

Marketing in the Emerging Era of Build-to-Order Manufacturing

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Abstract

Build-to-Order (BTO) and lean manufacturing processes are changing the paradigms under which businesses-to-business marketers operate. For example, BTO processes allow marketers to customize products to a greater degree, creating a competitive advantage over traditional manufacturing. Business-to-business marketers who take advantage of the operational efficiencies and effectiveness that emerge from BTO are outperforming firms that utilize traditional manufacturing processes. As an example, Dell computers, by utilizing BTO processes and customization, has gained market share in the PC business when compared to traditional manufacturers such as HP and Compaq that have lost market share. This paper first examines the genesis and implications of BTO and lean manufacturing processes and the factors that moderate their growth. The long-term impact of manufacturing changes on the marketing function is then discussed. Throughout, the paper highlights managerial implications and proposes directions for future research.

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Introduction

The growth in the adoption of build-to-order (BTO) and lean manufacturing has been revolutionary in the last decade. Firms such as Dell, Agilent Technologies, and Batesville have adopted BTO technologies to create enhanced competitive positions. The primary impetus for the move toward BTO and lean manufacturing is the value that can be generated for both the firm and the customer. There are two distinct advantages of adopting BTO processes. First, adopting BTO processes allows firms to effectively and efficiently customize their products. Customization allows firms to charge higher prices for product and at the same time create enhanced satisfaction and loyalty [2, 7, 14]. Second, BTO processes create tremendous manufacturing cost savings, particularly in the areas of reduced raw material inventories, reduced finished goods inventories, reduced space requirements, and increased flexibility. For example, it is estimated that by manufacturing non-demand inventory, auto makers waste eighty billion dollars annually [1].

This paper suggests that BTO and lean manufacturing are fundamentally changing the marketing function, and will continue to do so. The implication of the non-adoption of emerging marketing strategies will be dramatic. If firms do not capture the value that emerging technologies such as BTO and lean manufacturing will provide, value will migrate from their firms. Value migration is an issue that has affected most industries at most times. For example, value migrated from mid-size computers toward mass-produced personal computers in the nineteen eighties. Similarly, within the PC industry Dell captured value and enhanced their market share in the personal computer market by harnessing the power of build-to-order manufacturing.

The impact of BTO on the marketing function will be dramatic for an additional

reason. One of the primary drivers for marketing was the mass-manufacturing process. The manufacturing function after the Second World War adopted large volume production runs because of the efficiency associated with mass-produced goods. In this context of large production runs, marketing took on the role of demand management [8]. Sales were matched to production through price changes and through promotional sales. With the advent of BTO, the role of marketing will be more supply oriented, i.e., supplying customized products and services to demand.

This manuscript begins by examining the emergence of BTO and lean manufacturing. The moderators of the growth of BTO will then be discussed. The paper will then discuss how BTO manufacturing will impact the thought and practice of business-to-business marketing. Directions for future research are also proposed throughout the manuscript.

The Nature of BTO and Lean Manufacturing

Manufacturing is undergoing a paradigmatic shift toward BTO and lean manufacturing [7, 14]. In the practice of BTO, firms assess each customer individually, and manufacture and service the needs of the individual customer. Just as mass manufacturing came into vogue in the U.S. after World War II, BTO and lean manufacturing will emerge in this decade. Utilizing alliances and enabling technologies, business-to-business marketers can fulfill the needs of individual customers with BTO processes. For example, Dell Computers takes PC orders from business customers that are instantaneously accessed by manufacturing and suppliers, and even by FedEx, who delivers the computers. Production is performed only after the order is received and the suppliers and logistics firms ensure fast turnaround times. This fulfills the needs of the business customer at costs that are dramatically lower, i.e., that demonstrate effective efficiency.

Affordable technological advances facilitate the growth of BTO and lean manufacturing. CAD-CAM technologies and databases are being used for better and more customized products. Similarly, flexible manufacturing systems and just-in-time production allow manufacturers to customize products that are of better quality at lower prices. This change in availability of affordable technology has been extremely rapid during the past two decades, and indications are that this rate of change will accelerate. The prices of most information technologies will continue to decline, and therefore BTO capabilities will continue to expand.

