Knowledge Management (KM) for Mass Customization in the Apparel Industry

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ABSTRACT

Knowledge is neither information nor data. Knowledge management (KM) is a formal, directed process of determining what information a company has that could benefit others in the company, then devising ways of making it easily available. A majority of business leaders in consulting firms, professional organizations, and private corporations indicate that KM practices have created value by improving organizational effectiveness, delivering customer value, and improving product innovation and delivery. The apparel industry is no different than other industries in the need to manage information and knowledge. In fact, with information and digital technology, it would be natural for manufactured apparel to move from mass production to mass customization.

The purpose of this study was to provide information on KM in order for the apparel industry to more successfully manage the vast amount of information necessary to meet the needs of their changing consumers and evaluate current use of KM by certain companies within the apparel industry. Apparel companies which all had some focus on mass customization were investigated, including Benetton, IC3D, and Lands’ End. In addition, information about how 40 companies and practitioner worldwide used KM was gathered, which revealed how companies create value from their knowledge as intangible assets.

All knowledge was classified according to its complexity on a continuum from explicit to tacit. In the apparel industry, tacit knowledge appeared as two sides of the technical and business dimensions. The technical dimension to tacit knowledge was related to production of garments and was informal know-how. The business dimension of tacit knowledge was an abstract view that explained how to drive and succeed in business. Tacit knowledge related to lengthy experience and advanced skill is difficult to articulate. Knowledge Management has the great advantage of aiding in a more efficient organizational structure, better communication, and quick response that will assist the apparel industry and enable customization efforts.

Keywords: Knowledge Management, Tacit knowledge, Explicit knowledge, mass customization, quick response, apparel industry
1. Introduction

Knowledge Management (KM), a recent phenomenon in the business world, is a formal, directed process of determining what information a company has that could be of benefit and devising ways of making it easily available. A majority of business leaders within a fortune 100 companies indicate that Knowledge Management (KM) practices have created value by improving organizational effectiveness, delivering customer value, and improving product innovation and delivery [1]. Moreover, today’s largest firms have embraced KM in an effort to better leverage knowledge and information, including the technological process of how data and information is accessed, collected, and stored on a firm’s networked computer system.

The apparel industry is the fourth largest and most fragmented industry in the United States economy [2]. Like most other industries, it has similar knowledge management needs to those of most other industries. In fact, it can be argued that the apparel business is more complicated than other businesses because apparel is consumer goods, not the industrial goods. This is due to the fact that there is a strong relationship between a customer’s desire and the firm’s need to fill that desire. For example, the greatest challenge for retailing apparel over the Internet, via mail order or in department stores is to offer apparel in the desired fit, and in the desired style, fabric and color. With information technology and digital technology, it is a natural progression for manufactured apparel to move from mass production to mass customization. In the trend of mass customization, KM is necessary for the apparel business. However, very little is known about Knowledge Management (KM) in the apparel business.

The purpose of this study was to provide information on KM in order for the apparel industry to more successfully manage the vast amount of information necessary to meet the needs of their changing consumers and evaluate current use of KM by certain companies within the apparel industry. Apparel companies which all had some focus on mass customization were investigated, including Benetton, IC3D, and Lands’ End. In addition, information about how 40 companies and practitioner worldwide used KM was gathered, which revealed how companies create value from their knowledge as intangible assets.

2. The Concept of Knowledge and Knowledge Management

Before trying to understand Knowledge Management (KM), the intricacies of knowledge must be understood. Distinctions between types of information are categorized such that the users of this information can effectively use said knowledge. Thus, to understand Knowledge Management, components of KM must be understood.

