes current products obsolete. For example, electronic calculators made slide rules obsolete.

An innovation that is a market breakthrough provides substantially higher customer benefits per dollar than existing products, services, or processes but is based on the same core technology as existing products, services, or processes (Chandy and Tellis 1998). An example is cable television with signal compression technology that allows a significantly larger number of channels to be transmitted to customers than before, while using existing cable technology.

A radical innovation is one that employs substantially new technology and offers substantially higher customer or user benefits relative to existing products, services, or processes (Sorescu, Chandy and Prabhu 2003). A radical innovation combines the technological novelty of technology breakthroughs, and the dramatic improvements in customer and user benefits evident in market breakthroughs. As such, radical innovations tend to fairly rare. However, they can have powerful effects on the fates of individual firms and entire industries (Chandy and Tellis 1998; 2000). An incremental innovation is one that involves only minor changes to technology or minor improvements in benefits.

A disruptive innovation (Govindarajan and Kopalle 2006a, p. 15; Christensen 1997) introduces a different set of features, performance, and price attributes relative to existing products, making it an unattractive combination for mainstream customers at the time of
product introduction because of inferior performance on the attributes these customers value and/or a high price—although a different customer segment may value the new attributes. Subsequent developments over time, however, raise the new product’s attributes to a level sufficient to satisfy mainstream customers, thus attracting more of the mainstream market (Govindarajan and Kopalle 2006a, p. 15). As Govindarajan and Kopalle 2005b, p. 199) note, “Canon’s introduction of slower but inexpensive tabletop photocopiers in the late 1970s relative to Xerox’s high-speed big copiers is an example of disruptive innovation. The tabletop copiers were rapidly accepted by small businesses and individuals who appreciated the convenience and price despite poor resolution. At the time of their introduction, the mainstream market (larger companies) still preferred the large copiers because of speed, resolution, collation, etc. However, over time, further developments in small copiers have allowed Canon to improve quality, speed, and features and offer them at a price point that is sufficient to satisfy the needs of mainstream market.”

A discontinuous innovation is one that requires customers to establish different behaviour patterns (Robertson 1967, p. 16). It alters existing patterns of use or creates new patterns of use (Gatignon and Robertson 1986). Typewriters and microwaveable foods were discontinuous innovations, since they changed longstanding patterns of use and behaviour among customers.

A new to the firm innovation refers to the adoption of a product, idea, or behaviour by a firm that had not previously adopted the innovation (Booz, Allen, and Hamilton 1982). New to the firm innovations that involve the adoption of new management principles, processes, and practices are referred to as administrative innovations (Damanpour 1991) or organizational innovations (Hage 1999) or management innovations (Hamel 2006). For example, the adoption of electronic banking by financial institutions and of total quality management practices by manufacturing firms both represent new to the firm innovations. A new to the world innovation, in contrast, represents the first time an innovation is introduced commercially in any marketplace (Maclaurin 1950).

A competence-destroying innovation is one that requires new skills, abilities, and knowledge in the development and production of a product relative to those held by existing firms in an industry (Tushman and Anderson 1986, p. 442). As Tushman and Anderson (1986) note, a competence destroying innovation either creates a new product class (e.g., xerography or automobiles) or substitutes for an existing product (e.g., diesel vs. steam locomotives; transistors vs. vacuum tubes).

A competence-enhancing innovation is an order of magnitude improvement in price, performance, or efficiency that builds on existing know-how within a product or process class (Tushman and Anderson 1986, p. 442). Such innovations substitute for older technologies, yet do not render obsolete skills required to master the old technologies. For example, electric typewriters represented a competence enhancing innovation relative to mechanical typewriters.

**WHAT DIMENSIONS UNDERLIE THESE VARIED TYPES OF INNOVATION?**

The extensive literature on innovation typologies can sometimes resemble a Tower of Babel with different terms used to refer to similar concepts and, conversely, similar terms used to refer to different concepts. Moreover, terms and schemes sometimes overlap or only partially capture the complexity of the phenomenon of innovation. In this section, we present a meta-
typology, or typology of typologies, that seeks to provide some structure to the existing typologies in the literature. In doing so, we follow three criteria. First, the typology must be exhaustive and comprehensively capture the full extent of a phenomenon. Second, the typological units or categories of the typology should be mutually exclusive, thus avoiding redundancies and overlap. Finally, the typology should be parsimonious.

