Proactive Marketing Orientation in the U.S. Medical Manufacturing Industry

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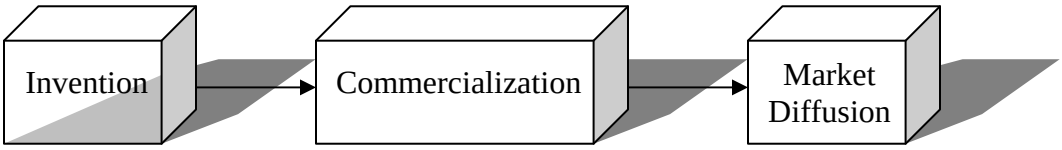
Many constructs have been put forth and analyzed to help explain, manage, and even predict an organization's innovative ability. One such construct is that of proactive market orientation (Narver, Slater, & MacLachlan, 2004), which focuses uniquely on identifying future unmet needs of customers. This approach infers that a firm is committed to understanding its customers in ways that allow it to provide innovations that customers have not yet realized they need. Previous research on the topic of proactive market orientation is broadly applied to multiple industries. This study empirically evaluates the application of proactive market orientation within the U.S. medical manufacturing industry; specifically, whether organizations exhibiting a proactive market orientation perform better than their counterparts in terms of innovative products or finances.

CHARACTERIZING INNOVATION

The topic of innovation has received a great deal of attention in the last several decades, from both a managerial standpoint and within academic literature. Within the medical industry, new products, services, and information are viewed not only in terms of their competitive advantage, but also by how they relieve suffering and enrich the human experience. A presupposition to having a competitive advantage is the idea that a product one company offers has the ability to meet customer needs better than other competing products (Chomka, 2004; Slater & Narver, 1998). While the appropriate source of innovation continues to be discussed, innovation's contribution to an organization's success is well documented.

Though the definitions of innovation are many and varied, three basic models are considered as a foundation for this study. The first, provided by James Utterback (1971), presents a three-phase description of innovation: invention or the solution to a problem, implementation of the invention into a commercial product, and diffusion of the new product into a market (Figure 1).

FIGURE 1
THREE PHASES OF INNOVATION ADAPTED FROM UTTERBACK



Failure to manage all three phases of this process increases the risk of loss in market leadership.

The second model (Figure 2) characterizes innovation as existing within a continuum from incremental to radical innovation (Alam, 2003; McDermott & O'Connor, 2002).

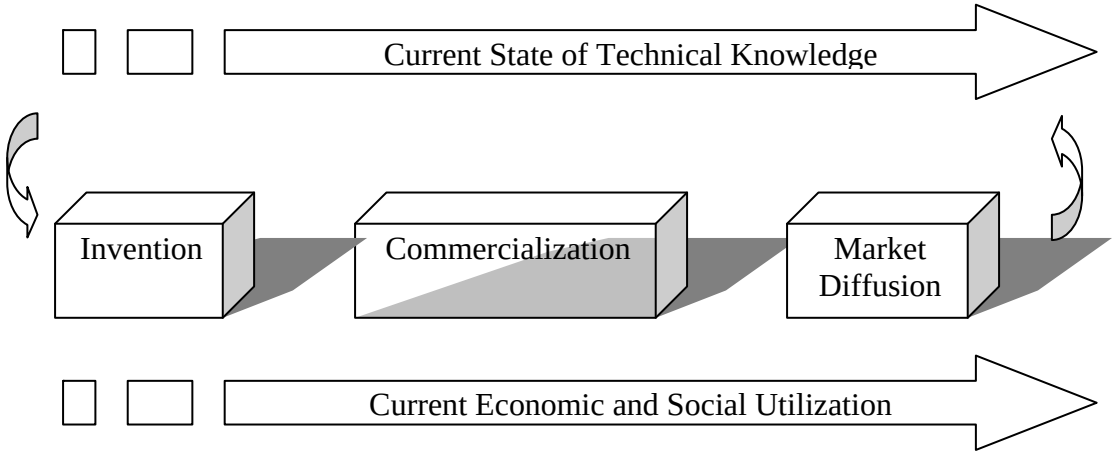
FIGURE 2
THE INNOVATION CONTINUUM ADAPTED FROM ALAM

Incremental innovation focuses on improving existing products or categories of products with which users are already comfortable. Radical product innovation, however, involves dramatic behavioral changes by the user and/or the market and typically includes developing or applying new technologies. Additionally, this type of innovation is usually characterized by long-term development programs and significant market diffusion challenges (McDermott & O'Connor, 2002; Utterback, 1971). This study utilizes the constructs of *new-to-industry* (new products utilizing technologies from other industries) and *new-to-world* (first-generation products with no comparative equivalent) to capture the levels of truly innovative new products.

