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Design and Development of Product Data Management (PDM) For Textile Company

Abdissa S, Worku A and Shekar C*

Ethiopian Institute of Textile and Fashion Technology (EiTEX), Bahir Dar University, Bahir Dar, Ethiopia

Abstract

This research work makes an assessment on data management related problems in Ethiopian textile and Garment industries in order to develop an applicable product data management model and develop the system so that the overall performance of the sector can be improved focused based on the case study company. A brief introduction is given on the fundamental concepts of product data management (PDM) with reference to recent literature in the area so as to help readers follow the model developed. The case company is Bahir Dar Textile Share Company (BDTSC) to undertake this research, a sample size to the case company in the case of system study is covering all sections and process was taken. Moreover, the selected garment industries produce different ranges of garment products in the country. Primary and secondary data were collected and analyzed to identify data management related problems of the case-company using a well-structured questionnaire, interviews, personal observations and review of previous research works. The research investigation covers all process flow of the company. Then a PDM model is developed along with primary steps to implement the model to attain the goal. The proposed PDM system is designed and developed by using HTML, CSS, PHP, MySQL, and java computer programing languages. Finally, a number of recommendations and sample trail in one section some data are tried on for the case-company and conclusion drown. The proposed PDM system has a significant potential to improve the company data management system. This paper can be used as a lead for future research works related to the issue in the field.

Keywords: SCM; PDM; VMI; Product development; Web-EDI; Fashion marketing

Introduction

Information technology is involving in various field of study. Apparel and textile manufacturing IT is used in to two ways. The first case is IT used to manage, guide, control and support in automating different machine types, and the second one IT is used as information communication and management tool in the company. Current Textile and Garment factories are partly trying to use semi-automatic and full automatic machines for production, but the extent of applying effective data organization administration system is very low [1].

Most warehouses are managed automatically and machines are controlled by CNC or DNC software. However, the challenge is that most of these initiatives have been implemented in silos. Different processes have been made digital at different times and to varying extent [2]. Consequently, most manufacturing companies haven't achieved a complete integration of information flow along the operations process. Compared to older technologies such as ERP, manufacturing companies have been quite slow to adopt more recent digital technologies [1].

Connecting an Advanced data management system with a machine control system allows for direct transfer of production orders to the machine. Alternately, the production orders can be transferred to digital devices, which display them to the shop floor control team. This eliminates manual tasks and automatically directs information flow to the target destination. The connectivity between ERP and operations execution system also introduces more transparency and visibility into material availability [3].

Materials and Methods

Required material list

Computer hardware requirements: Following are the requirements:

- RAM- 2GB
- Hard Disk- 500GB
- Monitor-standard
- Keyboard-standard
- Mouse-standard
- System type-32/64bit OS

Computer software requirements:

- Operating System-window 7
- Database- JavaScript/MySQL
- Editor - Note++/Dreamweaver
- PHP-To access database
- HTML-To design static page
- CSS- To decorate the frontier user page

Method

This study is based on a mostly qualitative, case-based, interpretive methodology that characterizes the technological artefacts as interrelated to and determined by the technological context therefore

***Corresponding author:** Shekar C, Assitant Professor, Ethiopian Institute of Textile and Fashion Technology (EiTEX), Bahir Dar University, P.O. Box 1037 Bahir Dar, Ethiopia, Tel: +251-7589785365; E-mail: Chandrabahir@gmail.com

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adding elements of computer programming science, as well textile and apparel context. As the study aims at design and developing of PDM for the BDTC practices of work and technology, the methodology largely also is inspired by design software field. Given, that major parts of the study are done within the organization-based study, there are elements of action research also underlining the insiders within the organization and the topical area. The actual approach for data collection was firstly to get insight into the problem area. This study methodology is followed in the sense of trying to obtain the fullest set of data on the case and systematically organize these into current state and future state of technology and data processes. The research follows of architecting the master data, that in holistic approaches such as enterprise architecture, stakeholder analysis, or business modelling able to serve as coherent frameworks in identifying the most common and specific master data management research themes for global businesses with networked IT environments (Figure 1) [4,5].

The above diagram shows the sequences of activities to design, and development of proposed PDM. The activity includes all theoretical and practical operation which is from concept to actual PDM implementation and documentation.

