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**FROM MASS CUSTOMIZATION TO CUSTOMIZATION:
AN OPPORTUNITY FOR ENTREPRENEURIAL DIFFERENTIATION**

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ABSTRACT

Small, entrepreneurial businesses must be able to successfully compete with both large, well-established firms and smaller, agile firms. By making use of modern technology to meet the product needs and wants of individual consumers, smaller firms can better position themselves as both mass producers and firms involved in mass customization. This study evaluates the present status of customization among smaller firms and identifies key success factors enhancing the implementation of product customization initiatives.

INTRODUCTION

A dilemma regularly facing entrepreneurs is the question of how to successfully position themselves against both larger, more financially stable competitors and smaller, nimble niche players. To be successful, the entrepreneur must often project an image of size, substance, and stability on an extremely limited budget but be agile and fast enough to pursue unique niche opportunities that may go unnoticed by the competition. A "look large, act small" motto is obviously challenging, but is frequently required in order to establish and retain a successful position in a crowded and competitive marketplace.

The relatively recent influx of technology enabling E-Marketing, E-Commerce, and M-Commerce initiatives has provided entrepreneurs the opportunity to project an image of a larger, perhaps more significant organization. But the use of technology goes far beyond the projection of a position in the market and encompasses many aspects of a firm's operations.

By taking advantage of technology to garner customer input and to produce products that meet specific, individual needs, smaller entrepreneurial ventures can build a loyal customer base and establish positions in markets often ignored by larger competitors.

Advances in technology in the product development realm, including agile and lean manufacturing, have led many firms from a mass production to a mass customization business model, signifying a dramatic shift of focus from "products to markets to niches to individual customers" (Pine 1993b, p. 225). Mass customization, or the "mass production of individually customized goods and services" (Pine 1993a, p. 26), drives firms to make this transition to customer driven production.

Recent declines in the American Customer Satisfaction Index have been interpreted, in part, as a loss in customer choice (Duray and Milligan, 1999). Mass customization attempts to address specific customer needs with products that are, in effect, developed by the customer. By allowing significant customer input into product development at any of a number of stages of the product development/distribution cycle, mass customization has brought with it a significant change in the way customers interact with firms.

ORIGINS AND STATUS OF MASS CUSTOMIZATION

While Toffler (1970) references the strategy to produce customized goods and services with mass production efficiency and cost in *Future Shock*; others give credit to Stanley Davis for coining the term mass customization in his 1987 book, *Future Perfect*. Davis suggested that the technology of the time restricted mass customization efforts but he believed the concept would prevail in the future. It is Joseph Pine II, however, who is widely regarded as the father of modern-day mass customization. In his hallmark work, *Mass Customization: The New Frontier in Business Competition*, Pine (1993) emphasizes that firms can use more current technology and reengineered processes to assist them in their successful move to mass customization. In fact, if there is a signature tool of mass customization, it may be the microprocessor. Philip Kotler went far in validating mass customization as a viable alternative for both large and small corporations with his declaration that, "We think there is a revolution in marketing today. It is called mass customization, and it is at least as valuable to small business as to large corporations." ("Tailoring...", 1993, p. 2).

Driven by customers with unique needs and wants and ever-increasing technological advancements, the further implementation of the mass customization doctrine by such noteworthy firms as Dell, Nike, Levi Strauss & Company, Lands' End, and Andersen Windows has prompted many firms to attempt applying the concept, but with varying degrees of success. On the industrial side alone, more than two-thirds (68%) of buyers state they have experienced an increased need for customized products or components over the past three years (Andel 2002). Although it cannot be claimed that the phenomenon is sweeping away the remains of mass production everywhere, there appear to be signs that it is becoming more and more widespread (Salvador, Forza, and Rungtusanatham 2002).

