Chapter 7

Research Findings and conclusion

This chapter is to analyze our results of theoretical and empirical findings in comparative way to bring the result for our research questions of the study. For that, all the vital points which are collected in theoretical and other study findings are analyzed to provide answers of our research questions and objectives of this thesis.

7.1 Research Findings

The primary objective of our thesis work was to identify the particularities of using ICT within higher education to propose and design an e-Governance system. Mainly, we have considered the risks and benefits of ICT architecture and proposed an ICT adoption strategy proper with suggested design based on ICT based model for institutes and universities. An analysis of the data and the main activities that exist within a university was the starting point for choosing a ICT model that should take into account the special security requirements of higher education and the available ICT solutions as well.

By creating eLC, we propose a Software Development Platform for future e-Governance systems based on ICT technology. It enables clients (mainly students and trainers) to specify and design their task hosted as a service through distributed ICT which is interfaced with Web services technology. Since the eLC ICT is loosely coupled with that of View ICT, the View pattern can be outsourced to provide a
universal structure for a high variety of end users. The presented model can significantly improve teacher-student collaborations through adaptation of devices to a variety of end-users. In the traditional e-Governance ecosystem, physical machines are usually simply and exclusively stacked, and most resources are deployed and assigned for some specific tasks. Moreover, the utilization of those resources becomes urgent problem.

In our proposed solution we argued for a new e-Governance system based on ICT infrastructure. We proved that ICT based e-Governance system is reliable, flexible, cost-efficient, self-regulated, and QoS-guaranteed. It has some mechanisms to guarantee the teaching and learning activities, the quality and the running of the system.

Finally, our research results answers the main research question of the study: —What can be the main issues in use ICT based e-Governance systems and how can we made a ICTbased e-Governance system and we propose our new model named eLC.

After completion of the theoretical study, we used empirical studies to crosscheck our findings. In empirical study, we used three ICTbased e-Governance solution vendor’s websites as our sampling for empirical research. All these companies published their product details clearly on their websites. So we took the answers for our questionnaires from the published data of those websites. Subsequently text analysis is used once again to analyze the procured data from websites. These final results helped us to strengthen our theoretical results and ultimately paved more reliable resolutions based on this validation.

The reliability criteria of our thesis results are consistent through the conscious selection of research papers and articles in finding answers to our research questions. We selected and reviewed as many research articles to perfect theoretical study for our study. Those papers and articles are collected through various sources like IEEE explorer, Google scholar, LIBRIS, etc. In general IEEE papers and articles are considered as reliable source, so we mostly gave priority to good research papers from international journals and IEEE articles than any other sources. And apart from this,
some ICT services offering companies like Oracle, we chosen for our prototype design of eLC model. So the results of our research will help to design a practically working solution of our proposed eLC model.

7.2 Conclusion

Despite its critics and drawbacks, our findings indicate that ICT is there to stay. Present economic and technical situation will force more and more organizations at least to consider adopting a ICT solution in e-Governance. Universities have begun to adhere to this initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of ICT solutions.

ICT has recently emerged as a compelling paradigm for managing and delivering services over the internet. The rise of ICT is rapidly changing landscape of Information technology and ultimately turning to the long-held promise of utility computing into a reality. ICT can help communities and nations, can transform education. An entire world of knowledge can now be made available to teachers and students through ICT based services that can be accessed anytime, anywhere, from any device. By helping countries worldwide, lowering the cost and simplifying the delivery of educational services, ICT enables students across the globe to acquire the 21st-century skills and training they need to compete and succeed in the global information society. Present economic situation will force different educational institutions and organizations to consider adopting a ICT solution. Universities have begun to adhere to this initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of ICT solutions. The aim of our work was to identify an architecture which will be using ICT within higher education.

7.2.1 Benefits and disadvantages of using the ICT for e-Governance

Using ICT for e-Governance solutions influences the way the e-Governance software projects are managed. There are specific tasks that deal with finding providers for ICT, depending on the requirements (infrastructure, platform or
services). Also, the cost and risk management influences the way the e-Governance solutions based on ICT are managed.

**E-Governance Benefits**

Many education institutions do not have the resources and infrastructure needed to run top e-Governance solution. This is why Blackboard and Moodle, the biggest players in the field of e-Governance software, have now versions of the base applications that are ICToriented. E-Governance is widely used today on different educational levels: continuous education, company trainings, academic courses, etc. There are various e-Governance solutions from open source to commercial. There are at least two entities involved in an e-Governance system: the students and the trainers.

**The students:**

- Take online course
- Take exams
- Send feedback
- Send homework, projects

**The trainers:**

- Deal with content management
- Prepare tests
- Assess tests, homework, projects taken by students
- Send feedback
- Communicate with students (forums)

Usually, e-Governance systems are developed as distributed applications, but not limited to. The architecture of an e-Governance system, developed as a distributed application, includes a client application, an application server and a database server,
beside the hardware to support it (client computer, communication infrastructure and servers).

The client hardware could be a mobile device or a desktop computer. The client application can be a simple web browser or a dedicated application.

Even with the current hardware and software limitations, mobile devices are supporting multimedia based applications. Currently, compared with desktop applications, mobile applications, especially multimedia-based applications, have serious limitations due the processing power and memory constraints. Due the fact that the data processing is on the server side, the use of mobile devices for learning is growing fast. Still, the mobile applications need to be optimized to be used for e-Governance. The e-Governance server will use ICT, so all the required resources will be adjusted as needed.

E-Governance systems can use benefit from ICT using:

- Infrastructure: use an e-Governance solution on the provider's infrastructure
- Platform: use and develop an e-Governance solution based on the provider's development interface
- Services: use the e-Governance solution given by the provider.

A very big concern is related to the data security because both the software and the data are located on remote servers that can crash or disappear without any additional warnings. Even if it seems not very reasonable, the ICT provides some major security benefits for individuals and companies that are using/developing e-Governance solutions, like the following:

- improved improbability – it is almost impossible for any interested person (thief) to determine where is located the machine that stores some wanted data (tests, exam questions, results) or to find out which is the physical component he needs to steal in order to get a digital asset;
virtualization – makes possible the rapid replacement of a compromised ICTlocated server without major costs or damages. It is very easy to create a clone of a virtual machine so the ICTdowntime is expected to be reduced substantially;

centralized data storage – losing a ICTclient is no longer a major incident while the main part of the applications and data is stored into the ICTso a new client can be connected very fast. Imagine what is happening today if a laptop that stores the examination questions is stolen;

monitoring of data access becomes easier in view of the fact that only one place should be supervised, not thousands of computers belonging to a university, for example. Also, the security changes can be easily tested and implemented since the ICTrepresents a unique entry point for all the clients.

Another important benefit is related to costs. If the e-Governance services are used for a relative short time (several weeks, a quarter, a semester), the savings are very important.

7.3 Future Work

Our study was fully focused on the basic and popular issues in ICTbased e-Governance technology. But as mentioned in thesis chapters, there exist are some other threats, issues and limitations in proposed model. So people may continue to work on our research limitations presented in our work. That kind of research will imply to bring more powerful and effective eLC product in market. Apart from this, our research will found to be useful in mobile e-Governance technology as the future of e-Governance will be m-Learning using mobile technologies.
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Appendix: Published Papers