The final model considered in this study is that of technology push versus market pull. Tidd and Bodley (2002) maintain that the two prevailing starting points from which a firm can embark in order to provide a fulfillment of customer needs are (1) to seek the application of technology to solve a customer's problem, commonly referred to as technology push; and (2) to understand the market needs and seek solutions for those needs, which is referred to as market pull. Many individuals voice their concern that a market pull strategy lacks the critical technical focus to promote true innovation (Bennett & Cooper, 1979, 1981; Christensen, 1997, 2001; Gordon, 2000; Hayes & Abernathy, 1980; Webster, 1994). In this context, technology push is thought of as the appropriate alternative to market pull; since it essentially states that the firm is motivated to utilize state-of-the-art technology for their products based on the premise that consumers prefer technologically superior products and services (Zheng Zhou, Yim, & Tse, 2005).

One of the clearest voices in providing a context for understanding technology push and market pull is James Utterback (1971). In his model for technical innovation (Figure 3), he suggests that the state of technical information continues to move forward while, within a somewhat independent context, the economic and social utilization also change over time. He indicates that both current technical knowledge and the current state of the market influence the potential of invention, commercialization, and market diffusion. This presents a model that links technology with market needs making the argument for technology push versus market pull unnecessary.

FIGURE 3
THE PROCESS OF TECHNOLOGY INNOVATION ADAPTED FROM UTTERBACK



Regardless of one's approach to innovation, there is considerable agreement that innovation is at the heart of success for new products and the firms that introduce them. Calantone, Schmidt, and Song (1996) find that products introduced within the past three to five years can account for more than 25% of the current revenues of most firms. A more recent study shows that a few large medical device companies report as much as 70% of their current year revenues are derived from products introduced within the previous two years (Alltucker, 2007).

The Marketing Concept and Market Orientation

The conceptual framework for this research is based on both the *marketing concept* and *market orientation.* Kohli and Jaworksi (1990), among others, contrast the marketing *concept* as a "business philosophy" to that of market *orientation* as the "implementation" of the marketing concept, which yields specific activities and behaviors of an organization. One of the earliest, clear explanations of the marketing concept is put forward by Barksdale and Darden (1971) as having two basic notions: the customer is recognized as the focal point for all business decisions; and profit, rather than sales volume, is the criterion for evaluating marketing activities.

There are challenges to the hegemony of the marketing concept, even within the marketing discipline itself (Bell & Emory, 1971; Hayes & Abernathy, 1980). Among early criticisms is the notion of the lack of breadth of application or inclusiveness within the marketing concept (Kotler & Levy, 1969). Another criticism to the marketing concept, regarding its negative impact on new product innovation, emerges in the early 1970s (Bennett & Cooper, 1981). Both of these challenges to the marketing concept are of importance to this study, as both have significant ramifications within the current U.S. medical manufacturing environment; indeed, if these criticisms were to prove true, those medical manufacturers which focus on customer needs will not be as innovative as those who choose alternate business philosophies.

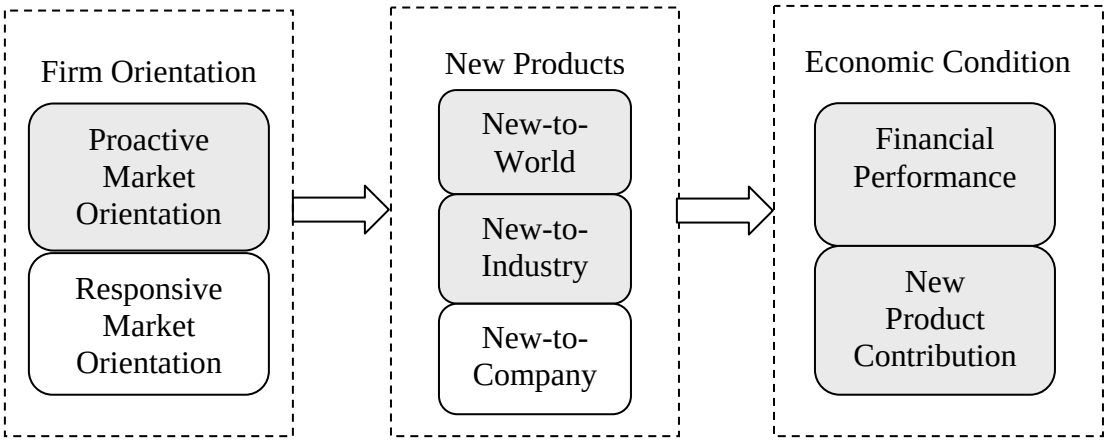
Measurement Scales and Proactive Market Orientation

Narver and Slater (1990) first published their research results from MKTOR, the market orientation research tool they developed, in 1990. MKTOR includes 15 questions that evaluate customer orientation, competitor orientation, and inter-functional coordination. Over a decade after Narver and Slater created their MKTOR scale, Narver, Slater and MacLachlan (2004) set

out to improve it to include the construct of proactive market orientation. They renamed the existing construct of market orientation as 'responsive' market orientation and developed MOPRO, a scale to measure 'proactive' market orientation. Using a dataset of 120 respondents to their survey, they were able to purify 34 items on the MOPRO scale down to 8 items. Narver et al. followed both Churchill's (1979) and Gerbing and Anderson's (1988) scale development recommendations to produce a responsive (MORTN) and proactive (MOPRO) market orientation scale with appropriate validation. Their MOPRO scale is used to determine proactive market orientation in this study.