For the entrepreneur, the financial commitment required of a truly *mass* customized product may prove insurmountable. Spira and Pine (1993) refer to Computer-Aided Design and Computer-Aided Manufacturing systems (CAD/CAM), Computer Integrated Manufacturing (CIM), Flexible Manufacturing Systems (FMS), Computer Numerical Control (CNC), and Direct Numerical Control (DC) as all having a significant impact on the design and production processes required in a mass customization setting. On the customer information collection side of the equation, the Internet has greatly enhanced the amount of information firms can capture about their customers, thereby allowing manufacturers the capability to

respond quickly to customer demands for made-to-order products (Krizner 2001). And in spite of the on-going concerns associated with E-Commerce, the Internet's inherent ability to enhance communication with existing and potential customers makes mass customization far more practical and efficient. As Schonfeld (1998, p. 114) puts it, "A whole list of technological advances that make customization possible is finally in place." Unfortunately, for many entrepreneurs, the adoption of these advances is simply not financially feasible, and mass customization represents the unachievable *future* of manufacturing (Agrawal, Kumaresh and Mercer 2001).

Because of the high costs associated with much of the technology required for the implementation of mass customization, many small businesses have identified a viable alternative to *mass customized* products, the modern *customized* product. Not to be confused with the one-of-a-kind products associated with pre-mass production, or crafted products, a small business's *customized* product is one that addresses unique customer needs by taking advantage of current technology, but on a more limited scale and scope than is required in a true mass customization scenario. For example, a personal tailor is capable of tailoring suits on a very limited scale, serving at best only a few customers per day. These tailored suits would be considered crafted products. A small business's *customized* product, on the other hand, could utilize affordable technology, such as the Internet, to collect detailed customer information, and then take advantage of relatively inexpensive manufacturing technology to provide unique products that meet individual customer needs.

While the key to customizing on a mass scale may be digital technology or a combination of hardware, software, and new machines that fine-tune the production process, customization on a smaller scale may require less of a financial investment in expensive technology, but a similar commitment to customer needs and/or wants. The small firm committed to customization realizes the power that choice can play in the consumer decision-making process and that with a reasonable investment, consumers can be offered at least a limited degree of choice at a price that is, hopefully, similar to that charged for mass produced products.

In spite of the dramatic impact that mass customization, or a customization derivative, can have upon smaller American firms, empirical research addressing customization and smaller firms is virtually non-existent. Due to the substantial financial commitments required to implement a mass customization strategy, many small firms may consider the doctrine to be cost prohibitive and not a viable option. This study, therefore, focuses on the status of *customization* among America's smaller firms. The study investigates key customization issues of significant importance to smaller organizations considering product offerings tailored to meet the needs of individual customers within a smaller market niche.

It is hoped, that by better understanding the customization methods currently employed by smaller firms and the business results garnered from the concept's employment, entrepreneurs will be able to make more informed decisions regarding possible business ventures via customization initiatives.

METHODOLOGY

A Web-based questionnaire was developed asking where customization took place, the level of customization for products, goals for those products, and some general firm demographics. The specific items were developed from a literature review of mass customization and interviews with executives involved in mass customization. Firms that produced a single product answered 38 items; firms with multiple customized products answered 65 items.

Those firms that produced more than one customized product were asked the same series of questions about their most successful customized product and their least successful customized product, thus the questionnaire was somewhat longer.

A list of 3,834 firms that customized consumer products was developed from an Internet search, a literature review, and a customer list for a Web Custom Configurator¹ software firm. A pretest with a random sample of 15 firms indicated no major problems with any of the questionnaire items. The long version of the questionnaire took about ten minutes to complete. As an incentive to participate, participants could include their name and e-mail address for a drawing of a PDA. Firms were recruited by calling a systematic sample from the list of 3,834 potential participants. They were first screened to ensure that they customized products and that the contact person was involved and knowledgeable about those processes in the firm. Of the 290 firms that were contacted, 239 agreed to participate and were either sent an e-mail with the questionnaire Web address included as a link, or were given the Web address directly on the phone. Given the ease of agreeing on the phone and ignoring or forgetting e-mails, we expected substantially fewer firms to actually complete the survey; however, almost half of those agreeing on the phone to participate actually completed the survey. A total of 113 firms completed the questionnaire for a response rate of 39 percent of contacts and 47 percent of those who initially indicated a willingness to participate on the phone.

When the respondent completed the survey and hit the submit button, responses were automatically sent by e-mail to an address set up specifically for this study. Those responses were then entered into an SPSS database for analysis.