Data collection instruments: This research is performed under several investigation and analysing of the theoretical, practical both soft and hard knowledge to reach the problems. Primary and secondary data sources are used to support and make concurrent foundation in the study. In primary data collection strategic interviews, observation, field survey, and reporting format investigation are main tools. In secondary data collection books, websites, magazines, journals, researches, and articles used as crucial and key Knowledge Ocean which can serve for the study [6-8].

Selecting sample and methods: This research is performed through investigation of reporting and information flow process in the company's 100%. Interviews and questioner is performed at first level confidence interval to make the study highly significant in the study.

The questionnaire and interview are taken from section heads, department heads, directors and shift leaders and officers in supportive staffs.

Data analysis: The data collected by using data collecting tools of questioner and interview results was analysed both in qualitative and quantitative data analysis methods. As well as observation and field survey data are combined with questioner open end question responses and interview responses is analysed well. SWOT analysis is used to compile those general company qualitative studies. The statistical mean was used in the analysis of the data collected was the Software Package for the Social Sciences (SPSS), R studio software, Microsoft packages [8-12].

Conceptual frameworks to be used: Waterfall-model is going to be used to develop the proposed PDM. This model is referred to as a linear-sequential life cycle model. It is very simple for understand and to use or easy for the new users. In Waterfall-model each phase must be completed fully before the next phase begins. At the end of each phase, a review takes place to determine if the project is on the right path or not. This approach is suitable for the proposed PDM. The figure below shows how the waterfall-model is used to build the system from requirement study to final system maintenance (Figure 2) [12-15].

Product data system designing tools

There are several programming languages available in current computer programming and communication technology. For design, develop and implement the new proposed PDM the researcher used the following software's and scripting languages [16]:

PHP: PHP is simple, fast, portable script language well studied for development of database-enabled web sites. It is open source, server-side, and HTML embedded scripting language used to create dynamic web pages.

MySQL: MySQL is Database Management Software (DBMS) which performs storing, retrieving, managing, and manipulating of data. MySQL is a software, the program is open source, and free to use. Structural Query language.

CSS: Cascading Style Sheet (CSS) is a computer programming language which is used to decorate the front user interface of web page.

HTML: Simple, fast, portable script language well studied for development of web page front interface which is able to link to data base system in ease way [17-20].

Dreamweaver/Notepad++: It is free software package which allows designing and writing different programing languages.

Results and Discussion

Data analysis on existing system of the company

During this research the researcher uses both questionnaires and interviews with selected mangers and different section leaders. The result of this study result is discussed below (Figure 3).

The first issue to this study is covering on discussing and ask questions regarding computer and internet access for different supervisors, shift leaders, section heads and other level managers (Figure 3).

As a result, shows among the total respondents most have internet connection in their office, but 22% of the population in the study respond there is no internet connection in their office and some supervisors they report that even they don't have computer too. This result leads this research must also consider to visualization.

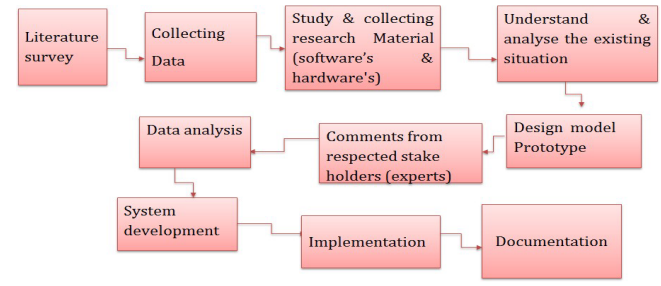

Figure 1: Work of the research.

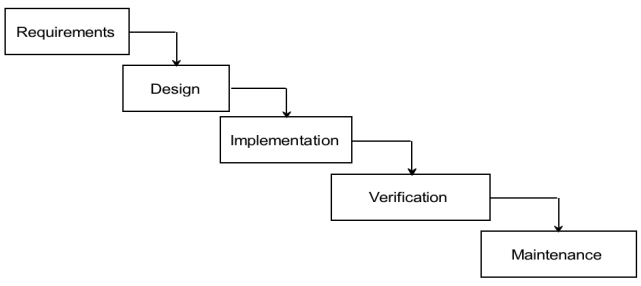

Figure 2: Waterfall-model.

