The need for Product Lifecycle Management (PLM) in the fashion industry: a case study analysis

Elisa d’Avolio*, Romeo Bandinelli*, Rinaldo Rinaldi*
*Department of Industrial Engineering, University of Florence, Viale Morgagni, 40, 50134, Firenze – Italy (elisa.davolio@unifi.it, romeo.bandinelli@unifi.it, rinaldo.rinaldi@unifi.it)

Abstract:

Purpose

The aim of this research is to fulfil the gap existing in literature between the Product Lifecycle Management (PLM) topic and its implementation in the fashion industry. PLM can be seen both as a business strategy and also as a specialised information system, supporting all the product-related processes from its development to its disposal. Fashion companies have implemented industry-specific solutions, mostly in order to improve their capability to reduce time-to-market and to enhance product development performance. Basically, a fashion-specific PLM supports all the core processes within its supply chain.

Design/methodology/approach

The first methodological step, a literature review, has inspired the research issue and has represented its background. Then, in order to reach the scope of the present study, a case study analysis has been conducted in two big companies belonging to the High Fashion market segment.

Originality/value

The issue of PLM has been widely debated in the last decades and different authors have adopted proper methodologies to cover the topic. Actually, little is known in literature about PLM implementation in the fashion while most of the papers are related to manufacturing. This is due to the peculiarities of the fashion companies, where creative ideas, Style and product quality have to match with innovation, Information Technology and product performance.

Several key features of fashion industry, such as short product lifecycles, a small number of standardized items and the marginal role of after-sale processes, have often distanced it from the PLM environment. Nevertheless, nowadays lots of PLM vendors have developed proper solutions for the fashion business and many companies have decided to implement PLM. The paper provides valuable insights in describing how PLM has become essential and successful for fashion companies, thanks to its benefits.

Keywords: “Product Lifecycle Management”, “Fashion”, “New Product Development”, “PLM implementation”.

1. Background for research

The role of Product Development within the luxury fashion industry is widely acknowledged by its companies. In modern product development, as the complexity and variety of products increase, so does the need for knowledge and expertise for developing products. Appropriate strategies and tools have to be designed to face the challenges of the luxury fashion environment.

Product Lifecycle Management (PLM) is both a company strategy and a specialised information system (Segonds et al., 2014). The concept of PLM is enabled by a PLM solution, which is a combination of business processes, methods, engineering applications and Product Data Management (PDM) systems (Bokinge and Malmqvist, 2012).

PLM in the fashion industry is an underexplored topic in literature but, on the other hand, it is a consolidated reality in the fashion industry. Nowadays lots of vendors offer general purpose and business specific solutions.

At the start of the millennium, there were around five vendors selling PLM for the fashion industry, and today it includes almost sixty companies selling advanced PLM solutions. This figure will only increase as retailers, brands and manufacturers become better informed and better able to realise the true value of adopting a PLM solution.

The purpose of the present study is to assess the PLM implementation in the fashion industry, not just...
considering it as a technology solution, but especially as a business strategy improving knowledge management, collaboration and inter-functional coordination, reducing the time to develop products and time-to-market. With the intent to revolutionise the previous policies and to deal with the market transformations, fashion companies are trying to optimise their core business processes, such as design, engineering and production.

The remainder of this paper is organized as follows. The Section two first outlines the main issues emerged during the literature review step, showing a lack of researches about PLM implementation in the fashion industry. A definition of the research questions within the study and the methodology used are then presented in Section 3. In order to answer to the research questions, the importance of Product Development and the tools supporting it have been described in Section 4, basing on the cases analysed. Finally, the paper concludes with several remarks and future challenges.

2. Literature review

In order to enhance a company’s competitive advantage, the product development and introduction processes need to be improved. PLM is the activity of managing a company’s products all the way across their lifecycles in the most efficient way (Bokinge and Malmqvist, 2012). PLM is a strategic business approach that affects lifecycle knowledge, i.e. the knowledge generated or consumed by various processes throughout the product’s lifecycle (Ameri and Dutta, 2005). It involves managing all the data concerning a product, and all the internal and external actors involved in the development of this product (Le Duigou et al., 2012).

As a knowledge management system (Bandinelli et al., 2013), it improves the learning capacity of the organization and consequently, increases the rate of knowledge accumulation in the corporate knowledge base. PLM is also a culture generating solution, which can give the company a unique competitive advantage through its institutionalization.

The issue of PLM has been widely debated in the last decades and different authors have adopted proper methodologies to cover the topic, such as Ball et al. (2011), Chen et al. (2008), Garetti et al. (2005), Hans et al. (2010), Pol et al. (2008), Subrahmanian et al. (2005), Terzi et al. (2010) and Verhagen et al. (2012).