Taking into account these three hallmarks, we synthesize the various schemas discussed in the section above into a single typology laid out in Table 1. We identify two key dimensions that underpin all the various typologies mentioned in the literature. The first dimension classifies innovations based on attributes (i.e., what they are) versus their effect (i.e., what they do). The second dimension classifies innovations based on their locus of novelty: the novelty of the concept itself, or the novelty of the innovation in relation to the customer or the company that introduces or adopts it. Accordingly, we classify product/service/process innovation, technological breakthrough/platform innovation, component innovation, architectural/design innovation and business model innovation all as types of innovation that emphasize the innovation’s attributes (i.e., what it is) and whose locus of novelty lies in the concept behind the innovation. Similarly, we classify market breakthroughs and disruptive innovations as types of innovation that emphasize the innovation’s attributes (i.e., what it is) and the novelty of the innovation in relation to the customer. Likewise, we classify new to the firm innovation, organizational innovation, administrative innovation, and management innovation as types of innovation that emphasize the innovation’s attributes (i.e., what it is) and the novelty of the innovation in relation to the company. Drastic innovation and revolutionary innovation we classify as being types of innovations that emphasize the innovation’s effects (i.e., what it does) and whose locus of novelty lies in the concept behind the innovation. In contrast, we classify discontinuous innovation and disruptive innovation as types of innovation that emphasize the innovation’s effects (i.e., what it does) and the novelty of the innovation in relation to the customer. And finally, we classify competence-destroying innovation, competence-enhancing innovation and disruptive innovation as types of innovation that emphasize the innovation’s effects (i.e., what it does) and the novelty of the innovation in relation to the company.

WHAT ARE THE IMPLICATIONS OF THE TYPOLOGY WE PROPOSE?

The meta-typology in Table 1 has several implications for research and practice. We discuss each of these in turn.

Implications for research: The meta-typology we propose in Table 1 helps to reduce some of the confusion and complexity in the literature on the types of innovation. While the literature suggests many different dimensions underlie innovation, the typology shows that in fact only two major dimensions underlie most types of innovation. In identifying only two underlying dimensions, the typology meets the important condition of parsimony in a classification scheme. Further, by capturing most major types of innovation, the typology is also exhaustive and comprehensive. Third, the typology ensures that the categories it suggests are mutually exclusive, thus avoiding redundancies and overlap.

By meeting the major conditions of a good typology, Table 1 provides the basis for a rigorous approach to the study of innovations. Specifically, it forms the basis for further research that can help better circumscribe the rich and diverse phenomenon of innovation, and its antecedents and consequences. Most importantly, it furthers the task of good theory in the
area, namely to be able to explain and predict aspects of the phenomena in a parsimonious and logically rigorous way.

**Implications for practice:** The typology in Table 1 provides at least three major benefits for managers. Specifically, it helps managers make better innovation decisions in the areas of 1) portfolio assessment, 2) resource allocation (time, people, money) and 3) portfolio management. A key issue for managers is to be able to assess in real time the extent to which their portfolio of existing products as well as those in the pipeline are complete and sufficient given their firms’ short and long term objectives. The typology in Table 1 enables managers to keep a track of the various types of innovations they have planned and introduced in markets over time. This in turn helps them assess any imbalances in the portfolio. Any imbalances in the portfolio would immediately suggest a re-allocation of resources devoted to the development and support of innovations. Such imbalances would also suggest means to systematically identify and generate new innovations by, for instance, seeking novelty in innovations based on their relationship with concepts, customers or the company itself.
## Dimension of Novelty

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<td>• Product/service/process innovation</td>
<td>• Market breakthrough</td>
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<td>• Technological breakthrough/Platform innovation</td>
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<td>• Component innovation</td>
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<td>• Organizational/administrative/management innovation</td>
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