CUSTOMIZER PROFILE

Of the 113 firms that completed the questionnaire, most (88%) have been customizing products for five years or more, regardless of whether they customize a single product (32%) or multiple products (68%). A little more than half of the firms (53%) customized ten or more products. The majority (64%) indicated that the bulk of their sales (76-100%) came from customized products. There was a wide variety of types of customized products including apparel, art, furniture, graphics, sporting equipment, and tools, as shown in Table I.

Most firms (61%) had fewer than five employees. Only 16 percent had more than 25 employees. While the largest number of firms (26%) had annual sales of between \$25,000 and \$100,000, the distribution of sample firms in terms of annual revenues was relatively uniform between under \$25,000 and \$1,000,000 to \$5,000,000 as shown in Table II.

¹ A Web Custom Configurator is a software program that enables customers to define their customization requirements online. The customization information is then automatically integrated into the company's production.

Table I - Study Participant Products Customized

Product	Percent of Sample (n=113)
Apparel/Shoes	12%
Art	4%
Furniture	4%
Health Care	1%
Home - Outdoor	2%
Home Construction	3%
Household Products	9%
Jewelry	4%
Manufacturing/Design/Tools	11%
Misc	12%
Music	5%
Promotion/Mktg/Graphics	8%
Signs/Printing/Engraving	4%
Sports- Golf	2%
Sports- Marine	5%
Sports- Other	5%
Woodwork/Cabinetry	4%
None Listed	6%
TOTAL	100%

Table II - Study Participant Annual Sales Distribution

Annual Sales	Percent of Sample (n=113)
Less than \$25,000	14%
\$25,000-\$100,000	26%
\$100,000 - \$500,000	18%
\$500,000 - \$1,000,000	17%
\$1,000,000 - \$5,000,000	18%
More than \$5,000,000	7%

FINDINGS

The vast majority (87%) of firms indicated that mass customization was very important to the firm's business strategy. The methods by which customers could customize products included e-mail (87%), telephone (85%), and mail (63%). Fax (58%) and the Web (56%) were also methods that over half of firms said their customers used. However, when asked which were used most commonly by customers, telephone (25%), e-mail (22%), and the Web (22%) were the most frequent responses by far.

For those firms that used a Web Custom Configurator (22%), most (68%) developed it in-house. For firms that did not use a Web Custom Configurator, most (43%) did not use one because they felt the tools did not offer enough customization capabilities for their needs. Another 19 percent did not know such tools existed.

Table III compares the customization process for firms that customize only one product with those that customize multiple products. For firms with multiple customizable products, respondents were asked about the customization process for the most successful and the least successful products. Responses for all three categories of firms/products are shown in Table III. For ease of interpretation, not all item response categories are listed in Table III. Only those response categories that received a significant percentage of responses are included. Binomial tests were run to test for significant differences between single products, most successful products, and least successful products. Significant differences are noted in the table.

Table III - Customization Analysis

Item	Firms Customizing Multiple Products			
	Single Product (n=36)	Most Successful Product (n=75)	Least Successful Product (n=67)	
Length of Time Customizing Product	> 6 years: 64%	> 6 years: 65%	> 6 years: * 52%	
Number of Customizable Features	1-5: 42%	1-5: **25%	1-5: 45%	
	21+: 28%	21+: **43%	21+: 28%	
Number of Options for Most Customizable Feature	21+: 53%	21+: 54%	21+: **40%	
			1-5: 33%	
Number of Options for Least Customizable Feature	1-5: 59%	1-5: 50%	1-5: 53%	
Customizing Price Premium	0-5%: **38%	0-5%: 31%	0-5%: **22%	
			11-15%: 13%	
	36%+: 17%	36%+: **22%	36%+: **10%	
Difficulty of Customizing	Easy/Very Easy: 74%	Easy/Very Easy: 76%	Easy/Very Easy: *64%	
Where Customization Occurs:	Manuf: *86%	Manuf: *74%	Manuf: 77%	
	Whole: 23%	Whole: 22%	Whole: 22%	
	Retail: 30%	Retail: 34%	Retail: 28%	
Manufacturing: Design	73%	77%	83%	
Fabrication	63%	54%	54%	
Assembly	*53%	*38%	43%	
Add-on	33%	32%	*20%	
Wholesaler: Assembly	**50%	71%	80%	
Add-on	**13%	41%	40%	
Retailer: Assembly	*50%	*65%	58%	
Add-on	**70%	46%	53%	

*Significant at $p < .05$

**Significant at $p < .10$

NOTE: A row with one value asterisked indicates that the value is significantly different from the other two values in the row at the noted p-value. A row with multiple values asterisked indicates that those values are significantly different from each other at the noted p-value.