Narver et al. (2004) posit that definitions of market orientation previous to their research fall into the classification of responsive market orientation, due to the lack of an explicit focus on future customer needs. Based on this rationale, proactive market orientation was chosen as the most appropriate construct to utilize within this research. Because many new-to-company products already exist in competitive terms within the industry and are created in response to a competitor's product, not in a direct response to a customer need, they are better classified as responsive market orientation efforts. As such, new-to-company products are deemed to be inappropriate indicators of proactive market orientation and are excluded from this study. Figure 4 depicts the specific relationships that are evaluated in this study.

FIGURE 4
MODEL WITH SPECIFIC COMPONENTS STUDIED IN THIS RESEARCH.



U.S. MEDICAL MANUFACTURING INDUSTRY

Medical manufacturers are a subset of the U.S. healthcare system, which garners significant attention with regard to its high rate of cost increases. The estimated U.S. healthcare spending for 2007 in the United States was $2.3 trillion, or 16% of the Gross Domestic Product (GDP), which was growing at an annual rate of 6.7%. Federal government estimates suggest that healthcare spending will reach $3 trillion in 2012 ("National Health Expenditure," 2007). Despite this high amount of spending, an estimated 47 million Americans do not have access to healthcare coverage (DeNavas-Walt, Proctor, & Smith, 2008) and the U.S. healthcare system ranked 37th out of 191 countries for health system performance in the 2000 World Health Report ("U.S. Health System," 2003). Practically speaking, these dynamics put tremendous pressure on

contributing industries, including medical manufacturers, to reduce system costs while continuing to produce innovative products.

Another characteristic of the U.S. medical manufacturing industry is the fact that it is regulated by the Food and Drug Administration (FDA), which manages the requirements for development, manufacturing, and promotion of medical products. The FDA also has enforcement mechanisms, including mandatory recall of products and consent decrees, should they deem the company is in sufficient violation of federal regulations ("FDA Medical Devices," 1999). This dimension within the industry provides a significant risk-management component against which new products must be evaluated and presents unique constraints that can influence U.S. medical manufacturer's proclivity toward market orientation.

Not only do firms within the medical manufacturing industry deal with these cost and risk factors, they must also provide product solutions that give them a competitive advantage. The view that the medical manufacturing industry has the leading edge in its innovative products and services is prominent (Rochford & Rudelius, 1997). Therefore, the firms in this industry must also deal with the pressure from the stock market to maintain growth and earnings rates commensurate with these de facto expectations. The former U.S. Surgeon General C. Everett Koop illustrated the prevailing challenge when he stated, "Americans want three things from their healthcare system: immediate access, low cost, and high-tech medicine. While it's easy to deliver any two of these things, it may be impossible to have all three" (Vagelos, 1993).

Because the medical manufacturing industry affects so many aspects of the economy and impacts the quality of health for the entire country, its ability to progress within the known constraints and expectations is paramount. Therefore, it is instructive to understand the influence of proactive market orientation within this context and whether those firms which embrace this construct perform better than their counterparts who do not.

RESEARCH DESIGN

This study is based on the following questions relating to market orientation within the U.S. medical manufacturing industry which, to date, have not been researched: "Do U.S. medical manufacturing firms rely on market orientation for the development of their new products," "Is there evidence which suggests that market-oriented firms in the U.S. medical manufacturing industry perform better than their counterparts," and "Given that new and improved medical treatments are consistently being sought after, are the most innovative firms in the U.S. medical manufacturing industry market-oriented?" In examining these questions, this research query is posited: "Is there a relationship between market orientation and firm performance within the U.S. medical manufacturing industry?"

The dependent variable of this study is overall firm economic performance, which is separated into two distinct parts: financial performance and the contribution of new products toward overall sales. The independent variables of the study are market orientation and new product innovation. Market orientation is operationalized as proactive market orientation (Narver et al., 2004) and is established by utilizing existing market orientation survey tools. Firm performance and innovation are established by self-reporting mechanisms, which is consistent with other studies performed within this topic area (Jaworski & Kohli, 1993; Matear, Osborne, Garrett & Gray, 2002; Matsuno, Mentzer & Rentz, 2000; Narver et al., 2004; Singh, 2003, 2004; Slater & Narver, 1994, 2000).

Study Propositions

Based on the research questions, five propositions are put forward. The first addresses the relationship between a firm's market orientation and its financial performance in the U.S. medical manufacturing industry:

> P_1: There is a positive relationship between a proactive market orientation and the financial performance of firms within the U.S. medical manufacturing industry.

It is expected that firms which embrace a proactive market orientation will perform better financially than those with a more responsive approach.

The next proposition addresses the relationship between market orientation and firm performance, regarding new product contribution:

> P_2: There is a positive relationship between a proactive market orientation and a firm's new product contribution rate within the U.S. medical manufacturing industry.

