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Measuring variety reduction along the supply chain: The variety gap model

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ABSTRACT

To meet the demand for variety, many firms widen their product ranges, increasing not only revenues but also operational inefficiencies. Managerial choices can mitigate the negative effects on costs, but they also limit the ability of a firm to deliver variety to the market within the timeframe and costs requested by clients. Therefore, the variety actually offered in the market can be different from the level of variety that had been defined during, for instance, product development. We call the series of decisions whose interaction results in the variety actually distributed in the market the "process of variety reduction". This paper introduces a descriptive model of this process. The model has been applied to a real case to highlight the main variety reduction decisions.

1. Introduction

In today's global market, consumers demand a wider variety of products at mass-production prices (Thevenot and Simpson, 2004). Companies belonging to different industrial sectors may use different strategies to increase their product portfolios.

Food producing companies may extend their product offerings by proposing innovative packaging or by combining old ingredients into new flavors. Depending on the country in which they are sold and the distribution channel, Coca-Cola's products can differ in their packaging and recipe. The depth of Coca-Cola's product range has recently increased with the limited edition Coca-Cola light, resulting from the collaboration of Coca-Cola and Just Cavalli. Barilla distributes many types of pasta made up of finely ground semolina and water, but in various shapes and with different cooking times. Ferrero, by combining new recipes and new packaging, is able to offer an ever-increasing number of new products and traditional products adapted for special occasions. In the fast-food sector, new products have been introduced to attract new customers: salads, fruits and "healthy foods" have been added to the menus of many fast-food restaurants. In addition, new flavors from all over the world are being introduced as limited-time offers. This approach has been promoted by McDonalds and results in, for example, "Mexican" or "Greek" week. In the mobile communication sector, firms are attempting to develop an increasing number of new products with innovative designs while controlling R&D costs and reducing time-to-market. Therefore, products are developed that apply modular designs, high standardization and co-branding with fashion firms. Examples of these kinds of collaboration are the Motorola V3i D&G by Motorola and Dolce&Gabbana, Samsung E500 Versus by Samsung and Versace, and the 3 G Fashion Phone by Nokia and Cavalli.

In the home appliance sector, product variety can be achieved by increasing functionality. Vorwerk has only one product in its catalog, namely, Bimby, but every time a new Bimby is launched into the market, the number of functions it can perform has increased. In the fashion and apparel industry, the number of collections and, therefore, items, presented per year is at least doubled from the previous year. Zara is well-known for being able to design, produce and distribute an entire new collection in 15 day. Some other firms, by leveraging internet potentialities, are enabling customers to select a product and personalize several details, e.g., Nike's shoes on www.nike.it.

By widening their product offerings, these companies are able to reach more customers and, in turn, increase revenues. However, the variety offered by a company should be the one that maximizes expected profits (Gottfredson and Aspinall, 2005).

Although it is widely recognized that product variety brings about a range of difficulties in ensuring operational efficiency, in the literature, there is no consensus on the direction of the effect of an increase in product variety on profits. In Table 1, the main contributors and their perspectives on the effect of variety on profit are summarized. In addition, the direction of the effects are outlined. Hayes and Wheelwright (1984) contend that if a firm offered a broader product line, it would result in high unit costs due to ever-increasing overhead expenses. Stalk (1988) takes a similar position, stating that a reduction in product variety to half of its original size would increase productivity by more than 30% while reducing costs by at least 17%. However, Kekre and Srinivasan (1990) advocate a broader product line to achieve a higher market share, which, in turn, would lower manufacturing costs and lead to higher profitability. Scholars such as Dowell (2006), Zipkin (2001), Agrawal et al. (2001), Randall and Ulrich (2001), Gimeno and Woo (1999), and Ulrich et al. (1998) outline

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Table 1
The direction of the effects of variety.