The adoption of BTO processes entails large cost savings for a firm. An example is Pella, a manufacturer of windows for both business and individual customers that developed a build-to-order system. Between 1990 and 1999, inventory turns doubled despite a rise in sales, work-in-progress inventory is almost gone, and lumber supplies (raw materials) are less than a third of the 1990 inventory level. In addition, Pella has increased on-time delivery (98.5%), and reduced lead times to one-fifth of the original times. Maytag is following the same path for its upscale lines. Through lean manufacturing they have reduced costs by \$7 million, reduced defects, freed up 60% of space and increased capacity by 50% [3, 6]. In the same manner, Lantech Technologies, a shrink wrap manufacturer, has a 10.5% return on sales from a loss and has increased sales per employee by 80% by adopting BTO practices [3].

Another reason for the adoption of BTO processes is the change in business markets. In the last decade, business markets have been pulled in two opposite directions [16]. On one hand, there has been a growth in very large businesses, in part through megamergers (e.g., Time Warner, Bank of America, Daimler-Chrysler). On the other hand, small businesses with less than six employees have grown rapidly and are responsible for the majority of employment growth in the nineties. Locational diversity is also increasing [16]. There has been a growth in the global business of large firms and

at the same time a growth in home businesses. While small businesses with less than fifty employees predominantly operate from a single location, large businesses with more than 500 employees operate out of an average of 54 locations each (U.S. Census Bureau, 1992). Diversity in the type of business is also increasing [16]. In the last decade, there has been a disproportionately large increase in non-manufacturing firms. While manufacturing firms increased by 60,000 between 1992 and 1997, service firms increased by 272,596 (U.S. Census Bureau, 1997). Similarly, service industries created 6.8 million new jobs when compared to manufacturing, which created 1.5 million jobs.

These differences in size, location, and type of companies have led to a high level of diversity in the needs, wants, and resources (capital, human resources) of business customers [16]. BTO processes will be needed to address the diversity that arises from the diversity of demand.

Speed of BTO Adoption

BTO adoption will not be uniform across industries, and this section discusses the moderating factors. One of the primary requirements for a rapid deployment of BTO processes is the availability of a low-cost information platform that allows customers to determine the impact of their choices. The Internet, a low-cost platform, has been instrumental in the rapid growth of BTO. There are some industries that will be more prone to use BTO and lean manufacturing. In this context, this study discusses the constructs of diversity of demand, flexible manufacturing facility, legacy systems, customer knowledge, and logistics systems and their impact on the speed of adoption of BTO. The model is presented in Figure 1.

Industries that have diversity in demand will tend to move toward BTO processes. This diversity of demand may be overt or created by marketing firms. In the case of overt diversity in demand is the office furniture business market. Although the

major manufacturers have created modular furniture that can be customized, Miller SQA builds furniture after receiving the order. Miller SQA's BTO processes have reduced costs and made the manufacturing process more efficient. Consulting services also demonstrate overt diversity in demand. As well, learned diversity of demand is created by marketing firms. A simple example is the promotional industry, where firms started providing, and customers have started expecting, higher levels of adaptation. To compete in these industries, firms have to adapt BTO processes.

Second, BTO processes will be successful in industries that have highly flexible production technologies [19]. Therefore, industries where cost of adaptation is not high (e.g., personal computers) are at the forefront of BTO and lean manufacturing. In other words, industries that have high cost of customer adaptation in production (e.g., basic metals) and where the majority of customer requirements are not variable (e.g., rolled steel) deter the rapid expansion of BTO processes.

Third, BTO processes will also be successful in industries with few legacy systems. Industries that have large firms with legacy production systems and locked up distribution channels will see the diffusion of BTO at a slower pace than other industries. The primary reason is that large firms will be more reluctant to abandon existing assets in legacy manufacturing processes, systems, and infrastructure. In these industries, BTO processes will lead to discontinuous innovation.

The next construct that will determine adoption of BTO processes will be the level of customer knowledge in an industry. If business customers do not have knowledge of the products and services offered, their attempts at customization may lead to inappropriate products, in turn leading to dissatisfaction and even legal actions. For BTO processes to succeed customers need to have intrinsic knowledge of the product, or customers need to be provided knowledge of the product by the distribution channel. Customers in product categories such as PCs (corporate IT departments) are

knowledgeable about products, which makes customization easier for firms. If customers are not knowledgeable about products, effective customization emerges from the distribution channel (including salespeople) educating customers. This type of customer knowledge enhancement occurs in a wide range of firms from jet engines (GE) to furniture (Miller SQA).