Intrinsic to the belief that new product success is related to proactive market orientation is the assumption that new products provide a competitive advantage for a firm (Agarwal, Erramilli & Dev, 2003; Akgün et al., 2004; Brenner & Tushman, 2003; Christensen, 2001; Langerak, Hultink & Robben, 2004; Tidd & Bodley, 2002). Therefore, one indicator of the innovation performance of a firm is its *new product contribution* (NPC) (Langerak et al., 2004). NPC is defined as the percent of annual revenue contributed by products introduced within the last specified number of years. This is represented by the following formulae:

$$\textbf{NPC} = \frac{\text{revenue from products introduced within (x) years}}{\text{annual revenue}}$$

For this study, the number of years (x) is set at three. Though not definitively a standard, many firms already track new product contribution using this metric.

The third proposition relates to the relationship between market orientation and the number of innovative products a firm has introduced within the last three years:

> P_3: There is a positive relationship between a proactive market orientation and the number of innovative products a firm has introduced within the last three years in the U.S. medical manufacturing industry.

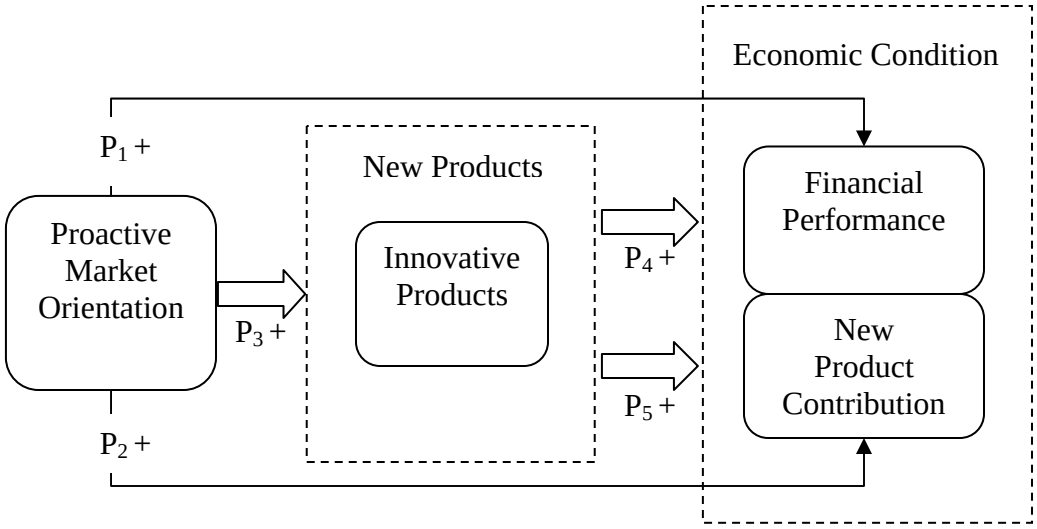
The number of new products a firm has introduced over the course of the past three years is indicative of the innovative nature of that firm.

The final two propositions relate to the impact the number of innovative products introduced has on overall firm performance:

> P_4: There is a positive relationship between the number of innovative products introduced in the last three years and a firm's financial performance within the U.S. medical manufacturing industry.
>
> P_5: There is a positive relationship between the number of innovative products introduced in the last three years and a firm's new product contribution rate within the U.S. medical manufacturing industry.

It is expected that the number of innovative products introduced will positively affect the firm's financial performance and will also positively affect the new product contribution. Figure 5 depicts the propositions and relationships examined in this study.

FIGURE 5
MODEL OF SPECIFIC COMPONENTS
WITH PROPOSITIONS AND ANTICIPATED DIRECTION OF RELATIONSHIP



DATA ANALYSIS RESULTS

Statistical Framework

The descriptive statistics utilized to establish that the study population is representative of the industry are response profile and rate, company size, and public versus private ownership. Non-response bias is evaluated by a ratio comparison of respondents to population for public versus private representation and firm size profiles. Data validity and reliability and scale reliability are addressed by an analysis for distribution normalcy and a Cronbach's alpha analysis, respectively. All five propositions are evaluated through correlation regression analysis to determine the significance, strength, and direction of relationships.

Analysis of Survey Respondents

Research surveys entitled "U.S. Medical Manufacturer's Best Practices Survey," were sent to senior-level managers of medical manufacturing firms in the United States. The population for the study was selected from the Dun and Bradstreet database of Standard Industry Classification (SIC) codes for surgical and medical instruments, surgical appliances and supplies, X-ray apparatus and tubes, and electromedical equipment. The data collection was done in two phases. The initial phase included the use of multiple mailings, e-mail follow-up, and phone contact follow-up with a population of 636 firms. The response rate for the initial mailing was 1.4% (9 responses). Two additional postal mailings to the same 636 firms yielded an additional 1.4% response rate (9 responses); which totaled a 2.8% response rate for all three postal mailings. Phone contact follow-up was conducted with 200 firms, which produced a 4.5% response rate, or an additional 9 responses; however, while this response rate was higher than that of the postal mailings, only 2% of the responses (4 responses) were from the intended group of presidents or

general managers. Finally, an e-mail follow-up approach was utilized with approximately 400 firms, yielding a 1.25% response rate (5 responses).