The second issue was on study individual's habits regarding how often they are checking their email. It is done for the purpose of analysing the existing system medial level managers are information and command monitoring working experience and effectiveness through email communication (Figure 4).

The result shows that few respondents are only regularly checking their email account less than or within an hour, majority population of the study shows that either once in a day or once in a week visits their email account. This information communication controlling and monitoring mechanism can be defended as weak as compared with international companies with central and fast communication implemented companies through PDM, PLM.

The third issue was regarding the internet connection performance in their working areas. This study aimed to know how the company is strong enough to hold the proposed PDM system with the existing network. The study result is positive and shown below as follow (Figure 5).

The question was how they evaluate the speed of internet connection in their work areas. The finding was more than 75% of offices are moderate and more than moderate (good and very good) in their internet connection strength. But, few offices require facilitating this connection through internet cable.

The fourth issue was about their individual industrial specific software's experience. This topic is proposed in order to know in which areas there are expertise and regularly using in their departments. The result of this study reflects the following finding (Figure 6).

Among industrial specific software familiar groups (the 15%) majority

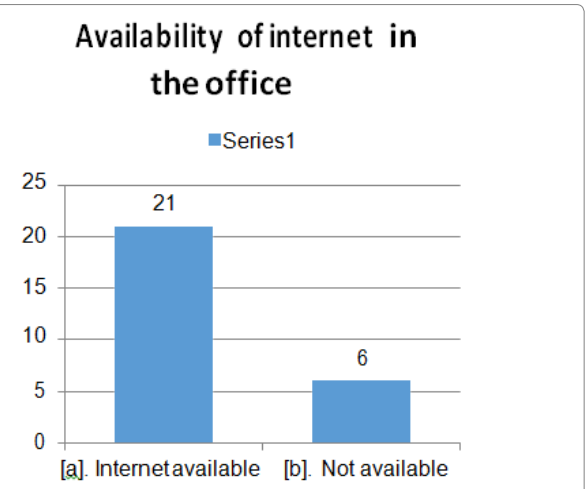

Figure 3: Availability of internet in the office.

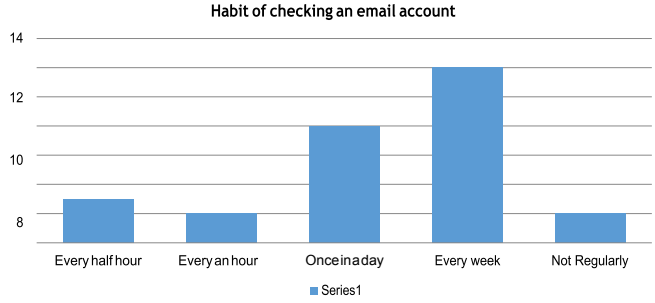

Figure 4: Habit of checking an email account.

67% are CAD users and the remaining 33% ERP (but the trained about ERP in other areas and currently not available in the company). Meijer causes ware software's listed are not available in their company 67% and lack of proper training provided 25%, the other 8% respondent answers they are not egger to know those software's (Figure 7).

From the study searching previous time files in recording office takes around half an hour and more than that. This time and movement from departmental officer to the file recording office is noon value adding as well tiring task.

Only 11% respondent were seen related PDM in other company or training center. The others either not used before or even they didn't hear about it before.

Result of SWOT analysis

SWOT analysis is a tool that identifies the strengths, weaknesses, opportunities and threats of an organization. Specifically, SWOT is basic, straightforward model that assesses what an organization can and cannot do as well as its potential opportunities and threats. The method of SWOT analysis is take the information from an environmental analysis and separate into internal (strengths weaknesses) and external issues (opportunities and threats). Once this is completed, SWOT analysis determines what may assist the firm in accomplishing its objectives, and what obstacles must be overcome or minimized to achieve desired results. The analysis result of the case study company will be elaborated in the following table and brief discussion about the content below the Table 1.

