CHAPTER 7

CONCLUSION

This chapter concludes the overall presentation of this thesis write-up. Section 7.1 starts by discussing the challenges in the information visualization area of research. Section 7.2 highlights some interesting lessons learnt from this thesis while Section 7.3 discusses the thesis' achievements. Section 7.4 briefs the readers to the thesis' constraints and finally, Section 7.5 covers the future enhancements deem suitable for this thesis.

7.1 INFORMATION VISUALIZATION CHALLENGES

Myers et al., in Strategic Directions in Human Computer Interaction [1996] argue that research challenges in this area of study include making the specification, exploration, and evolution of visualizations interactive and accessible to a variety of users. The tools should be designed to support a range of tailoring capabilities: from specifying visualizations from scratch to minor adaptations of existing visualizations. They also argue that the incorporation of automatic generation for information visualization with user-defined approaches is another challenge for information visualization practitioners.

More foundation work is needed for establishing general principles of information visualization. The groundwork for information visualization is still not too solid as this field is still in its infancy at the moment.

7.2 LESSONS LEARNT

Theoretically, many aspects of Human Computer Interaction (Human Computer Interaction) have been applied in this project. Furthermore, as this thesis is focusing more on the user interface aspects (with emphasize on Information Visualization) as well as the usability testing, thus many new insights and practical knowledge has been gained.

Practically, many features of Java have been learnt as well as the usage of Windows NT and MS-IIS server. Besides that, the use of Tripod.com as the web server also gives much new knowledge of how useful this kind of service for individual Internet developer.

This thesis has also gives value to a well-organized web site especially for the benefits of novice users. What users of the Internet really want is the contents together with the organization of material being presented by the web site. It is obvious that the Information Visualization paradigm has contributed something into the Web arena and in the future, it is expected that more such interfaces and tools to be developed.

7.3 ACHIEVEMENTS

It is obvious that for a hierarchical tree structure, this simple traditional representation is still the most effective visualization method. In addition, in terms of the facilitation of navigation and user interactivity, it is believed that this CRIVE interface is as useful as the interfaces produced by other researchers as discussed in Chapter 2: Literature Review.

Among others, the CRIVE interface has achieved the following needs of the web users:

- **Space Efficiency**

  The user interface designed is ideal in terms of space efficiency in terms of effectively using screen space. If the user is using a bigger monitor such as 17" or 21", they will benefit this user interface design to even greater height.

- **Simplicity/Elegance**

  Although the CRIVE interface having a very simple and elegance interface (a control panel and table of contents applets), they are very complicated behind the scenes (see the algorithm for building the hierarchy tree structure in Chapter 5).

- **Effective Navigation**

  The criteria under which the CRIVE interface design preferred by the users is its effective navigation facility. The traditional tree do not provide any user navigation, whilst the others suffer from possible loss of context for the user. The CRIVE interface however provides a backtracking mechanism and many levels of sub-tree browsing. Additionally, the powerful mouse-driven, direct-engagement actions are very simple to learn. The use of frame enhances navigation even further, helping the user maintain his or her mental model without needing to toggle between browsers or active windows.

7.4 THESIS CONSTRAINTS

There are four fundamental research problems must be solved for visualization to attain its potential as a key information technology. They are:

1. Theories, guidelines, and fundamental insights are necessary that illuminate which visual techniques are effective in what contexts. Currently, there is little theory and few guidelines to help designers who know what techniques will be effective. In the future, techniques must then be reduced to engineering production rules.
2. A software infrastructure is required that enables designers to produce effective interfaces rapidly. Unfortunately, since the theory is limited, practical progress is made through interaction and intuition. To speed this process, the designers need a production capability.
3. Technology for solving important information problems involving real people must be deployed widely. The WWW is a natural vehicle: browsers such as Netscape and IE offer an increasingly ubiquitous platform that can be leveraged to make technologies available to anyone with Internet access. With careful design, the Java programming environment is rich and efficient enough to solve real information access problems.

7.5 FUTURE ENHANCEMENTS

The CRIVE interface design developed for this thesis needs some improvements while it works the way it is intended to be. Some of the enhancements that can be done to make the CRIVE interface design more novel and usable are as the following:

1. The user interface design of the hierarchy tree structure should be able to generate the table of contents automatically which currently being input manually.
2. A more powerful searching capability should be equipped into the user interface design
3. The hierarchy tree structure can be rendered into 3D as the user wished or to stay in its 2D nature

The thesis has given a new insight of how web sites in Malaysia especially the ones categorized into content-rich web sites can be given extra value. Information visualization provides a very good avenue in realizing this. The supporting languages (Java and HTML) and technologies (Windows NT and Tripod) also complement the dreams of realizing it into a reality which is available today. The hierarchy tree structure, even though is very basic, yet it provides a very valuable features needed by every Web users.