The questionnaire had a number of items asking about the number of features that could be customized, and for those features, the number of options a customer could select from. For example, a shoe might have four customizable features (size, width, material, and color), but each feature would have a different number of options to choose from (12 sizes, 4 widths, 3 materials, 4 colors). While firms were fairly similar with respect to customizing processes, several differences can be noted from the table. First, most firms had been customizing their products for more than six years, although fewer firms have been customizing their least successful product for that long ($p < .10$). This is not that surprising; firms would likely discontinue their least successful products, so the percentage of these products being produced for more than six years should be lower. As noted for the item 'Number of Customizable Features,' the most successful products for firms that customize multiple products have more

customizable features than either single product firms or less successful products ($p < .05$). The most customizable feature for all types of products generally had 21 or more options, but significantly fewer least successful products had this many options to customize ($p < .05$).

Very often, firms are able to charge a price premium for customization. Most firms in our sample had a price premium of 0-5 percent. However, firms with only one product are more likely to charge price premiums of 0-5 percent as compared to the least successful products ($p < .05$). The most successful product of multiple product firms is more likely to have a price premium of 36 percent or more ($p < .05$). The least successful products of multiple product firms show a different pattern of price premiums; they are less likely than other products to have either very high or very low premiums. Thus, it appears that more successful customizable products have a higher number of customizable features, which may enable firms to charge higher premiums.

In addition to the number of customizable features, the ease of customizing from the customers' perspective may also influence a product's success. We asked firms to rate how easy it is for their customers to customize the product. Most firms rated their products as Easy or Very Easy for customers to customize. However, this percentage was significantly lower for the least successful products ($p < .05$).

The participants were then asked a series of items about where customization occurred, recognizing that customization can occur at multiple locations even for the same product. The bulk of customizing occurs at the manufacturing level (74-86%). This is significantly more so for firms with only one product ($p < .10$) as compared to the most successful product for multi-product firms. Within manufacturing customization, single products (compared to multiple products) are more likely to be customized at the assembly stage ($p < .10$), and least successful products are less likely to be customized at the add-on stage ($p < .10$). For customization at the wholesaler stages, single products are less likely to be customized at both the assembly and add-on stages (both $p < .05$). When customizing through retailers, firms with single products are more likely to rely on retailers' customization at the add-on stage than firms with multiple products ($p < .05$) and less likely to have retailers customize at the assembly stage than most successful products ($p < .10$).

The results revealed some significant differences between firms that customize single versus multiple products and between successful and less successful customized products. Some of those differences are the number of customizable features, where the customization occurs, and the price premium charged for the customization. These are discussed in more detail later.

The questionnaire asked firms to indicate what goals they had for customizable products and how well the products met those goals. Table IV summarizes these questions for single and multiple product firms.

Generally, firms had multiple goals for their customizable products. The most common were customer satisfaction and awareness, with almost 100 percent of firms indicating they had these as goals for their customizable products. Other goals for over 90 percent of firms were revenue and profit. Firms with single products were slightly less likely to have ROI ($p < .10$), ROA ($p < .10$), and market share ($p < .05$) goals than the most successful products. For firms with multiple products, the least successful products were less likely to have ROI, ROA, revenue, and profit goals ($p < .10$ for all comparisons).

