8.1 Introduction

This chapter discusses the objectives that have been met in this project, the strengths and limitations of the Web services developed by the researcher for the colour communication process of textile industry and possible future enhancement.

8.2 Problems Encountered

The researcher has encountered several problems during the process of developing colour communication Web services for textile industry. Those problems include:

i. Determining the scope of the system

Since the researcher was lacking experience in developing colour communication related system for textile industry, it was difficult for him to determine to which extent the scope of the system should be defined.

However, the researcher has tried to overcome this problem by having thorough analysis and studies on current existing systems with similar functionalities and sought for professional feedback from the industry expert about what are the functional requirements with high commonality that are needed by different stakeholders across the colour communication supply chain in textile industry. With these efforts, the researcher was able to obtain a clearer picture about the problem domain of the system to be developed.
ii. Difficulties in getting business domain knowledge

Lacking of exposure to the colour communication knowledge of textile industry has impeded the progress of requirement capturing and analysis process. As there are not many experts in colour communication process in Malaysia, the researcher needed to perform in-depth study from the resources available on the Internet.

8.3 Project Strengths

i. Reusability

This research is about the development of 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.

By using the Web services provided by this system, user will be able to store colours into database, retrieve colours from database on demand, search for desired colour from database based on desired criteria, and compare colours stored in the database under different observers and illuminants.

Besides, this XML-based Web service is also able to import colour data from other vendors' applications into its database as well as export color data from its 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, this Web service is able to be incorporated into current existing product life cycle management of textile manufacturer.
ii. Open Standard

The colour communication Web services are implemented based on open standard XML-based technologies such as Extensible Markup Language (XML), Simple Object Access Protocol (SOAP) as well Web Services Definition Language (WSDL). These technologies are platform independent where systems written in different programming languages and running on different operating systems can seamlessly exchange data over the Internet by using Web Services.

8.4 Project Limitations

Despite of the strengths mentioned in the previous section, the Web services application has a few limitations, which cannot be researched and developed due to time constraint and the lack of resources. The limitations of the system are listed as below:-

i. It does not cover all types of error handlings

As Web services are operating across the Internet and there are a lot of possible exceptional cases could be happened on the public network. The system developed under this dissertation project is not able to cater all types of exceptional scenarios.

ii. Lack of rigorous testing approach to verify the correctness of each technical implementation aspect of Web services

The implementations of Web services are much more tricky, obscure and complicated compared with the operations of traditional software applications. Typical functional testing approaches that only involve the interaction between human users and the system interface to verify and validate the correctness of the software application are not robust enough to cater all testing aspects that are needed for Web services application.
8.5 System Constraints

i. It does not publish on UDDI

The researcher implements the colour communication Web services by using local server with a private registry. As the Web services are not bind to public UDDI, the functionalities available in the system are not openly published over the Internet.

ii. It is not implemented under real-world business environment

This system is not being setting up and implemented under real-world business environment. However, as the system works properly under the local intranet environment, theoretically, the same system will be working equally smoothly over the Internet once a permanent Internet Service Provider (ISP) link has been established for this system with a Web server set up for this purpose.

8.6 Future Enhancements

A number of potential enhancements have been identified by the researcher and are being discussed as follows:-

i. Front-end presentation layers developed by using non-java programming language

Since the proposed system for colour communication process in textile industry is implemented via Web services, it could be connected, extended, and applied by front-end applications that are written in any programming language as long as the underlying implementation logic is adhered to the open standard of Web services such as SOAP, WSDL and XML. Theoretically, all of these client applications will be working fine with the implementation of Web Services. However, this will require a lot of effort in studying, analysing, designing and developing the mentioned front-end components.
ii. Web Services Security

As Web services need to be implemented across public network that is exposed to a wide range of security threats, Web services security has always deemed as the major concern by system stakeholders. More stringent Web service security measures need to be enforced into the system implementation in order to reduce the risks of being unauthorized accessed.

8.7 Conclusion

As the open standard and the technology of service-oriented architecture (SOA) such as Web services are starting to gain ground in the commercial world as well as among the international IT communities over the past ten years, it is vital for the researchers from the academic field to put in more effort in exploring the mentioned technologies so that they could always stay closely connected to the industry, at the same time contribute to the evolution and implementation of state-of-the-art technology.

This project shows that the obstacles faced by the traditional platform-dependent standalone applications and tightly-coupled Web-based applications in the colour communication supply chain of textile industry could be overcome by using the Web services related development and implementation technologies such as XML, SOA, WSDL which are supporting open standards and exhibiting the nature of platform independent and programming language neutral.

The design and implementation of colour communication Web services for textile industry provide real time colour data sharing and the ability of on-demand data retrieval to various stakeholders across the colour supply chain of textile industry. Earlier colour communication practices which very much depending on the sending of
colour measurement samples over the email and physical postal mails are very inefficient, inflexible and error prone.

With the advent of Web services, the difficulties caused by the static nature and inflexibility of the earlier technologies can be overcome by the interoperability, dynamic nature and high degree of accessibility of the Web services related technologies.

The development of this project by using Apache AXIS framework has improved the implementation and deployment in terms of easy of use and maintainability. Besides, this Web services system is designed based on n-tier architecture that separates the responsibilities of the system into multiple layers such as business logic layer, data access layer, database layer and Web services implementation layer. This separation provides encapsulation for the different layers of the system, which results in a more scalable and robust system.