Proposed system design

The research result shows the company is in the experienced in both local and export market business of cotton yarn and fabric products. The company is in the way of advancing different technology and systems. The currently the company information management

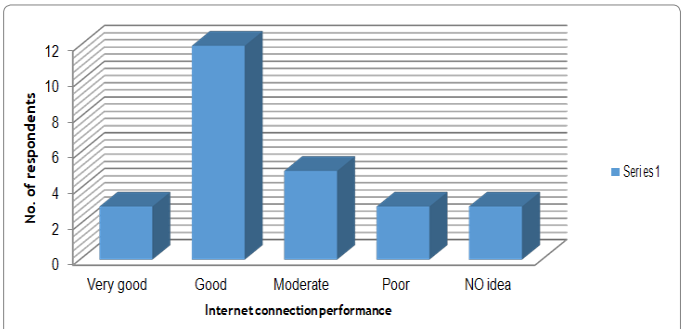

Figure 5: The internet connection performance.

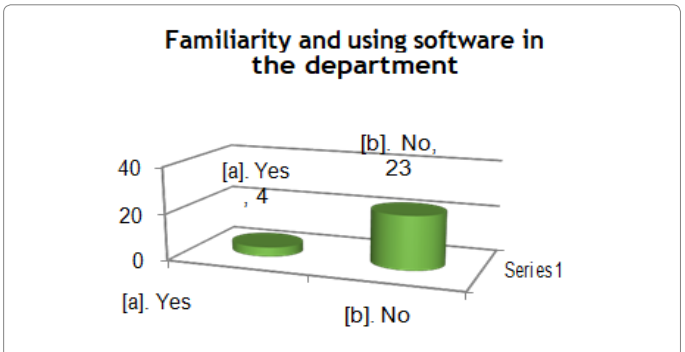

Figure 6: Familiarity and using industrial software in the department.

system is paper based and tedious. This working condition leads for losing several time and energy for data collecting, compiling, report preparation, and file searching. In the opposite of that situation, current international markets are requesting fast communication, electronic data transferability, integrity of information and timely market information. In order to make compatible with this market, the company should advance the information management and product data, therefore the proposed PDM system is design to fill the gap shown above. The diagram on Figure 6 will describe the areas of the proposed PDM model from supplier to final end users. As well as it shows multi directional flow of information from supply chain involving parties and product and material flow from souring to final customer (Figure 8).

User Diagram of Proposed PDM

The expected users of the systems are categorized in to three user groups of User, Section Head, and Admin. Each group will have various levels of contribution and function allowed in proposed PDM system

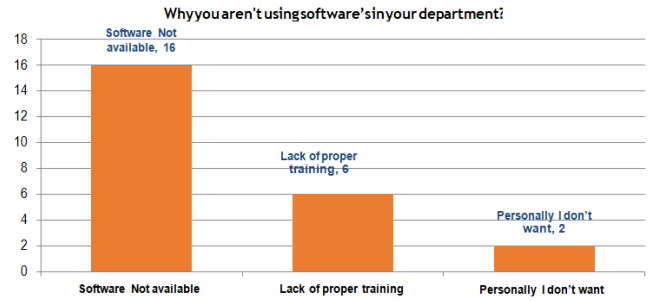

Figure 7: Reason for not using software's in the department.

Strengths	Weakness	Opportunities	Threats
Working hours	Implementation	Market conditions	Convincing traditional market
Workers potential and initiation	Lack of systematic approach	Customers and Vendors Technology uniformity	-
Skill and academic combination	Absence of central server	-	-
Collection of format & Special collection of training	-	Digitization and technology	-
Technological Adaptions	-	-	-

Table 1: Result of SWOT analysis.

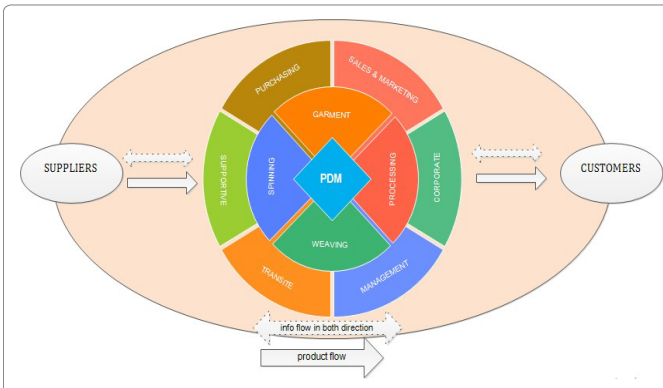

Figure 8: The proposed PDM model.

and the figure billow describes some functions briefly. The information flow in Figure 9 the system is expected both up and down way. The designed interface seems the following in below (Figure 10).