Table IV - Customization Goal Analysis

Goal	Firms Having Goal			Did not Meet Goals		
	<i>Sgl</i>	<i>MS</i>	<i>LS</i>	<i>Sgl</i>	<i>MS</i>	<i>LS</i>
	(n=35)	(n=75)	(n=54)	(n=35)	(n=75)	(n=54)
ROI	83%	*92%	83%	10%	10%	**44%
ROA	80%	*89%	79%	11%	6%	**43%
Revenue	94%	*95%	*89%	**18%	**7%	**47%
Profit	97%	*97%	*92%	21%	15%	**52%
Market Share	**64%	83%	83%	*10%	*21%	**49%
Customer Satisfaction	100%	**100%	**96%	*0%	*5%	**16%
Customer Awareness	**100%	96%	**92%	20%	18%	**41%
Brand Image/Positioning	79%	87%	85%	*15%	*27%	**49%
	Met Goals			Exceeded Goals		
Goal	<i>Sgl</i>	<i>MS</i>	<i>LS</i>	<i>Sgl</i>	<i>MS</i>	<i>LS</i>
	(n=35)	(n=75)	(n=54)	(n=35)	(n=75)	(n=54)
ROI	48%	43%	36%	41%	46%	**20%
ROA	46%	56%	50%	43%	38%	**7%
Revenue	39%	*51%	*38%	42%	41%	**15%
Profit	38%	**44%	**29%	41%	41%	**19%
Market Share	33%	37%	30%	*57%	*42%	**21%
Customer Satisfaction	11%	15%	**29%	89%	80%	**55%
Customer Awareness	34%	33%	31%	46%	49%	**29%
Brand Image/Positioning	*37%	*24%	29%	48%	48%	**22%

Sgl: Firms with Single Customizable Product

MS: Most Successful Product of Multiple Customizable Products

LS: Least Successful Product of Multiple Customizable Products

*Significant at $p < .05$

**Significant at $p < .10$ NOTE: A row with one value asterisked indicates that the value is significantly different from the other two values in the row at the noted p-value. A row with multiple values asterisked indicates that those values are significantly different from each other at the noted p-value.

Firms were also generally very good at meeting or exceeding their product goals. Even for the least successful products, a little more than 50 percent met or exceeded their goals. This is not terribly surprising, because products that performed much worse than that are likely to be discontinued. Goals most likely not met by single product firms included profit (21%), customer awareness (20%), and revenue (18%); by most successful products included brand image/positioning (27%), market share (21%), and customer awareness (18%). For the least successful products, slightly less than half did not meet any of their goals except customer satisfaction, and the percentage of least successful products not meeting their goals was significantly higher than both single products and most successful products ($p < .05$). In

addition, single products were more likely than multiple products to not meet goals for revenue ($p < .05$), but less likely than multiple products to not meet goals for market share ($p < .10$), customer satisfaction ($p < .10$), and brand image ($p < .10$).

All products were most successful at exceeding customer satisfaction goals (single: 89%, most successful: 80%, least successful: 55%), although this was significantly lower for least successful products ($p < .05$). In addition to customer satisfaction goals, the most successful products were most likely to exceed goals for customer awareness (49%) and brand image/positioning (48%). In addition to customer satisfaction goals, over half (57%) of single product firms also exceeded their market share goals, and this was significantly higher than the percentage of both most successful ($p < .10$) and least successful ($p < .05$) products for multiple product firms.

DISCUSSION

Customization represents a viable option for small firms seeking to increase their customer base, enhance customer satisfaction, and position themselves against large firms and small niche players. The literature on customization seems to associate this approach primarily with large firms. Notable cases include Dell, Nike, Levi Strauss & Company, Land's End, and Anderson Windows, all veritable giants in comparison to smaller firms. Little research has been done on the practices of small customizing firms.

Research is needed in this area as small firms continue to be a major source of wealth and employment creation in the U.S. Firms with fewer than 500 employees account for more than 99 percent of all business establishments and employ 49.8 percent of the workforce (U.S. Small Business Administration 2001). Given the specifics of small businesses, it is essential to validate the application of customization within the context of these firms and to distinguish successful and unsuccessful business practices as their success is of paramount importance. This research sought to provide a profile of small customizing firms and identify the set of business practices utilized by those firms succeeding at customization. Three success factors stand out that differentiate successful and not-so-successful small customizing firms. In particular, small firms should consider customization as a competitive tool and 1) develop a set of metrics to evaluate their customizing efforts, 2) offer multiple products for customization and implement a premium pricing strategy, and 3) utilize technology to achieve goals whenever possible.

