CHAPTER VII
CONCLUSION AND RECOMMENDATION

A solution for on-line examination was successfully developed after a thorough research and studies done. The interactive web solution developed is suitable to be used in a real situation public examination as it is easy to use, increase examination management efficiency and the examination result can be produced once the candidates completed their examination. VPN implementation offers a reliable security solution to the system. Analysis on the user acceptance survey approves the quality of the solution developed. However there are certain problems encountered during the development process.

7.1 Problems Encountered and Solutions

7.1.1 Research and Background Study

Among the problems faced on the background study were the literature on the Examination Syndicate of Malaysia on examination design and security measures was very limited. Discussion with the officer in charge of the Information Technology subject examination, Examination Syndicate of Malaysia revealed minimum input due to highly classified nature of their job but discussions with Puan Hanizah bt. Hamzah, the Examination Syndicate officer assigned to Information Technology subject, did give some idea on smart assessment approach of the Information Technology subject and the implementation of Criteria Reference
Test (CRT) to complement smart learning. According to Pn. Hanizah, CRT was first proposed for Sekolah Bestari (Malaysian Smart School Project), but due to number of technical constraints faced by the Smart School, the Information Technology subject was the first subject to deploy CRT. One of the main objectives of smart learning is that learning and teaching is focus on individual student capability. Students were given chance to take their test whenever they are ready. They will be given all the required skills and knowledge according to their ability, at their own pace. Assessment that follows the teaching and learning activities should be flexible to cater difference ability of students. Those reason emphasis on the need of having on-line examination to cater the on-going teaching and learning process.

Discussions with teachers teaching Information Technology subject disclosed the financial problem faced by the school to facilitate physical equipment for Information Technology subject especially maintaining computer hardware in the computer lab. Most of the schools get minimum financial support from the State Education Department and the Ministry Of Education. Maintaining the computers is very costly and time consuming. The teachers did the minor maintenance work themselves most of the time to save cost. As a result to this finding, a free-of-charge VPN solution is proposed for the on-line examination project.

Literature study on security feature of an on-line examination was also very limited as it is relatively a new solution for assessment especially in teaching and learning activity in a public school. Most of the literature focuses on the approach and the effect of an on-line assessment to the student. As an alternative, study on the
security issues was done on a general network security issues. The WWW services of the Internet offer a lot of articles and discussion on computer network security.

7.1.2 System Analysis

System analysis phase defines the system requirement, interface design and database dictionary. The interface design was the most critical task as it gives direct visual effect to the user of the system. Improper interface design may discourage user to use the system and may lead to the system failure. Graphics may attract young user who are the target group to the solution but at the same time is increase download time.

Functional requirement of the system were carefully isolate to ensure the system is capable to replace the existing system efficiently. All the crucial functions in the existing manual multiple-choice type of examination such as display, response selection, and instructions were emphasized in the new system. The scripting language automated scoring system. The multiple delivery of question was made possible with implementation of a randomize function.

The database dictionary was change a few times to suit the coding and query process during the system implementation. Some of the data attributes such as primary key and validation rules were amended to avoid error during run time.
7.1.3 System Implementation.

System implementation took a long duration because I was a novice in ASP programming. Reference from books, Internet and friends help me a lot to develop the system. Previous experience with Visual Basic and HTML made the learning process easier.

In the VPN implementation, it was first suggested in the system design process that only Chief Invigilator of the Examination Center to do the authentication process for the Examination Center. Once the Examination Center was authenticated, the candidates could access the examination web page located on The Examination Syndicate Server. When implement the Microsoft PPTP virtual private networking, all the workstation must perform the dial-up to establish VPN. This may cause congestion and effect download time very badly.

7.2 System Advantages

There are few features that distinct the on-line Examination System for Information Technology subject from the existing system and the other web-based on-line assessment solution. Security feature was the main character make the system reliable to be implemented in a national level examination.
7.3 System Security

VPN implementation provides a total security solution to the system. Double authentication process, during the VPN dial-up and web page login provides checking of a claimed identity. This will protect the system from masquerade threats over the Internet. The candidates were given limited access control to the folder that deals with the examination only. This feature stops the candidates from deploying unauthorized use of resource, which may lead to fraud during the examination session. Strong encryption algorithm applied to the encapsulated data packet enhanced the data confidentiality.

7.4 User Friendliness

User friendliness of the system is shown by the way the candidates’ response to the examination question. On the other web-based examination, candidates must submit the responses by clicking the submission button. Once the responses were submitted, there was no way that the candidates can change the choice of answer. In this system, the candidates are free to browse back to the previous question should their had another thought for the choice of response. To submit responses, candidates should just click the mouse when the cursor point to the correct choice of answer.
7.5 Future Enhancement

One of the disadvantages identified in the online examination solution for Information Technology subject is speed latency. It was due to strong encryption applied to the packet. PPTP packet encapsulated on PPP protocol worsens the situation. It is suggest that in future, a strong encryption technique but require minimum processing power to be applied to increased speed of the system. Implementing VPN through hardware devises as a gateway will increase efficiency in channeling data packet.

7.6 Overall Conclusion

The opportunity to develop this on-line examination solution enhanced my knowledge in Information Technology discipline. Valuable experience gained from developing the server side scripting language that sharpens my programming skills. The on-line examination for Information Technology is now ready to be considered in implementing a national level examination.