Garetti et al. (2005) highlights the ICT point of view in PLM, which can be defined as the “connective tissue” that allows the connection of design software to production and supply chain management software, taking into account the dispersed nature of the extended and collaborative enterprise. Therefore, from a software point of view, PLM can be considered as: data and document management tools, that is to say an enlargement of the PDM approach.

PLM implementation enables the companies to face both internal and external forces (Ameri and Dutta, 2005). From the first point of view, PLM improves competitiveness because it encourages innovation, provides customer intimacy and promotes operations excellence. Coming to the external forces, PLM enables a decisive reaction to globalization, product complexity, shrinkage in product lifecycle and environmental issues.

Actually, little is known in literature about PLM implementation in the fashion industry while most of the papers are related to manufacturing cases. This is due to the peculiarities of the fashion companies where creative ideas, Style and product quality have to match with innovation, Information Technology and product performance.

Just few authors (Segonds et al., 2014, Kaur and Sharma, 2011, D’Amico et. al., 2013) have discussed the topic of PLM implementation in the fashion industry.

Segonds et al. (2014), through a case study PLM research in the apparel industry, focus on the definition of needs in terms of collaborative functions to support the design of apparel products. The authors highlight the key stages in the implementation of a new PLM tool dedicated to the early stages of apparel design.

D’Amico et al. (2013) formulate a model enabling companies to simulate the levels of the main variables of the marketing mix in order to govern the lifecycle of their products.

Kaur and Sharma (2011) provide an overview of the fashion industry needs in terms of PLM solutions.

The major part of the publications concerning PLM in the fashion industry is actually based on analyses conducted by consulting societies (WhichPLM, CIMdata, Gartner etc.) and specialized magazines.

3. Methodology

The aim of this research is to fill the gap existing in literature between the PLM topic and its implementation in the fashion industry.

The fashion-specific environment presents a number of unique features and needs in terms of PLM implementation, leading to the following research question: which are the tools that a fashion company is able to implement, in order to support the New Product Development process?

In order to answer this question, a case study analysis has been conducted in two big companies belonging to the High Fashion market segment.

The case study is a research strategy, which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989). The authors have investigated a small number of longitudinal cases (Voss et al., 2002); a period of four months has offered the opportunity to observe the sequential relationship of events. Structured and unstructured interviews and interactions have constituted the basis of the research, then the authors have been involved in the PLM implementation projects.
Both the companies analysed provide the Product Development and the Production processes in the centre of Italy and have decided to deploy a PLM solution. They have also offices in other countries and need to get through to their headquarters, located in the North of Europe.

The first company, founded in 1961, has been considered one of the world’s most prominent fashion houses and it is known for its and iconic pieces, that can range from the ready to wear to shoes and bags.

The second company’s core businesses are shoes, bags and small leather goods (SLGs). Established in the luxury fashion business in the early 1990s, the brand has now an international profile and sells a large part of carry over within its collections.

This study is the result of two projects, which involve CEO, ICT managers, Project managers and PLM vendor consultants, often in different business geographical areas.

4. The importance of Product Development in the Fashion Industry

The high competition in the luxury segment has evolved to constantly changing fashion trends and fluctuating consumer demands within a single season. This fast-moving environment continually have added pressure for fashion companies to compete on their ability to deliver “newness” and “refreshed look” in products. In this scenario, the Product Development process represents a set of tasks carried out in the initial part of the fashion supply chain (SC).

It is a macro-process, which includes several strategic processes, such as product design, prototyping, sampling and manufacturing. The importance of a single process may vary in each business context: for example, a company may decide to not track the information related to the prototyping process, because it involves a short length of time and the transit to the next step of sampling is very fast.

Moreover, a company has to manage specific tasks within the Product Development process. In Figure 1 the modelling of a particular business process, concerning a general material processing, has been proposed as an example from the case study.

The research has demonstrated that before implementing a PLM solution, roles, responsibilities and business processes have to be identified and mapped.

An important issue within the Product Development process is managing product data. Many tools supporting the Product Development process exist and have a wide diffusion within companies belonging to different industries. In order to answer to the first research question, a list of these tools is reported (Rossi et al, 2013): the flagged items are used by the companies interviewed, the bulleted ones are not in use.

