Chapter 1  Introduction

1.1  Introduction to Colour Communication in Textile and Apparel Industry

In textile and apparel industry, colour always plays a critical role. It is the colour that attracts the consumer to buy an apparel product. Often, consumer experiences an emotional reaction to colour and decide to purchase a product because of that colour.

However, the visual effect of colour is mutable: it changes, shifts, and fades or deepens depending on the light in the surrounding environment. Equally elusive is the notion of fashionable colours that change often and quickly. In fact, popular colour preferences are almost as fickle as consumers themselves (Azoulay, 2005).

Because of consumers’ preferences change with the times, so too do the colour palettes of manufacturer. In textile industry, failure to produce the textile product with the right colour combination favoured by the consumers could result great loss in both manufacturing cost and business opportunity. Sometimes, misinterpretation or miscommunication of colour can be a major cause for dispute between colour specifiers, buyers, manufacturers and colour suppliers. Therefore, colour communication plays an important role in the manufacturing process of textile and apparel industry.

The supply chain of textile and apparel industry starts with the design of new products. After receiving design specifications from apparel designers, the manufacturers need to ensure the accuracy of the colours that will be used to dye the clothing materials. Traditional communication in the colour development process between textile manufacturers and their colour suppliers is based on physical samples.
Based on the designer's colour specifications, manufacturers produce colour standards in pieces of clothes. The colour suppliers are requested to produce physical colour samples (lab dip) in which match the colour standards. The textile manufacturer then compares the physical samples with the colour standards. If the physical colour samples do not match the colour specifications requested by manufacturers, the sample process goes back to the colour suppliers with instructions for the next attempt. This cycle continues until the suppliers succeed to produce colour samples that meet the specification standard. Often, time pressures and costs increase with each new round of samples, and all those involved are placed under increasing stress.

Mulligan (2002) revealed that in the 1980s, manufacturers alleviated some of these difficulties in colour communication process by measuring the physical standards with a spectrophotometer in one location and then distributing the "colour" of that standard to other locations in the form of spectral data obtained from the measurement of spectrophotometer. In this way, the colour suppliers are able to check whether their colour samples fulfilled the colour specification standard by comparing the measured result of the physical colour samples produced by them with the standard spectral data sent by the manufacturers. Under this condition, physical colour samples were still needed for visual reference, but the approval of batches was “by the numbers (spectral data).”

According to Mulligan (2002), the resulting digital sampling obtained from spectrophotometer brings an ability to create or evaluate colour electronically and to avoid the time-consuming and costly traditional method of mailing coloured samples back and forth between sites for approval. Digital sampling technology breaks new ground across all industries and is particularly important in manufacturing applications where accurate colour reproduction is critical to the delivery of a quality product.
Although the digital spectral data obtained by the measurement of spectrophotometer has been adopted by textile industry in determining the pass or fail of a particular colour sample since 1980s, the challenges in communicating colour are still remaining because many people tend to evaluate colour subjectively based on their age, fatigue, colour vision defects, gender, or experience (Mulligan, 2002). Therefore, a comprehensive communication channel in which able to provide everyone involved in the colour communication process an objective and accurate evaluation of colour is needed.

1.2 Problem Statement

Although the Web-based colour communication technology does contribute a lot to the improvement of colour communication process in textile industry, it still shows some drawbacks due to the rapid change of textile industry.

According to Ramamurthy (2003), the textile industry is a complex industry involving unpredictable variation in market trends. It has been changed dramatically over the past decade, going from in-house domestic manufacturing to offshore sourcing. This change has added tremendous complexity to the apparel supply chain.

However, most of the current existing colour communication applications in the market are showing the following weaknesses in responding to the changes in the industry:

i. Most of the current existing colour communication applications in the market are tightly-coupled software applications in which lacking the potential to be reused, customized, and modified in order to suit the rapid changing nature of textile industry on time.
ii. Most of the current existing colour communication applications in the market are platform dependent softwares in which lack of interoperability, reusability, and flexibility, thus, these softwares are difficult to be integrated with other existing or newly developed applications that built on different technology platforms.

iii. There are still a lot of textile manufacturers and colour suppliers using standalone software applications to manage their colour communication process. To develop an online colour communication application for them from scratch based on their requirement specifications is very time-consuming.

1.3 Project Objective

The objectives of this project are listed as below:-

i. To develop colour communication Web services in which could be reused and integrated into current existing or newly developed colour management application in textile industry supply chain.

ii. To apply Extensible Markup Language (XML), Simple Object Access Protocol (SOAP) and Web Services Definition Language (WSDL) technology in developing online colour communication application for textile industry.
1.4  **Project Scope**

This project will focus on the following scope:-

i. The Web service will only cover the colour communication area of supply chain in textile industry.

ii. The creation of colour communication Web services can be perceived as one of many attempts by software developer community in contributing to the richness of functionalities of a particular application domain, therefore it is impossible for the proposed Web services to cover all functionalities and features expected by business end users in textile industry.

iii. This project involves the effort to develop colour communication Web services in which could be reused and integrated into product life cycle management of textile industry. Hence, these Web services are not equivalent to the entire product life cycle management system.

1.5  **Project Deliverables and Contributions**

At the end of this project, the researcher will deliver a set of XML-based colour communication Web services in which:-

i. They are built on top of a central repository database. This central repository database could be accessed via Internet connection.

ii. They consist of the following functionalities:

   - Store colours that will be used to dye clothing into database.
   - Search for colours from database based on search condition input by user.
   - Compare colours in the database under different combinations of observers and illuminants.
- Able to import colour data from other vendors’ applications into a central database as well as export colour data from the database for the usage of other applications via qtx file, the most common file format used for the electronic communication of spectral data for a colour. In this way, the Web services are able to be incorporated into current existing product life cycle management of textile manufacturer.

- Serve as on-demand Web services for developers who want to build a new Web-based colour communication application for textile industry. The developers do not need to start the development effort from scratch; instead, the developers can just reuse the functionalities provided by these Web services as the building blocks for developing a new colour communication application.

1.6 Report Organization

The purpose of this section is to give reader an overview regarding the major contents of the project report. This report consists of eight chapters. The brief description for each chapter is as follows:-

Chapter 1: Introduction

This chapter includes a background introduction to the project, problem statements, the objectives of developing Online Colour Communication Web Services for Textile Industry, project scope, and project deliverables and contributions.

Chapter 2: Literature Review

This chapter discusses the current practices adopted by most of the companies involving in the colour communication of textile industry, current existing electronic colour communication applications in the industry, Web services technology, and the potential technologies that would be used to develop this project.
Chapter 3: System Methodology
This chapter puts emphasis on the system development strategy, which is the methodology used to develop the system.

Chapter 4: System Analysis
This chapter describes the results of the use case driven object-oriented analysis in which presented in the form of UML modelling diagrams.

Chapter 5: System Design
This chapter mainly describes the design of the system based on the input obtained during the stage of system analysis.

Chapter 6: System Implementation
This chapter discusses about the concrete steps taken to develop the system that were analysed and designed in the previous chapters.

Chapter 7: System Deployment and System Testing
This chapter focuses on the steps taken to deploy the system as well as elaborates on various testing phases in which play significant roles in ensuring the system fulfills the requirement specification and assures the quality of the delivered system.

Chapter 8: Evaluation and Conclusion
Evaluation is a process that occurs continuously at all phases of the system development. Evaluation phase is carried out to determine the extent to which the system’s expected outcomes have been realized, and the prescriptive value of the process where extraneous factors were taken into consideration. Lastly, conclusion will be made for this system.