Conclusion

Based on the survey from Textile Company, this research work addresses the current situation of data management related problems in the company. The data analyses revealed that there are a number of data management related problems in the company and this will also can reflect other Ethiopian textile and garment industries situation.

The company problems can be broadly summarized as: poor supplier and customer relationship, lack of proper education and trainings, weak external customer focus, unavailability of self-evaluation techniques towards technological data management system, poor data control, low technological data management level, lack of teamwork and lack of recognition activities to build sustainable and long-term data control system. Though, most of these problems are potential areas for product data management system improvement, problems pertaining to technological upgrading the Ethiopian textile and garment industries for various reasons.

These industries have financial constraints to renovate their technology in order to improve the data management of their products. In order to overcome the stated problems of the case company, a proposed PDM system design, development and implementation is performed. These components are improving supplier relationship, provision of education and trainings, proper external customer and supplier focus, implementing self-evaluation techniques, proper quality control, implementing quality system activities and improving maintenance control design. This are identified as potential areas for product data management system improvement of the research. The proper implementation of the proposed research work can serve as a basis for future research works in information communication integration areas such as central designing improvement in Ethiopian textile industries, supply chain of Ethiopian textile and garment.

Effective PDM greatly support company effort of building those new strategies of strategic networks and move towards tactical, and collaborative relationship building seemingly allow for new avenues of 'fast fashion' tactics.

Generally, it can be concluded that the current paper based manual data management system of the company is tedious, time taking, and most workers tiered of this process. Furthermore, ineffective data management leads the company to loss huge amount of effective time

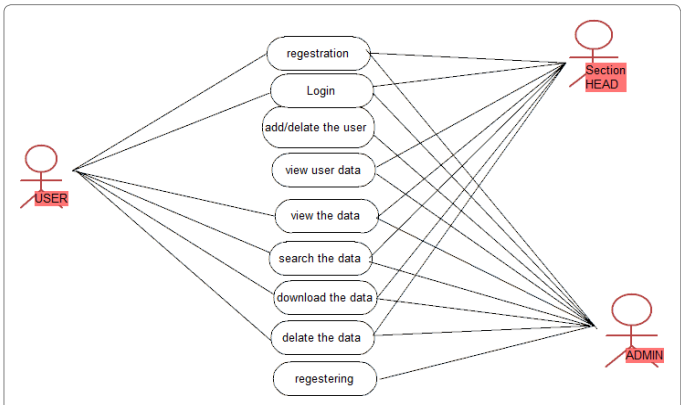

Figure 9: The User diagram of proposed PDM.

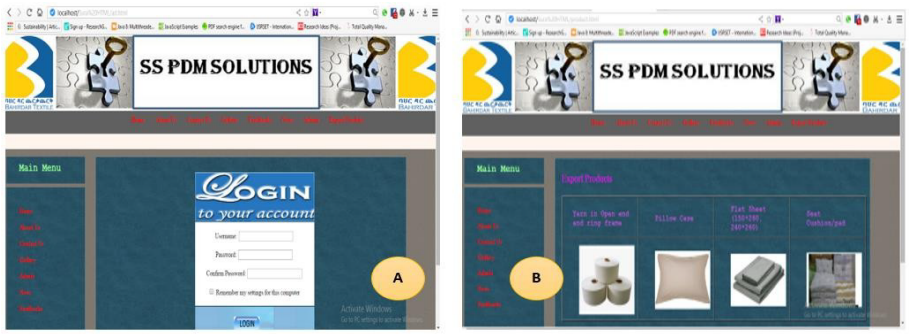

Figure 10: (A) Login page (B) Product Display page.

and energy of manpower, market-potential, and control the business. This project can solve file searching time and speed of an average of current half an hour in to less than a minute, traceability of the process and data flow can be improved in significant way.

Disclosure

Surafel Abdissa is currently working as Lecturer in Garment Engineering, Wolkite University, and Wolkite, Ethiopia. Amare Worku is currently working as Lecturer in Textile Chemistry at Dire Dawa Institute of Technology (DDIT), Dire Dawa University, Dire Dawa, and Ethiopia. Dr. Chandra Shekar K E is currently working as Assistant Professor in Fashion Technology at Bahir dar University, Bahir dar, Ethiopia.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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