- Office Automation (Spread sheet, Word processing, etc.)
- Enterprise Resource Planning (ERP)
- Material Requirements Planning (MRP)
- Product Data/Lifecycle Management (PDM/PLM)
  - CAD 2D
  - CAD 3D
  - Digital Mock-Up (DMU)
  - Computer Aided Styling (CAS)
  - Computer Aided Engineering (CAE)
  - Finite Element Analysis Method (FEA/FEM)
  - Knowledge Based Engineering (KBE) and Design Automation
  - Computer Aided Manufacturing (CAM)
  - Computer Aided Process Planning (CAPP) / Digital Manufacturing & Factory
  - Discrete Event Simulation (DES)
  - Virtual / Augmented Reality (V/A R)
  - Customer Relationship Management (CRM)
  - Supplier Relationship Management (SRM)
  - Computerized Maintenance Management System (CMMS)
  - Lifecycle Analysis Software (LCA)

Just a little part of these tools is used in the analysed business and they are Office Automation, ERP, MRP and the recent PLM solution. The handcrafted tradition of the companies’ products limits the opportunities offered by CAD software, but also SRM and CRM solutions’ importance is not still been acknowledged. One of the most important drivers that has triggered the adoption of PLM is the need to refresh collections and to innovate the product choices. The complex network of suppliers allows the achievement of product quality, which represents even now a critical success factor.
5. Findings from the case studies

Implementing PLM technologies into fashion companies enables several aspects, emerged during the case study research. In this section the main results highlighted by the interviews and collected by direct observations with our analyzed companies are reported.

Software selection

Implementing PLM in the fashion industry is not only a matter of industry-specific solutions, but often business-specific ones are required to satisfy the needs of a single enterprise. Customization is the basic rule that guides all the PLM-related choices.

When choosing a PLM vendor, one of the major discriminating factors is availability of PLM consultants to customize the AS-IS solution. PLM consulting is not merely a support during the PLM implementation, but it aims to cover many specific business requirements:

- Speaking the enterprise’s language (a finished product could be a product, an article, an option, an aspect…).
- Matching the solution capability with the business processes: several PLM functions could be managed in-depth and other ones could be useless.
- Providing an integration to the existing solutions, such as ERP and CAD software or replace previous PDM modules.

Functionalities

The two cases analysed has allowed the authors to acknowledge the capability of a PLM system in the fashion industry. It enables the users to:

- Manage the entire set of materials, attributing those colours, sizes, suppliers, approval state and other details (composition, description, notes…). Moreover, the users are able to manage the Bill of Material (BOM), starting from a basic template and customizing it on the base of the product typology (bag, shoes, small leather goods, belts…).
- Manage all the hierarchy levels of a product (e.g. season, collection, gender and department).
- Manage states: various states correspond to each document. These help define their level of maturity, such as concept, approved, validated, cancelled, etc. Changes in these states may be decided based on the workflow identified through processes mapping.
- Detail the product properties (e.g. size and colour range, development instructions, information about costing, pricing, customs and composition). The properties views may also be customized basing on the user’s requirements.
- Manage sourcing and supplier quotes: the system allows to assign one or multiple suppliers to a prototype or a sample and to define the quotes. Each time a development state moves forward (e.g. from Prototype to Pre-Edit, Post-Edit, First Negotiation, Bulk and Production), its costs is automatically updated.
- Manage Prototype/Sample requests: the user will just choose the model and the supplier to whom he wants to request the prototype. Firstly, it is created in a “draft” state and, when the user consider worthwhile, it is switchable in the “issued” state. Once the prototype/sample is completed, the user can print it and send it to the supplier.
- Extract costs and review development information. The users can choose the view that highlight the costs he/she wants to check and ease the business management.
- Catch and throw requests from and to the headquarter, tracing also the dates and attaching comments.
- Manage other issues, such as massive prints, breakdown reports and calendar.

Benefits

During the Product Development stage, benefits are related to the reduction of time to develop products, with important effects on quality, efficiency and effectiveness. PLM technologies also improve document management, reducing the time to search information, to update and review data.

Within the manufacturing process PLM has a positive impact, ensuring automation, reducing stocks, WIP and improving information sharing with suppliers.

Moreover, lots of benefits affecting the entire company at a cross-functional level may be achieved, such as the reduction of time-to-market and the improvement in managing processes and projects. Adopting PLM technologies allows the fashion companies to be more reactive to consumer needs: the firms’ flexibility may be improved through a reduction of lead times, inventories and product development times.

Human resource management

PLM projects ask for a huge commitment of top management, super-users, key-users and consultants in order to achieve both the tactical and the strategic goals.

The human resources involved in the Product Development process are used to manage all the information concerning materials, prototypes, samples and products through spreadsheets. A workflow management is difficult to arrange because of the lack of proper approach and tools. As a result, tracing data, measuring performance and matching the needs of
different headquarters within the Product Development process, appears not sustainable.

An aspect that has to be highlighted is that in comparison to other industries, within the fashion companies, product engineering is not carried out by engineers: fashion designers and stylists play an important role during the Product Development process but their skills are not so much related to managing data through information systems. Their attitude to inventiveness and inspiration is the reason why they show resistance to standardized practices and tools.