The final construct is the availability of a direct-to-customer logistic system in the industry [19]. This system is in place for most physical products. The Internet boom and subsequent growth of FedEx and UPS in conjunction with existing trucking and rail transportation systems have ensured that direct-to-customer logistic systems are available for most products. The area of service delivery still remains an area of concern. For example, in spite of the airline industry attempting to disintermediate business travel agents, the vast majority of tickets are still purchased through travel agents. Based on the above discussion, it is proposed:

- P1:** An increase in the diversity in demand within an industry increases the likelihood of adoption of BTO processes.
- P2:** An increase in highly flexible production technologies within an industry increases the likelihood of adoption of BTO processes.
- P3:** The lower the level of legacy systems within an industry, the higher the likelihood of adoption of BTO processes.
- P4:** The higher the level of customer knowledge within an industry, the higher the likelihood of adoption of BTO processes.
- P5:** The higher the level of customer logistics within an industry, the higher the likelihood of adoption of BTO processes.

The Impact of BTO on Marketing

The manufacturing-marketing interaction is critical for a firm's competitive positioning. In spite of the importance of this topic, very little attention has been paid to the topic in marketing. For example, in searching *Industrial Marketing Management* issues, only five articles addressing this topic are found. Of these, the last article was

published more than a decade ago [5]. This is in contrast to manufacturing research, where this area is widely researched from the manufacturing function perspective. The adoption of BTO will impact marketing, and specifically business-to-business marketing, in a dramatic manner. This impact will parallel the change in marketing associated with the mass production era.

BTO processes will allow marketers to understand and satisfy the needs, wants, and resources of individual customers rather than those of mass markets or market segments. Marketers will be able to assess each business customer individually and determine whether to create an offering that customizes the product and/or some other element(s) of the marketing mix or to standardize the offering. BTO processes will be distinct from “one-to-one” marketing. “One-to-one” marketing focuses on the adaptation of product or offering, i.e., product-centric approach, and makes the product the starting point of planning process. In contrast, BTO firms will focus on the needs, wants, and resources of customers as the starting point of the planning process.

In this section, we examine the areas of impact within the marketing function with special emphasis on business markets. These areas are shorter product life cycles, variety, disruptive innovations and BTO marketing, customer-centric organization, marketing manufacturing interface, role of distribution channels, demand versus supply management, co-creation, supply comes closer to customers, and higher utilization of the Internet. The model is presented in Figure 2.

Shorter Product Life Cycles, Variety, Disruptive Innovations, and BTO Marketing

It has been suggested that reasons for long business-to-business product life cycles in the past are manufacturing and other supply side restrictions that include customized manufacturing facilities and economies of scale [12, 13]. In the era of BTO, product life cycles are expected to shorten extensively due to flexible manufacturing

facilities and low economies of scale. As examples, Intel and Samsung demonstrate extremely short life cycles through continuous innovation and creative destruction. Shorter product life cycles combined with BTO will increase the variety in supply. This variety in supply will lead to a variety in marketing practices.

The second major change in markets due to BTO will be the rise of disruptive innovations. Most new technologies foster improved product performance. Disruptive innovations underperform in the short term but disrupt older technologies because they deliver customer value in a different manner [4]. These products are typically cheaper, simpler, smaller and more convenient to use. The introduction of transistors when vacuum tubes were predominant is an example of a disruptive technology. Since existing manufacturing facilities and infrastructure will not be critical, BTO processes will lead to an increase in disruptive innovations.

In the era of shorter product life cycles, marketing will also have to develop BTO marketing strategies. The traditional role of marketing in extending product life cycles will no longer be needed, as extending life cycles will be more expensive and will not provide adequate returns. To organize for BTO and lean manufacturing, marketing firms will need to organize themselves as market specialists, and eventually as customer specialists, rather than as product specialists. By doing so, marketing firms will begin to look more like “one-stop shops” for a range of loosely-related products and services, some of which the company produces and most of which they acquire from other producers. This requires development of core competencies surrounding particular customers and customer groups. For example, marketing firms will be experts in the needs of “oil refineries” rather than experts in “plastic oil refinery pipes.” The traditional marketing practices will also change. Advertising will be more “customer need” based rather than “product based.” Long-term budgeting will decrease as short-term returns will become more important. Therefore:

P6: An increase in BTO processes will lead to shorter product life cycles, increased variety, an increase in disruptive innovations and enhanced practice of BTO marketing.

Customer-Centric Organization

The adoption of BTO will lead to firms practicing customer-centric marketing, and marketing will integrate activities around the customer. “Customer-centric organizations” will create new systems. For example, marketing metrics will be oriented toward share of customer, customer processes, customer equity, and customer relationship management rather than concepts such as market share [16]. In customer-centric organizations, the emphasis is on the integration of all customer-facing activities by aligning activities around customer value-adds [16].