Based on the results of the survey follow-up methodology investigation, a single postal mailing to a larger population was chosen as the most effective way to obtain data from medical manufacturing industry firms. Therefore, the second phase of the data collection utilized a single postal mailing to 6,050 firms, which were identified from the Dun and Bradstreet database for the four SIC codes of interest. The surveys were sent to the president, chief executive officer, or owner of each firm. The cover letter did allow for delegation of completion of the survey and provided guidance on the selection criteria for such delegates. A total of 113 usable surveys were obtained from a combined mailing of 6,392 effective surveys, yielding a 1.77% response rate. While this response rate may seem low, it is reasonable when viewed in the context of previous market orientation research and when considering the sensitive nature of the requested information. The survey respondents of this study yield a comparable study-group size (113 responses) to those of the studies listed in Table 1. The 113 responses are also consistent with Alreck & Settle's (1995, p. 62) suggestion that a minimum of 100 respondents is adequate to represent even a large population.

TABLE 1
PREVIOUS MARKET ORIENTATION STUDIES

Author(s)	Population/ Sample	Observations (N)	Reported Response Rate	% of Population
Jaworski & Kohli (1993)	49 MSI member roster	13 Companies	26.5%	n/a
	Top 1000 US Corporations	102 out of 500 firms contacted	20.4%	10.2%
Langerak, Hultink & Roben (2004)	475 Dutch Firms	126 out of 315 eligible	40%	26.5%
Lee & Tsai (2005)	1300 Taiwan Companies	100 out of 230 contacted	44%	7.7%
Narver, Slater, MacLaughlan (2004)	25 Companies – 41 SBUs	120 (3 per business unit)	98%	n/a
Singh (2003)	3 Cities in India	138 firms	unknown	n/a
Singh (2004)	407 UK Firms	93 firms	23%	22.8%
Slater & Narver (1994)	2 US Conglomerates	107 SBUs out of 117 SBUs	91.5%	n/a

MSI = Marketing Science Institute.
SBU = Strategic business unit.

In the majority of cases, the surveys for this study were completed by a chief executive officer, president, owner, or other senior executive of the firm. A small percentage of surveys

were completed by an individual identified as someone other than a senior executive of the firm (see Table 2). Also, the profiles of firms who responded to the survey were compared to the population for representation of size. Table 3 shows the comparison between the profiles of firms within the survey population and those of the respondents.

TABLE 2
RESPONDENT SUMMARY

Respondent Title	N	Percent	Cumulative Percent
CEO, President	71	64.0	64.0
VP, GM, Director	23	20.7	84.7
Other	17	15.3	100.0

TABLE 3
FIRM SIZE COMPARISONS

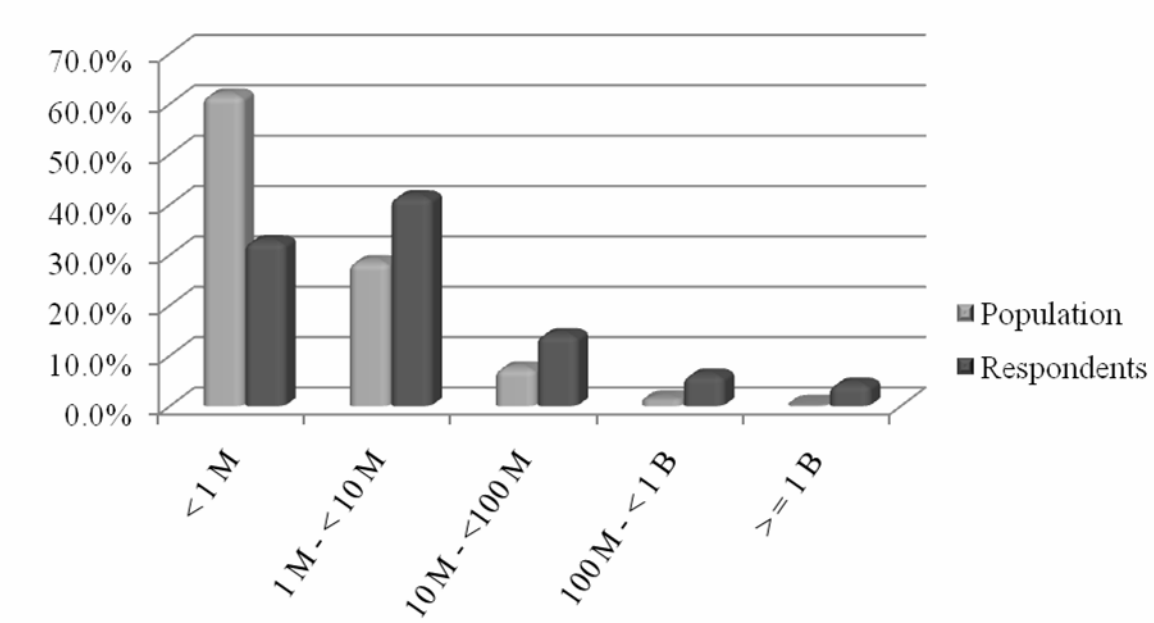
	Count		Percentages	
Annual Sales U.S. $	Survey Population	Respondents	Survey Population	Respondents
< 1 M	4450	64	61.8	32.7
1 M - < 10 M	1653	48	28.7	41.6
10 M - < 100 M	437	16	7.6	14.2
100 M - < 1B	94	7	1.6	6.2
>= 1 B	18	5	0.3	4.4

B = Billion; M = Million.