2.1 Knowledge

Knowledge is a very difficult concept to define, and it is neither information nor data [3]. As shown in the Figure 1, Knowledge appears at a higher level than information in the value chain of data, information, and knowledge. The knowledge base comprises the facts, rules, models and concepts; it is for daily decisions made at every level in the organization [4]. However, data is only represented by isolated facts concerning a subject, and information is represented by facts that have a meaningful context and which may be analyzed to support decision making.
According to the study of KM [5], the following criteria must be met before information can be considered knowledge that enables the enterprise to anticipate events:

- **Connectivity**: Knowledge is connected.
- **Leveraging**: KM is an action of leveraging.
- **Applicability**: Knowledge is applicable in planned and expected environments.

Information becomes knowledge when it is used to address novel situations for which no direct precedent exists. Information, which is merely plugged into a previously unplanned model, is not knowledge [5]. Knowledge may be used as an example in dealing with subsequent similar instances. Knowledge is formulated in the minds of individuals through experience. People learn, naturally, all the time. Knowledge is shared between groups and communities through shared experience, and through the transfer of knowledge, both tacitly and explicitly.

Knowledge is categorized based on how users exploit or leverage knowledge. Levers describe the ways a firm can leverage its knowledge resources. The action modes describe what can be done with knowledge or knowledge artifacts and the intents yield four varieties of knowledge management approaches: Harvesting, Hunting, Harnessing, and Hypothesizing [6].

- **Harvesting**: Expertise must be encoded. The codified information has to be organized, stored and retrieved in a way that makes it easy for an end user to locate and retrieve [6].
- **Hunting**: The collecting of data or information without a specific issue or problem in mind. There is a hope that discovery of meaningful trends or other information contained in a large data set [6].
- **Hypothesizing**: Firms seeking to leverage knowledge resources by connecting people with the intention to explore issues or future possibilities can maximize the benefit derived from these approaches [6].
- **Harnessing**: Assuming that significant knowledge exists among employees and expertise is highly tacit and not readily codifiable, then, organizational strategies are implemented to maximize involvement in problem solving and production by these employees [6].
2.2 Knowledge Management (KM)

Knowledge Management (KM) is action-oriented and about the process of knowing [5]. KM embodies organizational processes that seek a synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings [7]. KM has become a new way of capturing an institution’s full expertise addressing factors such as: Managing database-web site interfaces and documents; Accessing knowledge infrastructure for just-in-time knowledge; Enhancing the visibility of knowledge in an institution; Sharing knowledge not only within an institution but also with external clients; Capturing tacit knowledge and experience of individual staff. Further analysis reveals three themes that can be derived from the list. Indeed, these three themes dominate the field of KM. The themes are: Organizational Learning (OL), Technology and Document management.

Organization Learning (OL) emphasizes that the efficiency and effectiveness of knowledge workers depends on how workers communicate and collaborate in their efforts and expose themselves to communities of practice within the organization or company as well as outside the organization. Technology experts focus on KM with systems analysis, design, and implementation in mind [8]. Without knowledge of how to operate, design, and implement ideas, only having an advanced technology or system does not mean that the company will be successful in the competitive market environment.

Document management with information technology in the field of KM gives organizations stronger, more thorough control over not just information but the way it is handled over increasingly complex networks [1]. The effectiveness of those information systems relies on factors like response time, quality of information, accuracy of information, completeness of information, relevancy of information, and operating costs [8]. The explicit knowledge component is used in this document management process and Information purveyors provide information services to clients through explicit knowledge.

Thus, knowledge is a very meaningful resource for businesses. If businesses manage knowledge effectively by drawing on the abilities, insight, and skills of professionals, they can increase organizational competitiveness and enhance the productivity of all employees. According to Dr. Sveiby [9], KM can be defined by looking at what people in the field of KM are doing and how people use knowledge. He defines researchers and consultants as KM vendors and companies and practitioners as KM users.