Customer-centric organizations will need to integrate sales, marketing and customer service function, but also non-marketing functions. Business-to-business marketing is ahead on this curve through the “key accounts” system that includes sales, marketing, customer service, and financial functions. This integration needs to take place across geographical boundaries (to match customers), within the marketing function as well as across different functions [16]. Therefore:

P7: An increase in BTO processes will lead to an increase in customer-centric marketing organizations.

Marketing Manufacturing Interface

BTO processes will impact communication between manufacturing and marketing. Traditionally, the links between manufacturing and marketing have not been very strong [10, 18]. Traditional communication processes are transactional within and across business firms [15]. A typical communication pattern proposed by Sharma [15] from a business-to-business marketing firm is presented in Figure 3. He suggests that

“...in a traditional business marketing firm, the marketing and sales departments typically interact with customers. The manufacturing department is contacted

when there is a customer order or when the customer has an inquiry. There is little communication between the customer and the manufacturing department, as if they are blind to each other.”

There are multiple reasons why the lack of communication is bad for firms. First, there is no communication between manufacturing and marketing regarding demand pipelines, which leads to inefficient manufacturing processes. Second, manufacturing is made to forecasts that may be determined by departments other than marketing. Finally, in mass manufacturing, product is first manufactured and then marketed, which leads to higher marketing expenses (e.g., discounts, liquidation).

In the era of BTO, the marketing-manufacturing link will have to be stronger, because demand will drive manufacturing and forecasts will improve manufacturing cost positions. The marketing department will have to keep manufacturing informed of market changes that may affect manufacturing processes and demands. This will include sharing information on sales pipeline and forecasting data. Marketing will also have to share information with supply chain partners such as suppliers and logistics firms. Central to this position is the fact that the customer will be closer to the business firm rather than only to the sales department. This should increase customer satisfaction and loyalty. In this context, a higher level of marketing-manufacturing relationship has been shown to lead to higher levels of customer satisfaction in business-to-business setting [9, 10].

Sharma [15] suggests that communication processes will migrate toward an integrated platform presented in Figure 4. Central to this structure is the marketing – manufacturing integration. Such a network of departments, suppliers, and customers is labeled “extended enterprise” or “Interprise,” and a tremendous growth in this area is expected. These “extended enterprise” networks lead to a reduction in “exchange friction,” and to an increase in both efficiency and effectiveness of firms. In this environment all departments within the organization, as well as customers and supply

chain members, access the same information platform [15]. This platform has been seen in Cisco and GE Power Systems and this paper suggests that enhanced manufacturing-marketing alliance will lead to higher levels of satisfaction and loyalty.

Therefore:

P8: An increase in BTO processes will lead to an increase in marketing -- manufacturing communications.

Role of Distribution Channels

Business-to-business distribution channels had multiple utilities in terms of buying, storing, marketing and delivering goods. In the BTO era of lean inventories and customized products, the role of distribution channels will change from a logistical one [12]. It will move from a physical distribution entity toward a “knowledge delivery” entity. The role will be of an information conduit to the customers [12, 13]. The role of the distribution channel will be to create customer knowledge of the product, help the customer co-create the product, and ensure that the customer receives extensive post-sales education. An increase in the need for value added resellers (VARs), a distribution channel member that is the information conduit to the customer has already been observed. This need is expected to increase in the future. Therefore:

P9: An increase in BTO processes will lead to a shift in distribution channels from a logistics function toward an information function.

Demand versus Supply Management

Traditional marketing has focused on the products and services that firms provide. As stated earlier, the goal of marketing is to create a demand for the product that matches organizational requirements and, therefore, marketing management has traditionally been viewed as demand management [8].

BTO and lean manufacturing will increasingly make the marketing function responsible for “supply management.” The customer will be the starting point for

marketing activities for multiple reasons. The increasing diversity in needs, wants, and resources of businesses and households will make customer behavior inherently less predictable and forecasting less accurate [16]. In such an environment, companies that succeed will be those that can rapidly adjust their supply to meet demand, i.e., that practice demand-driven supply management (e.g., use efficient consumer response (ECR) for supply management). For example, airlines use yield management to optimally allocate available capacity across fare classes and manage demand to match capacity. Many airlines are now able to dynamically manage capacity by canceling or adding flights at short notice [16].