The annual sales revenues of the surveyed firms were supplied by the Dun and Bradstreet database and were broken into nine segments, ranging from less than $500,000 in annual sales to greater than or equal to $1 billion in annual sales. For purposes of reporting the results, the nine categories were collapsed into five, which represent different management operating environments based on revenue.

The results indicate that the data is under-represented in only the smallest collapsed category of firms; those with less than $1 million revenue per year. The remaining categories, those firms with over $1 million revenue per year, are consistently more highly represented when compared to the population. Figure 6 shows the category relationships between the overall population and the respondents. Based on the fact that a higher number of the respondents represented large firms, the results of this research are likely more strongly applicable to large firms. Figure 6 also demonstrates that the respondents follow a similar trend to the population, again with exception to the smallest category, and, therefore, show a good fit with the population profile.

FIGURE 6
COMPARISON OF POPULATION TO SURVEY RESPONDENTS FOR FIRM SIZE



Respondents were asked to provide data regarding the number of new products introduced per year over a three-year period, as well as the percentage of revenue in the current year derived from those new products. They were also asked to indicate whether the firm officially tracked each of these items or if their responses were based on a self-reported estimate (see Table 4).

TABLE 4
TRACKING OF NPC AND NEW PRODUCTS

	NPC		New Products	
	Frequency	Percentage	Frequency	Percentage
Officially Tracked	36	34.0	40	38.8
Self-reported Estimate	70	66.0	63	61.2
Missing	7	-	10	-
Total	113	100.0	113	100

Ten respondents did not mark either option. Of the completed responses, 38.8% of the firms officially tracked new product introductions over the three-year period, while a slightly lower percentage (34%) officially tracked the new product contribution. Potential bias based on tracking methodology was assessed and is discussed in detail in the Data Validity and Reliability section.

Because new products introduced within the last three years are anticipated to be a key indicator of a firm's innovativeness, respondents were asked to list the number of new products

introduced in each category (new-to-company, new–to-industry, and new-to-world) for each of the last three years. The results for each of the three years were then totaled by category for analysis; however, only new-to-world and new-to-industry products were utilized for this analysis. The sample was reviewed and adjusted for outliers, based on extreme product counts in each of the categories. This was done primarily due to a small number of firms that produce custom products and have new products that number from several hundred to over a thousand per year. An adjustment for outliers was necessary given that these responses were orders of magnitude higher than the mean response. The method utilized was to recode outliers as three standard deviations plus one above the mean. Table 5 lists the outlier adjusted mean responses for innovative products introduced within the last three years. The mean reported is from the total of the three years. The survey respondents reported introducing an average of 4.48 innovative products in the last three years, or about 1.5 innovative products per year.

TABLE 5
INNOVATIVE PRODUCTS INTRODUCED IN THE LAST 3 YEARS - OUTLIER ADJUSTED

	N	Min	Max	Mean	SD
Innovative Products	113	0	23	4.48	5.146

Respondents were evaluated to determine whether their firm was a publicly traded or private firm. This determination was made by establishing whether the firm name was listed with the Securities and Exchange Commission through their online EDGAR database. For those firms not listed in the EDGAR database, the firm website was evaluated to determine whether there existed any affiliation with a publicly traded firm. If neither of these criteria were met, the firm was coded as a private firm. Table 6 provides the breakdown of public and private firms from the survey respondents.

TABLE 6
PUBLIC OR PRIVATE FIRM

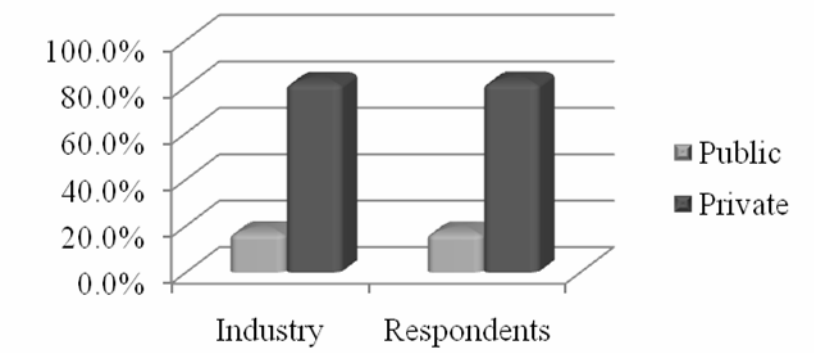
	Frequency	Percentage
Public Firm	20	17.7
Private Firm	93	82.3
Total	113	100.0

The figure of 82.3% private firms is reasonable, given the large number of small, private firms (90% < $10 million annual revenue) within the industry. Also, a sampling of 226 of the original 6050 firms listed with Dun and Bradstreet, twice the number of survey respondents, was taken to ascertain the proportion of population that was public versus private.