Success Factor #1: Develop a Set of Metrics to Evaluate Customization Efforts

Small firms considering customizing should establish several metrics as an assessment tool. The firms surveyed utilized objective goals such as ROI, ROA, revenue, profit, and market share, as well as, subjective goals, which included customer satisfaction, customer awareness, and brand image/position.

While the majority of entrepreneurs surveyed embraced all objective and subjective goals, customer satisfaction stands out as an accomplishment for firms succeeding at customization, regardless of whether firms customize one or multiple products. In fact, exceeding at all three subjective goals (customer satisfaction, customer awareness, and brand image/positioning) distinguishes successful from non-successful customizing firms. This finding is significant as it supports research on large firms, which suggests that a 1-point rise in a firm's customer satisfaction index corresponds to an average \$240 million increase in market share (Sweat 1999). While this statistic is impressive for large firms, small firms can also reap the benefits of exceptional customer satisfaction.

Firms succeeding at customization also perform better at achieving objective goals than their non-successful counterparts. In particular, increasing market share seems to be a top achievement for firms customizing one or more products, and although it is a goal for fewer single product firms, they seem to be more successful at exceeding this goal. Since the majority of firms surveyed indicated that 76 percent or more of their sales are derived from customization, it is no surprise that successful firms pay close attention and fare better. Therefore, we suggest that firms currently involved or considering customization set up objective and subjective metrics and pay close attention to the outcome of both.

Success Factor #2: Select Multiple Products to Customize and Implement a Premium Pricing Strategy

Our research revealed over half of the firms surveyed customized ten or more products and have more customizable features than firms customizing a single product or firms with unsuccessful products. Providing customers with an assortment of products and alternatives enhances the opportunity for increased sales for firms.

Premium pricing was also found to be advantageous, particularly for firms offering multiple customizable products. Research shows that items marketed over the Internet and perceived to be heterogeneous are least likely to experience strong competition (Bakos 1998, Brynjolfsson and Smith 2000). This is primarily due to perceived differences by customers among products and firms with respect to non-pricing related issues such as efficiency, ease of shopping and delivery, and assortment and variety. In our survey, more firms charged a premium of 36 percent for successful customizable products, while most firms offering a single product charged 5 percent or less. The perceived price differential between firms customizing a single product and those offering multiple products may be attributed to a wider assortment of products from which to select and a variety of customizable features and options offered.

Success Factor #3: Utilize Technology to Achieve Goals

Customizing success requires providing customers with an assortment of products from which to choose. However, close attention must be paid to the use of computers and the Internet. In this survey, customers used the telephone, e-mail, and the Web to customize their product selection. Research and anecdotal evidence, however, both seem to suggest that small businesses are not ardent users of computer and information technology (Howard 1997). Numerous studies on small firms all seem to point to the same conclusion, "small firms have to keep pace with technological changes if they want to keep a competitive advantage" (Bridge and Peel 1999). The U.S. Small Business Administration also estimates that 47 percent of small businesses have access to the Internet, however, only 35 percent actually maintain a web site (U.S. Small Business Administration 1999). Only 16 percent of small businesses that use the Internet are selling product or taking sales leads over this important medium (Computer Industry 1998).

In addition, small businesses tend to have a low level of information technology expertise and do not take advantage of the tremendous power afforded by the Internet and current technology (Polland and Hayne 1998). Only a small number of firms surveyed used a web custom configurator (22) and 19 percent of firms were unaware that a web custom configurator was available to help electronically customize products for them. Electronic presence on the Internet allows small firms to compete directly with large firms and therefore

serves as a source of competitive advantage. Therefore, small firms that want to be successful at customizing should seek continued improvements in information technology and use the Internet to increase sales and marketplace presence. Remember, firms do not need to be large to compete at customization. Most of the firms surveyed had sales of less than \$5 million and had one to four employees working for them. However, over 87 percent of firms felt that customization was a very important part of their business strategy.

The results of this research provide valuable insights for entrepreneurs currently involved or considering customization by providing a set of practices utilized by successful firms. In particular, small firms may succeed at customizing by establishing metrics early in the process, providing multiple product offerings to customers and premium price products to achieve enhanced effectiveness, and utilizing improvements in technology whenever possible.

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