Customers will drive the exchange process. Consequently, rather than trying to influence people in terms of what to buy, when to buy, and how much to buy, marketing will be more concerned with better responding to customer demand [16]. For example, the Cisco Systems web site enables customers to order hardware and software solutions unique to their existing and planned infrastructure. Therefore:

P10: An increase in BTO processes will lead to a shift in marketing's responsibility from a demand management to a supply management function.

Co-Creation

With an increase in BTO, customers will have an increasing role in the fulfillment process, leading to "co-creation marketing." Co-creation marketing involves both the marketers and the customer who interact in aspects of the design, production, and consumption of the product or service [16]. This process has been seen in services (e.g., business consulting) but will increasingly also be seen for physical products. The extent of co-creation marketing depends on how much customer knowledge a company is able to accumulate and utilize. Co-creation marketing enables and empowers customers to aid in product creation (e.g., Dell computers), pricing (e.g., ebay.com), distribution and fulfillment (e.g., UPS), and communication (email systems). Co-creation

marketing can enhance customer loyalty and reduce the cost of doing business.

Therefore:

P11: An increase in BTO processes will lead to an increase in co-creation processes.

Supply Comes Closer to Customers

With increased BTO processes, manufacturing facilities are expected to come closer to the customer. There are two reasons for this expectation. First, with BTO processes, customers require faster and less expensive delivery. It would be difficult for firms to manufacture in the Far East and supply customers in the U.S. or Europe. With increased efficiencies rising out of BTO processes, outsourcing manufacturing may become less attractive. The second reason is that BTO processes require modular manufacturing. Modular manufacturing requires closer cooperation between buyers and suppliers that includes geographical proximity between buyers and suppliers. For example, Smart car, which utilizes BTO processes with JIS suppliers, has most vendors located in the same area as the automobile manufacturing facilities. Similarly, Pella has moved its suppliers closer to its manufacturing facilities. Therefore:

P12: An increase in BTO processes will lead to an increase in supplier's proximity to customers.

Higher Utilization of the Internet for Internal Processes

There is a universal acceptance of the Internet by businesses, specifically in the context of B2C markets. In the arena of increased BTO processes, the advantage of the Internet will be derived through changes in internal processes. For example, order processing can cost a firm \$80. Utilizing B2B sites can reduce these costs to less than \$3. However, internal process changes are very slow and difficult since they may require not only physical reengineering but also reengineering of the cultural fabric of the firm. Firms will increasingly utilize the Internet to conduct both internal and external

communication processes.

The impact of utilizing the Internet in transactions is so significant that corporate Internet sites have become very prevalent and have attracted larger audiences than on-line markets or exchanges [11]. For example, in the plastics industry in 2001, an on-line marketer Ventro did \$100 million in business last year, in contrast to a corporate site, GE Polymerland, that did \$900 million. In the electronics industry VerticalNet did \$200 million in business in 2001 in comparison with Cisco, IBM, and Intel, that each did \$1 billion in business [11]. Therefore:

P12: An increase in BTO processes will lead to an increase in firms' utilization of the Internet for internal processes.

Conclusion

Based on trends in manufacturing, specifically BTO and lean marketing processes, this paper suggests that that emerging manufacturing processes will profoundly affect marketing. The antecedents, consequences, and moderators of BTO and lean manufacturing processes were explicated. It was suggested that diversity in demand, highly flexible technologies, few legacy systems, customer knowledge and direct-to-customer logistics will moderate the growth of BTO processes. BTO processes will affect the marketing function in the areas of shorter product life cycles, variety, disruptive innovations and BTO marketing, customer-centric organization, marketing manufacturing interface, role of distribution channels, demand versus supply management, co-creation, supply comes closer to customers, and higher utilization of the Internet. With an increase in ability to determine the profitability of specific customers, marketers can better respond to the needs of their more profitable customers.

There is an unfounded belief that implementing BTO processes will mean having to spend more on manufacturing and marketing. The mechanisms described here

should improve both customer loyalty as well as marketing efficiency. In the future, companies that thrive will have an intimate understanding of their customers. The practice of BTO marketing will be central to the achievement of effective efficiency in marketing processes.