References	Point of view	Effects outlined
Dowell (2006), Zipkin (2001), Agrawal et al. (2001), Randall and Ulrich (2001), Gimeno and Woo (1999), Ulrich et al.(1998)	Increased product variety allows a closer match between customer preferences and offered products, but, on the other hand, higher product variety could lead to operational inefficiencies	⇕
Dowell (2006)	A firm's degree of breadth within a market affects its performance and its very survival, making product line breadth one of the most important strategic choices that a firm must mak.	⇕
Fujita (2002)	The optimization of product variety must compromise between different objectives	⇕
Kim and Chhajed (1999)	Higher product variety increases overhead, administrative and manufacturing costs	⇓
Stalk (1988)	By reducing product variety to half of its original size, productivity would be increased by more than 30%, while costs would be reduced by at least 17%	⇓
Berry and Cooper (1997)	The adverse cost and margin implications of adding product variety may depend on the misalignment between marketing and manufacturing strategies	⇕
Mather (1992)	Unlimited product variety is clearly not the way to be successful	⇕
Yeh and Chu (1991)	As the product line increases, variety-related costs also increase dramatically	⇓
Kekre and Srinivasan (1990)	A broader product line helps to achieve higher market share, which in turn would lower manufacturing costs and lead to higher profitability	⇑
Hayes and Wheelwright (1984)	A broad product line would result in high unit costs due to ever-increasing overhead expenses	⇓

⇑: positive effects of variety are outlined, e.g. increased revenues.

⇓: negative effects of variety are outlined, e.g. increased costs.

different effects: increased product variety produces a closer match between customer preferences and products offered, which then has the potential of increasing or maintaining market share and/or yielding higher prices. In addition, firms can enjoy lower costs with broad product lines if there are economies of scope, and they may be able to use them to deter entry into their industries. Finally, if broad product lines result in firms meeting each other in multiple markets, rivalries between them may decrease as they recognize the potential to benefit from constraining competition and engaging in mutual tolerance. However, higher product variety leads to larger forecast errors, excess inventory for some products and shortages for others, higher overhead and administrative costs, and higher manufacturing costs due to more specialized processes and materials, frequent changeovers, and demanding quality assurance procedures (Lee and Billington, 1994; Baker et al., 1986).

The root of these different perspectives is the fact that the magnitude of the effect of variety on revenues and/or costs depends not only on the finished product variety level but also on how variety is obtained, e.g., packaging, component commonality, bills of materials and product architecture (we will generically call it "product structure") (Randall, 2007; Agard and Penz, 2009), on how the supply chain is managed (Ramdas, 2003; Fujita, 2002), and on marketing decisions (Berry and Cooper, 1997). It is worth noting that the product structure and the finished product variety level are defined by the new product development process, whereas supply chain decisions are in the domain of supply chain management (SCM). Managerial decisions, the finished product variety level, the product structure and the supply chain configuration and tools therefore determine the effect of variety on revenues and/or costs. To maximize profit, these decisions should be taken contextually. We believe that the problem is complex.

In addition, some decisions regarding the product structure, such as standardization or product architecture definition, affect the finished product variety that can be obtained (Pine, 1993). Some other choices made while designing and managing the supply chain (e.g., plant capacity or inventory policy) can actually limit the ability of a company to offer product variety within the timeframe and at the cost that the customers are requesting. Thus, if these constraints are not taken into account, the variety that customers actually experience in the market can be lower than, for instance, that actually designed by the company.

We call the series of decisions whose interaction results in the variety actually distributed in the market the "process of variety reduction". This process is composed of decisions that reduce variety from a theoretically conceivable level, e.g. the number of different product concepts analyzed (or screened) by the company, to the operationally feasible one (at supply chain level), e.g. the number of different products actually available at a store. Also the assortment optimization process, i.e. the definition of the maximum level of variety to offer of a certain product group, (Vaagen and Wallace, 2008) can be seen as a variety reduction process.

Arguably, a model that depicts, for each process, the decisions that determine the variety that customers experience in the market could help managers define the level of variety to offer and make appropriate variety management decisions.

Therefore, the objectives of this work are as follows:

1. To develop a descriptive model that details the process of variety reduction in the consumer goods industry; and
2. To apply the model to a case study to prove its applicability.