As shown in the Table 1, Information about the initial KM users was collected from 40 companies and practitioners worldwide, which revealed how companies create value from their knowledge as intangible assets. Sveiby [9] provides a simplified explanation by dividing initiatives into three categories: the External Structure Initiatives, Internal Structure Initiatives and Competence Initiatives.
Table 1. Knowledge Management Initiatives [9]

<table>
<thead>
<tr>
<th>Knowledge Management Initiatives</th>
<th>External Structure Initiatives</th>
<th>Internal Structure Initiatives</th>
<th>Competence Initiatives</th>
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<tbody>
<tr>
<td>Gain knowledge from customers</td>
<td>Build knowledge sharing culture</td>
<td>Create careers based on Knowledge Management</td>
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<tr>
<td>Offer customers additional</td>
<td>Capture individuals’ tacit knowledge, store it, spread it and re-use it</td>
<td>Create micro environments for tacit knowledge transfer</td>
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<tr>
<td>Create new revenues from</td>
<td>Measure knowledge creating processes and intangible assets</td>
<td>Learn from simulations and pilot installations</td>
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<td>existing knowledge</td>
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<th>Companies</th>
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<tr>
<td>Benetton Group, General Electric, National Bicycle, Netscape, Ritz Carlton, Agro Corp, Frito-Lay, Dow Chemical, Outokumpu, Skandia, Switzerland, Steelcase</td>
<td>3M, Analog Devices, Boeing, Buckman Labs, Chaparral Steel, Ford Motor Co, Hewlett-Packard, Oticone, WN-data, McKinsey, Bain&amp;Co, Chevron, British Petroleum, PLS-Consult</td>
<td>Buckman Labs, IBM, Pfizer, WM-data, Affaersvaerlden, Hewlett-Packard, Honda, PLS-Consult, Xerox, National Technological University, Matsushita</td>
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External Structure initiatives gain information and knowledge from customers, offer customers additional knowledge, and create new revenues from existing knowledge. For example, in the apparel industry, Benetton Group in Italy produces “mass customized” apparel to fit the latest trends in colors and designs. Daily sales data from their own boutiques are integrated with CAD and CIM [9]. Internal Structure initiatives build knowledge sharing culture, capture, store, and spread individuals’ tacit knowledge, and measure the knowledge creating processes and intangible assets. The competence initiatives create careers based on KM, create microenvironments for tacit knowledge transfer, and learn from simulations and pilot installations.

3. Knowledge for Apparel Business

In the apparel industry, two important factors for marketplace success are the identification of the target market and the evaluation of the precise timing to provide fashion goods for said market. Therefore, obtaining such information is the power to increase profit margins and returns on investment. Within the company, people deal with information through the Internet from customers, contractors, retailers, sourcing suppliers, and manufacturers. Some of the information that can be leveraged to knowledge is applicable for merchandising, garment customization, and business processes.

3.1 Explicit Knowledge for Apparel

As in other industries, the apparel business is composed of knowledge is a set of leveraged information. The knowledge has connectivity, leveraging, and applicability that are always necessary for transformation from the information. Most knowledge used in the apparel industry for developing products is considered as explicit knowledge. Explicit knowledge usually is leveraged from information in external criteria and internal criteria for merchandising (see Figure 2).
The explicit knowledge is delivered among suppliers, manufacturers, and customers. The explicit knowledge is significantly important for communication between suppliers and customers. Although the knowledge is readily understood, it is sometimes necessary for people training in order to obtain the knowledge from customers who do not understand apparel terminology.

### 3.2 Tacit Knowledge for Apparel

To be precise, there are two dimensions to tacit knowledge. The first is the "technical" dimension, which encompasses the kind of informal and hard-to-pin-down skills or crafts often captured in the term "know-how" [10]. For example, after years of experience, master craftsmen develop a wealth of expertise at their fingertips. But they often have difficulty articulating the technical or scientific principles behind what they know.

In the apparel industry, tacit knowledge can be explained as two sides of the technical and business dimensions. The technical dimension seen in the apparel industry is related to production of garments. The tacit knowledge is informal know-how. For example, in the process of creation or alteration of garments, there is difficulty articulating the technical principles. Even though a master designer attempts to train people how to manipulate apparel CAD for garment creation and how to alter garments for each individual customized garment, it is still difficult to deliver the skills that were obtained through long experience. Practices such as apprenticeships, mentoring and communities of practice proved effective.