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Figure 1
Moderators for Adopting for BTO

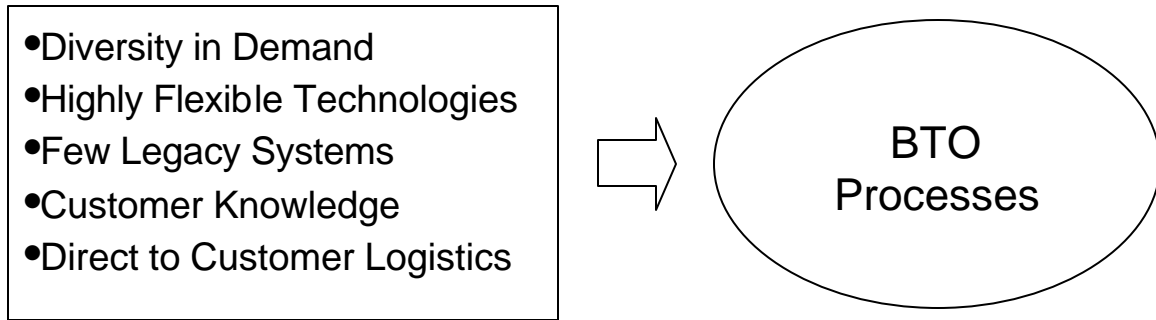


Figure 2
Consequences of Adopting BTO

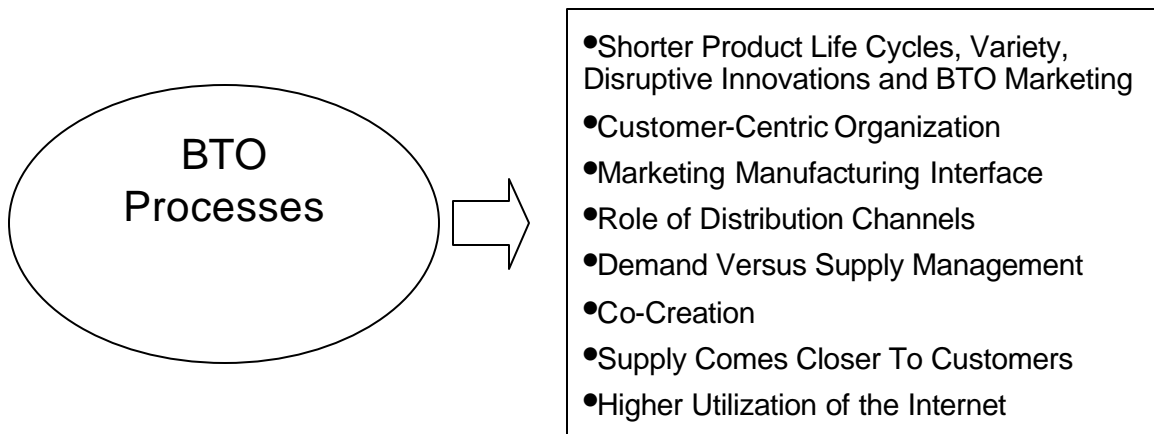


Figure 3

Typical Communication Patterns [15]

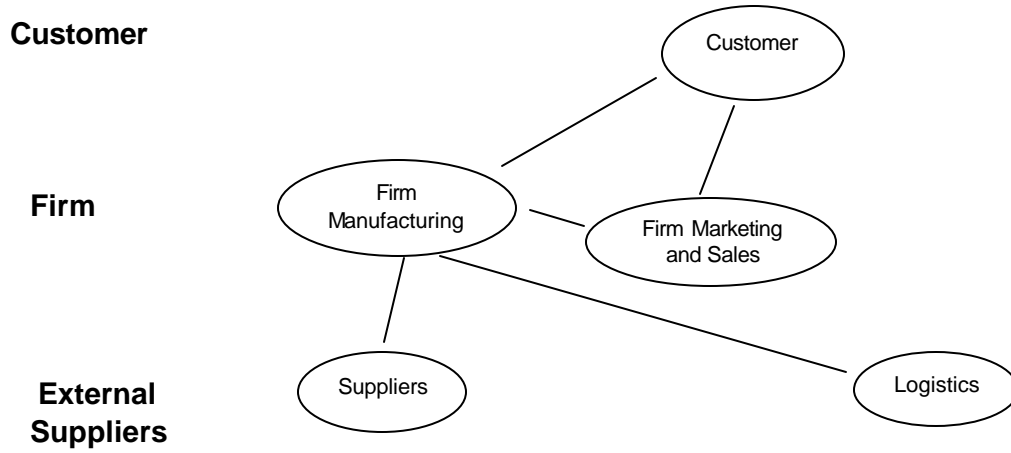


Figure 4

Marketing – Manufacturing Integration with an Internet-Based Information Platform [15]

