A Fabric Resource Management System (FRMS) for Fashion Product Development

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INTRODUCTION

The fashion industry is now facing a transformation due to the emergence of the fast fashion trend (Choy et al., 2009; Lee et al., 2013). Under the pressure brought by fast fashion, product life cycle and the speed to market of new products are getting shorter. In order to survive in the dynamic market, the effectiveness and efficiency of New Product Development (NPD) is of greater importance in today's fashion industry. According to Frings (2008), NPD in the fashion industry covers a wide range of activities including market research, trend analysis, merchandising, design and product prototyping. Critical NPD decisions have to consider not only the desired product functionality, but also supply chain issues including sourcing vendors, selection of materials, manufacturing, packaging, distribution, as well as the determination of the products design technology (Petersen et al., 2005).Therefore, in order to expedite the NPD process, it is necessary to improve internal processes in a fashion enterprise as well as the connections with external parties across the textile-apparel supply chain.

In view of the fact that fabric selection is a crucial operation that affects the success of designing a new fashion product (Choy et al., 2009), increasing the effectiveness and efficiency of fabric management operation is one of the ways to improve internal processes in a fashion enterprise. In a fashion enterprise, the selection of fabrics is heavily relying on the knowledge and experience of individuals such as creative designers, product development managers and merchandisers (Lau et al., 2006), causing bias easily. In order to guarantee the decision quality in the fabric selection process, a management system is necessary to guide the decision makers when selecting appropriate fabrics for new products. In addition, choosing appropriate fabric suppliers is an important issue in NPD. Fabrics, on average, make up 70 percent of the material cost of a garment (Moon & Ngai, 2010). Therefore, fabric sourcing can affect the profitability of a fashion business. As customers are now looking for products which are of high quality with low cost, fabric modifications are common in many cases so as to fulfill customer expectation. Unfortunately, the fabric evaluation and modification process may occur several times until the prototype is fully satisfactory in terms of cost, performance, and consumers' reaction (Kadolph, 2007). In order to respond to the market changes, fashion enterprises are expected to build a closer connection with potential parties in the supply chain such as the fabric suppliers.

In view of the above highlighted market needs, the objective of this article is to present a Fabric Resource Management System (FRMS) for fashion product development. Such system has embedded the

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Case-Based Reasoning (CBR) technology to support the knowledge manipulation involved in the selection of fabric swatches and suppliers during the fashion product development process.

BACKGROUND

New product development (NPD) has been widely accepted as a critical strategic activity for long-term success. In this process, new concepts or upgrades of existing products are created by trial-and-error and by learning from the errors made (Choy et al., 2009). Without any knowledge support tools, the NPD process becomes iterative and time-consuming. Enterprises in the fashion industry are losing their competitive advantages when their NPD cannot keep pace with the market changes under the fast fashion. In recent years, artificial intelligent (AI) techniques have become increasingly popular for providing support in decision making processes involved in the NPD in the fashion industry. For instance, fuzzy logic has been used to support fabric selection process (Lau et al., 2006) and case-based reasoning (CBR) has been adopted to support knitwear design (Richards & Ekart, 2010). All these applications have shown that AI is useful for better managing NPD processes. In particular, CBR is found to be very promising to provide solutions for rapid product design (Cheng, 2003), which can in turn shorten the cycle time of product development. In NPD in the fashion industry, a large amount of data related to fabrics as well as a tedious process of fabric selection are involved throughout the entire decision making process (Choy et al., 2009). Fabric management plays an important role in improving the efficiency of NPD. Considered that the searching and selection of fabrics is currently performed based to the experience of individuals (Lau et al., 2006), CBR could be a possible tool to solve the fabric searching problems as it operates based on the experience gained from solving past cases (Aamodt & Plaza, 1994).

In addition, it is observed that successful NPD should not be only focusing on the efficient flow of new products, but also the relationship with supply chain parties such as sourcing, manufacturing and distribution (Carrillo & Franza, 2006; Hilletofth & Eriksson, 2011). The consideration of design for the supply chain (Hult & Swan, 2003; Petersen et al., 2003; Hillebrand & Wim, 2004) has been known as involving the relationships between customers, manufacturers and suppliers which are often established early in the NPD process (Handfield & Bechtel, 2002; Ragatz et al., 2002). It is suggested that the integration of supply chain should start from the beginning of product development (Van Hoek & Chapman, 2007). However, application of CBR solely for fabric selection cannot fully support the alignment between supply chain and NPD. Therefore, in the proposed system, attempt is also made to develop a cross-supplier sourcing platform so as to coordinate the NPD process with other functional teams involved in the supply chain.

To summarize, NPD performance can be improved by identifying approaches to support the creation of knowledge and the coordination with supply chain management. In the proposed system, CBR is used to support the knowledge for fabric searching while a centralized hub/platform is developed for connecting numerous suppliers.

FABRIC RESOURCE MANAGEMENT SYSTEM (FRMS)

According to Kadolph and Langford (2007), fabric is a complex material and is the most important ingredient of a piece of garment. Its composition can be classified into two main fiber categories; natural and synthetic; and its construction methods include woven, knit, and non-woven. Different combination of fabric construction can result in different weight, hand feel, visual effect, texture and other special performance effects of fabrics. Therefore, a fabric swatch enquiry and recommendation system is needed for searching different combination of fabric properties.

In the current sale and marketing practices of textile and garment industry, when sales force team members receive a customer order request, they usually select a batch of fabric swatches based on their experience and knowledge so as to fulfill their customer's requirement. They will access their enterprise systems or contact other departments to collect relevant fabric information such as the price of fabric, availability of fabric sample swatches, Greige and fabric inventory. In order to facilitate sale forces team members to promptly acquire the above fabric information and prepare a customer quotation, the deployment of FRMS will be