The business dimension to tacit knowledge often appears as company’s mission, vision, guiding principles, and their strategy in the company. It is an abstract view that explains how to drive and succeed in business. It is related to business know-how. Sometimes it is difficult to make people within a company understand top managers’ tacit knowledge. Following Table 2 shows the mission and strategy seen in three apparel companies who are developing products for customization.
A shared language can have an important role in a management context. The better cooperation the better the results [11]. It seems fairly obvious that such a conversion with cooperation can be greatly assisted when the people speak a common language and share access to somewhat similar views of the world they inhabit. It increases the efficiency of production and process in any organization or company.

### 3.3 Knowledge of Customers for Customization

Many apparel companies are shifting from mass production to mass customization. The next generation B2C model are businesses creating products specifically for each customer, and the mass customization is the true Business-to-Consumer (B2C) model [12]. Mass customization enables businesses to offer customers unique products while operating with minimum inventory. For example, essentially by delivering “truly customized products” with higher customer satisfaction, the IC3D company is setting the standard for all next generation B2C companies [12].

Traditional retail business models rely on weak, uninformed consumers who do not know the actual cost, performance or repair record of product [13]. Retailers everywhere are talking about using “data mining” to learn more about consumers’ habits, tastes and buying behavior because the role of the consumer in the apparel business, as a fashion business, is an important one [14]. The part that consumers play seems to be a passive one and people do not actually demand new products and designs of which they have little or no knowledge. However, their individual and collective power is exercised in the selections they make and in their refusals to buy. The role of the consumer is related to their acceptance or rejection of the final products. They influence the goods that will be presented for their favor and even the methods of presentation.

Consumer’s collective acceptance or rejection results in annual figures on the industry. Clearly of the first importance is knowledge of the fundamental facts of what consumers want. Apparel firm’s target consumers are the center of all the firm’s activities. The knowledge gained from customers is used for customers’ additional knowledge. It creates new revenues with existing knowledge in the company or organization. Customer knowledge is significantly important for customization with the following reasons:
- Better and more timely design of new products and services
- Early warning and competitive intelligence
- Customer commitment and loyalty
- The synergy of collaboration [15]

Feedback, point-of-sale data (POS), and Internet orders might be good examples of how a firm gets customer knowledge. The analysis of what customers are actually buying is an important part of the fashion marketer’s job. In retail stores, computerized registers provide this important point-of-sale data (POS) from every purchase. The POS data is important for apparel business as to understand consumers’ purchase behavior. The data and information can be leveraged to gain customer knowledge. Conversely, it is not easy to apply the knowledge directly from customers. When the customer purchases the garments that does not guarantee real customers’ wants. However, it is obvious that knowledge gained from customers used for customers’ additional knowledge creates new revenue with existing knowledge in the company or organization.

4. Advancing KM in the Apparel Business

The progression from mass market through niche markets to segmented markets and finally to the customer marketplace is illustrated in Figure 3. The tendency of towards mass customization shows that data volumes and the level of detailed analysis of markets are increasing.

![Level of detailed analysis of markets](image)

**Figure 3. The tendency of towards mass customization [3]**

The traditional market segmentation has been based on demographic factors such as age, sex and income [3]. But companies in the move of mass customization need more data and specific data analysis than required for the mass market because data warehouse begins to deliver customer oriented data to the enterprise, the first thing that is discovered is that all customers are different. Benetton Group, IC3D Company, and Land’s End, inc. are in the direction of mass customization and needs high level of detailed analysis of markets.

According to Kelly [3], the progression of the enterprise shows transition from the primitive data-oriented organization to the more progressive information-oriented organization to the fully adaptive knowledge-based organization appeared (see Figure 4). All investment justification for the information technology will be based on the added business value.
Benetton Group, IC3D, and Lands’ End, inc. were in the phase of information and innovation that Information Technology such as Decision Support System (DSS) with innovation made their revenue grow. Today, these companies have customer user interface systems that provides interactivity through the Internet as their operational strategy. Fully adaptive knowledge based management is necessary to be a leader of the mass customization market.