**Project management**

Implementing a PLM solution means also to provide a proper project management. It includes several work packages; each of them is characterized by several steps and milestones, which have to be completed to move to the next. In Table 1 the authors have summarized the main work packages involved within the project, the tasks and an estimation of their durations.

Project management has its own lifecycle, which begins with kick of meetings, provide for other blocking tasks and involves all the strategic roles within the company. The PLM vendor needs also to plan a Technical Deployment, considering the architecture of the system and the application servers that should be used throughout the different phases of the project: a mirror environment to have a first approach to the system's capabilities; a test environment where the users could experience the PLM and conduct several trials; a production environment, that is the definitive one after the go-live activity.

A fashion PLM project implementation can lasts from six to twelve months, but several variables could take over. Often the different viewpoint of business, consultants and vendor slow down the normal flow of activities. Communication issues or, simply, underestimations of the tasks difficulty represent other causes of delay.

Basing on the requirements of the company, the other work packages may include different items such as the hierarchy definition, material management, style management, sample management, product sourcing and order entry. Basically, the vendor collects all the requirements, provides customization, data bulk load and asks a validation by the users. Once validated, the PLM vendor consultants prepare a handbook and carry on the training. Going live is the most critical task within this process and it is followed by the post go-live support.

In parallel to the issuing of the other work packages, the PLM project includes also an integration activity with the existing ERP, in order to ensure an alignment of the business processes and their management.

Within the analysed case studies, Style Management has been the “core” work package, due to its impact on the business practices and to its relevance for the business.

**Table 1 - PLM Project Management**

<table>
<thead>
<tr>
<th>Work packages</th>
<th>Tasks</th>
<th>Duration (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project management</td>
<td>Kick off, weekly meeting, steering committee, project closure</td>
<td>230</td>
</tr>
<tr>
<td>Technical Deployment</td>
<td>Design architecture, install Load, Validation, Go-Live, Post Go-Live support</td>
<td>80</td>
</tr>
<tr>
<td>Hierarchy definition</td>
<td>Validation of To Be Product</td>
<td>90</td>
</tr>
<tr>
<td>Material Management</td>
<td>Component structure, Configuration of Material To Be process, Training, Bulk Load, Validation, Go-Live, Post Go-Live support</td>
<td>100</td>
</tr>
<tr>
<td>Style Management</td>
<td>Requirements analysis, Training, Bulk Load, Validation, Go-Live, Post Go-Live support</td>
<td>160</td>
</tr>
<tr>
<td>Sample Management</td>
<td>Requirements analysis, Training, Bulk Load, Validation, Go-Live, Post Go-Live support</td>
<td>50</td>
</tr>
<tr>
<td>Material &amp; Product Sourcing</td>
<td>Requirements analysis, Training, Bulk Load, Validation, Go-Live, Post Go-Live support</td>
<td>130</td>
</tr>
<tr>
<td>Order entry</td>
<td>Collection &amp; Market Management and Pricing, Configuration and revision, Training, Go-Live, Post Go-Live support</td>
<td>50</td>
</tr>
<tr>
<td>ERP integration</td>
<td>Flow analysis, Interface mapping &amp; test, Go-Live</td>
<td>80</td>
</tr>
</tbody>
</table>

**6. Conclusions and future challenges**

Several key features of fashion industry, such as short product lifecycles, a small number of standardized items and the marginal role of after-sale processes, have often distanced this environment from the PLM. Nevertheless, nowadays lots of PLM vendors have developed proper solutions for the fashion business and many companies have decided to take advantage from these.

When conducting the literature review, the authors have noticed a lack of papers concerning PLM implementation in the fashion industry and this have led to the formulation of the research question. The aim of this study has been to fulfill the gap existing in literature between the PLM topic and its implementation in the luxury fashion industry.

A case study analysis has been conducted within two big companies belonging to the High Fashion market segment. The direct experience in the business context has given the opportunity to deepen the analysis of the Product Development process and the importance of PLM within this scenario.
The features of Product Development process and the main supporting tools have been described.

The limits of the research are related to the small number of cases performed, that have allowed a deep analysis but have restricted its generalizability. However, it must be said that the PLM implementation within fashion companies is a matter of a specific business and needs, opportunities and issues may vary from an environment to another.

The present study has encouraged several challenges. Identifying business-specific requirements to improve the Product Development process is a key point for a successful PLM implementation that is still improvable. To this aim, researchers may bring their contribution in deepening the study of the business processes and practices related to the fashion industry.

Finally, an important challenge is to support luxury companies to acknowledge the importance of PLM and the benefits achievable, involving top management and all the people implicated in the Product Development process.

References