Firms were also checked for inclusion within the EDGAR database. Those not listed within the EDGAR database were evaluated for evidence of ownership by a corporation and verified for active firm status. The Reference U.S. database was utilized to evaluate firms for business status (active or non-active), as well as reference to ownership by another business entity. Figure 7 shows the graphical comparison between the respondents and the industry, with regard to private

versus public firms. In total, 152 of the 226 firms had an active status, of which 27(17.8%) were publicly traded firms and 125 (82.2%) were private firms. This high comparability between the survey respondents and the population further suggests that the data are highly representative of the industry population.

FIGURE 7
COMPARISON OF PUBLIC VERSUS PRIVATE FIRM STATUS



The proactive market orientation and financial performance survey questions were reported on a seven-point scale. Proactive market orientation was established utilizing Narver et al.'s (2004) MOPRO instrument, which utilizes eight questions scored on a seven-point Likert scale. The financial performance questions were recorded on a Stapel scale of -3 to +3, with corresponding descriptions of "much smaller than" to "much greater than" the firm's next closest competitor. These responses were then recoded as 1 through 7 to provide a standardized score.

New product contribution was reported as a percentage of sales revenue derived from innovative products introduced within the last three years. The respondents were given seven options for consistency of reporting measure (<5%, 5 - <10%, 10 - <20%, 20 - <30, 30 - <40%, 40 - <50%, and 50% & >). This measure did not isolate the contribution of new-to-company products. It was deemed unrealistic to request that respondents separate this portion of the contribution; therefore, it was accepted as an unresolved factor to the reported value. Table 7 shows the dispersion of the population among the seven categories.

TABLE 7
NEW PRODUCT CONTRIBUTION RATE

	Frequency	Percentage
<5%	18	15.9
5% - <10%	16	14.2
10% - <20%	21	18.6
20% - <30%	16	14.2
30% - <40%	11	9.7
40% - <50%	4	3.5
50% - >	24	21.2
Missing	3	2.7
Total	113	100.0

Public firms had a higher average score for new product contribution rate than did private firms (Mean 4.89 versus 3.64, df=108, p<.05). It would seem to follow that the private firms would have lower financial performance, as well; however, they did not. Public firms were not statistically superior to private firms in financial performance or the number of innovative products introduced in the past three years. Table 8 summarizes the performance variables according to public versus private firm status.

TABLE 8
PERFORMANCE VARIABLE STATISTICS
FOR PUBLIC AND PRIVATE FIRMS

	Public or Private Firm	N	Mean	SD
New Product Contribution	Public	19	4.89*	2.21
	Private	91	3.64*	2.04
Financial Performance	Public	19	16.16	3.45
	Private	91	15.63	3.76
Innovative Products	Public	20	5.95	5.92
	Private	93	4.16	4.94

* p <.05

Data Validity and Reliability

The proactive market orientation scale, MOPRO, has demonstrated high reliability with a reported Cronbach's Alpha of .884 (Narver et al., 2004). A confirmatory reliability analysis was run on the data set from this study and a Cronbach's Alpha of .803 was reported. While this result is slightly lower than the result reported by Narver et al. (2004), it is well above the suggested cut-off of .60 for Cronbach's Alpha (Singh, 2004, p.114) and, therefore, is considered acceptable. Financial performance was established using three components: ROI, profitability, and sales growth. The financial performance survey questions were evaluated for reliability and demonstrated a Cronbach's Alpha of .901. Table 9 provides a comparative analysis of the MOPRO scale reliability scores between the Narver et al. (2004) study and the results from this study.

TABLE 9
CRONBACH'S ALPHA FOR BUSINESS
ORIENTATION QUESTIONS

	Previous Study [a]	Current Study [a]
Proactive Market Orientation	0.884	0.803

[a] Cronbach's Alpha

Independent t-tests were performed on both new product contribution and the number of innovative products introduced in the last three years to further evaluate the validity of the self-reported data. No statistical difference was found, t (103) = .654, p = .514 (two-tailed), d = .064, in new product contribution based on officially tracked (*M=4.03, SD=2.307)* versus self-reported data (*M=3.74, SD=2.005).* Similarly, there was no statistical difference, t (101) = .229,

p = .819 (two-tailed), *d* = .023, in innovative products introduced within the last three years based on officially tracked (*M=4.75, SD=5.973)* versus self-reported data (*M=4.51, SD=4.704)*. These results strongly support previous research, which suggests that self-reported data for business performance characteristics is both useful and valid (Dess & Robinson, 1984; Pearce, Robbins, & Robinson, 1987).

The variables of new product contribution and the number of innovative products introduced in the last three years were also evaluated for normalcy of distribution. New product contribution, D(113) = 0.16, p<.001, and the number of innovative products introduced in the last three years, D(113) = 0.19, p<.001, were both significantly non-normal according to the Kolmogorov-Smirnov normalcy test. However, the skew of the new product contribution was not significant at a .05 confidence level. Further evaluation of the number of innovative products introduced in the last three years showed that a high frequency (27.4%) of the lower boundary value of zero could not be transformed into a normal distribution by log, square root, or reciprocal treatment.

In practical terms, the distribution of innovative products introduced in the last three years is an expected reality. The median of this distribution is 3. The reality is that many firms are not introducing innovative new products and the variable may not be given to normal variance tendencies. Therefore, no transformation was applied to the data. Propositions were tested using SPSS version 14. Correlation and regression analyses were used to determine the covariance (r), the amount of variance explained by the regression model (R squared), and to test whether a statistically significant relationship existed. Each proposition was evaluated against the total sample of respondents. Table 10 provides a summary of the regression results for all five propositions.