According to Short’s analysis of KM approaches [6], the cited three apparel companies, Benetton Group, IC3D, and Lands’ End, inc., were analyzed whether the companies practice KM. Hypothesizing is a common approach in almost all businesses, and it appeared merchandising, prediction and planning of apparel product lines in fashion trends (see Figure 5).

As shown in Figure 5, all three apparel companies use Hunting and Hypothesizing approaches. Hunting approaches with Harvesting approaches rely on collecting data, information, and knowledge artifacts, with an aim to storing them in an organized fashion that will yield future business value. Practically, IC3D shows Harvesting approaches. Compared to other apparel companies, IC3D provides the best practices and useful codified information that is already stored and retrieves the information in order for customers to select garments in a well-organized process through the IC3D’s interface. However, any of apparel businesses did not show an evidence of practicing effective Harnessing approaches that need a map of “who knows what” for managing significant knowledge existing among employees.
For the efficient KM with the approaches, it is necessary to focus on strategy that is created by reviewing the firm’s articulated business strategy and objectives, identifying business issues that arise from the business strategy. The strategy for KM assesses the knowledge resources available to the firm, defining the way in which those resources should be leveraged against the business issues to support the business strategy [6]. Apparel businesses need a map that can be used to identify and prioritize KM levers and approaches in a way that supports achievement of long term strategic business objectives.

5. Conclusions and Suggestions

In all businesses, knowledge appeared at a higher level than information with following criteria: connectivity, leveraging, and applicability. Knowledge was always relevant to environmental conditions, and was applicable in planned environments. The apparel businesses had tacit knowledge that appeared as both technical and business dimensions, and was related to informal know-how. Like most businesses, apparel businesses, knowledge in an explicit form appeared to be understood clearly; however, tacit knowledge gained through long experience was uncorroborated. The results of the present study of KM may be summarized by pointing out the following:

- KM was extremely important for efficient organizational structures, better communications, and quick response in real time.
- Businesses that had three main themes such as Organizational Learning (OL), Document Management, and Technology mostly embraced KM in an effort to better leverage knowledge and information. This includes the process of how data and information is accessed, collected, and stored on a firm’s networked computer system.
- KM increased the efficiency of production and process in most companies while apparel companies with interest in customization are beginning to realize the need of managing information and knowledge.

In the apparel industry, major goals of the marketing effort associated with customization appeared to be customer retention and customer satisfaction. This indicates that apparel businesses were already focused on external structure of KM. For example, Benetton Group’s customization with communication networking, IC3D’s artificial intelligence with expert knowledge, and Land’s End’s Customer Relationship Management (CRM) were explained as efforts for managing knowledge from their customers.

However, in the apparel industry, firms did not show evidence of practicing KM. The business trends in the past decade were more closely associated with technology than KM. Even though it was very clear that information technology was a powerful tool for effective KM, it was not sufficient for managing the entire apparel business including top executive support, appropriate business strategy, and decision making on merchandising. This finding is of considerable importance since it suggests that KM is an integrated set of information technology tools. The KM is necessary in the apparel business because people perform the actual work such as data entry and information handling.

These findings suggest that a strategy for KM be comprised of the following discrete components: an articulated business strategy and objectives for tacit knowledge, an inventory of available knowledge resources, and an analysis of technology as knowledge levers. Once
this fundamental strategy is defined, technology options may be explored. Then, KM may be defined as the set of practices, tools, interventions, and infrastructure, aimed at improving a firm’s ability to leverage its knowledge resources to achieve business objectives. Clearly, this KM has promise for efficient management in apparel production innovation and mass customization. This suggests an inevitable evolution of KM in the apparel industry.

References