TABLE 10
PROPOSITION REGRESSION SUMMARY

Regression Summary

Proposition	R	R Square	Beta	df	Sig.
1 (PMO[a] vs FP[b])	.462[a]	0.213	.217	109	.000***
2 (PMO[a] vs NPC[c])	.298[a]	0.089	.080	109	.002**
3 (PMO[a] vs IP[d])	.261[a]	0.068	.171	112	.005**
4 (IP[d] vs FP[c])	.057[a]	0.003	.041	109	.553
5 (IP[d] vs NPC[c])	.173[a]	0.030	.072	109	.071*

[a] proactive market orientation
[b] financial performance
[c] new product contribution
[d] innovative products

* p < .1, ** p < .01, *** p < .001

Proposition 1 Results

Proposition 1 is supported by this research. The Pearson's correlation coefficient is 0.462 and the R square is .213 with a $p<.001$, which indicates a positive relationship between proactive market orientation and the financial performance of U.S. medical manufacturing firms. The financial performance measures were self-reported estimates of the respondent's knowledge of how their firm performed over the last three years compared to their next closest competitor. It was anticipated that the more a firm focused on current and future needs of customers, the greater financial performance they would enjoy.

Proposition 2 Results

Proposition 2 is also supported by this research. Proactive market orientation is positively related to new product contribution ($R= .298$ $p < .01$, $R^2= .089$, $df=109$). New product contribution, as defined within this research, is an evaluation of how much of the current year's revenue is due to products introduced within the last three years. It is logically expected that a proactive market orientation, one which seeks unmet needs and emerging future needs, will be positively associated with new product contribution. Based on the findings of this research, proactive market orientation has a positive effect on both of the firm economic condition indicators: financial performance (Proposition 1) and new product contribution (Proposition 2).

Proposition 3 Results

Proposition 3 is also supported by this research ($R=.261$, $R^2 = .068$, $p<.01$, $df= 112$). There is a positive relationship between proactive market orientation and the number of innovative products a firm has introduced within the last three years.

Proposition 4 Results

Proposition 4 is not supported by this research ($R=.057$, $R^2 = .003$, ns, $df= 109$). The number of innovative products introduced in the last three years has no statistically significant relationship to a firm's financial performance. This is an unexpected result, in that conventional wisdom suggests that the more new products a firm introduces, especially innovative products, the better it is likely to perform financially. One possible explanation for this result is that a three-year window of evaluation may be too short to properly assess the product contribution value.

Proposition 5 Results

Proposition 5 is not supported by this research at a .05 level of confidence ($R= 0.173$, $R^2 = .030$, $p<.10$, $df= 109$). This relationship is weak, with a statistically significant relationship only at a $p <.1$ confidence level. The number of innovative products introduced in the last three years does not appear to have a strong relationship with a firm's new product contribution rate.

CONCLUSIONS AND RECOMMENDATIONS

The medical manufacturing industry in the United States faces many challenges with regard to innovation and cost containment. Among many other factors, firms within this industry require the development of innovative products in order to stay competitive. This study shows that proactive market orientation is supported as statistically significant with regard to financial

performance, number of innovative products introduced, and high levels of new product contribution.

This study also contributes to the field of marketing knowledge in that it documents the usefulness of the measure of new product contribution and its association to proactive market orientation. Further, it demonstrates that a proactive market orientation positively influences a firm's financial performance within the medical industry. This research builds on previous knowledge of market orientation and innovation within academia and contributes a new concept of new product contribution measurement for market orientation. It also provides practical application and guidance for business leaders within the medical manufacturing industry.

Limitations and Recommendations for Further Research

There are many questions relating to how new products are best fostered and developed within this industry, including scope and market potential of the new products, which remain unanswered by this study. Some new products, as an example, may have limited market potential and/or may not have been well-penetrated within the market for the evaluation period of this research. Therefore, further insight into the characteristics of the new products being launched could provide a richer understanding of the relationship between new products and financial performance. Also, evaluation of the comparative orientations, such as technology or innovation orientation, would be useful to business leaders in this industry.

Implications for Management

This study demonstrates that a proactive market orientation is significantly related to the number of innovative products introduced within the past three years. On average, firms within this study introduced 1.5 innovative products per year. However, it is important to recognize that 27.4% of the respondents had not introduced a single, innovative product in the last three years. This variation within the industry demonstrates the opportunity for significant improvement and competitive advantage for innovators.

Firms which set goals for the number of new products introduced per year should be cautious that this indicator does not eclipse other business performance metrics. Within this research the number of new products introduced was not significantly predictive of new product contribution or financial performance. Balancing this metric with other performance indicators has been shown to be important.

Overall, the implication of this research to management is that a proactive market orientation is supportive of innovation and firm performance. Even within such a complex industry, with competing social and economic priorities, a proactive market orientation is beneficial to firms that take the time to invest in understanding the changing demands and needs of their customers.

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