Building the E-learning System in King Saud University, A System Perspective

Mohamed Mostafa Abouzahra

***Abstract*— This paper describes a case study of designing and implementing the e-learning system in King Saud University. It shows how the new theories of system engineering and system thinking can be used to design such a system, It shows the effects of using system engineering methodologies on the execution of the project, and the benefits they have on the success of the project.**

***Index Terms*—System Design, System Engineering, System Thinking, Project Management.**

I. Introduction

E-learning utilizes information and communication technology to improve the educational process and to increase interaction between students and teaching staff [1].

Most major universities provide some means of e-learning to their students to improve their performance, these means range from simple tools such as a projector or interactive board to more sophisticated tools such as an educational portal, or a learning management system.

King Saud University (KSU) is the biggest University in Saudi Arabia with over 80,000 students and 4,000 faculty members distributed among five campuses within the city of Riyadh.

Because of its role as the front of university education in Saudi Arabia, KSU decided to implement an e-learning system to elevate its role in society and to improve the performance of its students and faculty staff.

This system was successfully implemented by 2010, and it received the United Nations prize for public service 2010 – Western Asia region [2].

This paper will describe how the e-learning systems in King Saud University (KSU) was designed from a system approach, and how this approach accelerated and simplified managing the project to success.

This case represents a novel approach in designing and managing e-learning projects, and in applying system engineering rules to this field.

The first section will review the system principles used to design the system, followed by describing the requirements of the university based on its environment; the system design based on these requirements is presented next. We conclude by showing how this approach was used to organize and manage the project, and its role in simplifying this process.

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II. System Engineering review

System engineering is an approach and means to enable the realization of successful systems [3]. It is considered a link between soft (human) systems and hard systems [4 1995]. And it is driven by the business requirements of the organization applying this approach.

System engineering has developed significantly since the use of the traditional system engineering [5].

Currently System engineering has many theories and techniques that are used to improve the design and management of complex systems. These theories include Modeling methodologies [6] which help in transforming requirements into a complete system, Theory of Constraints [7] which involves understanding the weakest point of the system and attempting to strengthen it to improve the system performance. This theory presents interesting techniques to understand the system requirements [8].

One of the results of the theory of constraints is the Critical Chain project management methodology (CCPM) [9] which depends on identifying the weakest link in the project (the critical chain) and attempting to strengthen it. This methodology deals with the project as a complete system instead of a series of independent activities, and it matches system engineering much better than the traditional project management methodologies [10].

System thinking [11] involves viewing the system as a whole instead of looking at its individual components. This helps in fulfilling the needs of the stakeholders, and in making sure that the system operates seamlessly with complete integration between its parts. This is also essential in understanding the system dynamics and preventing common system problems resulting from looking at each system component independently.

The above mentioned methodologies help to design a system that satisfies the needs of the stakeholders and to build in quality in this system.

III. KSU environment and requirements

The environment and culture in Saudi Arabia enforce some requirements for any educational system there.

One of the main cultural factors is the separation between male and female students in different campuses. This requires having to duplicate the faculty staff or to have some means of transmitting lectures between campuses.

Other environmental factors include the distribution of students between different campuses in a 100 miles area, and the distribution of students in the wide area of Saudi Arabia. These factors require having a powerful distance

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learning system to improve interaction between these students and to utilize resources in the best way.

Requirements of KSU included implementing a blended learning model [12] where traditional and e-learning education are utilized, integration with existing information systems such as student information system, having quality built into this system, and having a single portal to access all e-learning tools.

The system should cover all the 80,000 students and 4,000 faculty members of KSU, and should provide an example to other universities in the country.

The next section describes how the system was designed based on the above requirements.

IV. SYSTEM DESIGN

The first step in the design process was to define this system. It was defined as an e-learning system which has students, faculty members, and guests as users. It provides these users with services including interaction between different user groups, course creation and participation, and resource sharing. The system also provides tools to transmit lectures within and outside campus, has built in quality control tools, and interacts with other IT systems.

Figure 1 shows the inputs and outputs of the e-learning system as described earlier. Inputs include students, faculty members, lectures, courses, and data from other systems. The outputs include a single integrated system to provide all functionalities, and improvement in performance and interactions between different groups in KSU.

The requirements include built in quality, covering the numbers and locations of students, using blended learning, and integration.

This design aided the process of deciding the required functionality in the system. It was decided that we need a video conferencing system, a learning management system (LMS), remote management system, a smart classroom system [13], and a portal to integrate all these systems together.

In order to further clarify the system and to define it in the clearest way, a system interaction diagram was built to show how the different parts of the system work together in order to form the complete system. Figure 2 shows a simplified representation of these interactions.

V. MANAGING THE PROJECT

This section shows how the above design helped in facilitating the management of the project to success.

Some of the major reasons behind project failure are problems in defining the scope of the project, failure to identify stakeholders, and unidentified risks [14].

The previous approach in designing the system helped to eliminate these issues by:

- The scope was well defined through system diagrams and definition. This enabled the scope to match the exact requirements of KSU, and prevented frequent changes to the scope considered to be a major failure issue.
- The system interactions helped to identify different stakeholders involved in the project and thus meet their needs.
- Most risks originate from the interactions and integration between different entities within the system. Clarifying these interactions eliminated many of these risks.

The planning and execution of the project was conducted using CCPM methodology described earlier. This methodology takes into consideration the nature of the system, available resources, and stakeholders' requirements.

It minimizes the execution time and increase the project probability of finish on schedule and in budget.

The project was completed in completely in six months which is almost half the estimated duration of the project.

VI. CONCLUSION

This research showed a case study of designing a sophisticated e-learning system for King Saud University utilizing system engineering theories in designing and implementing the system. It showed how these methodologies helped in clearly define the system, their interactions, and their scope.

It also described system engineering role in simplifying the execution of the project.

The project implemented using this approach was completed in half the estimated duration while meeting the expectations of stakeholders as well as quality criteria.

Future work will include detailed description of the implementation of this project, and how to apply critical chain project management methodology to this type of projects.

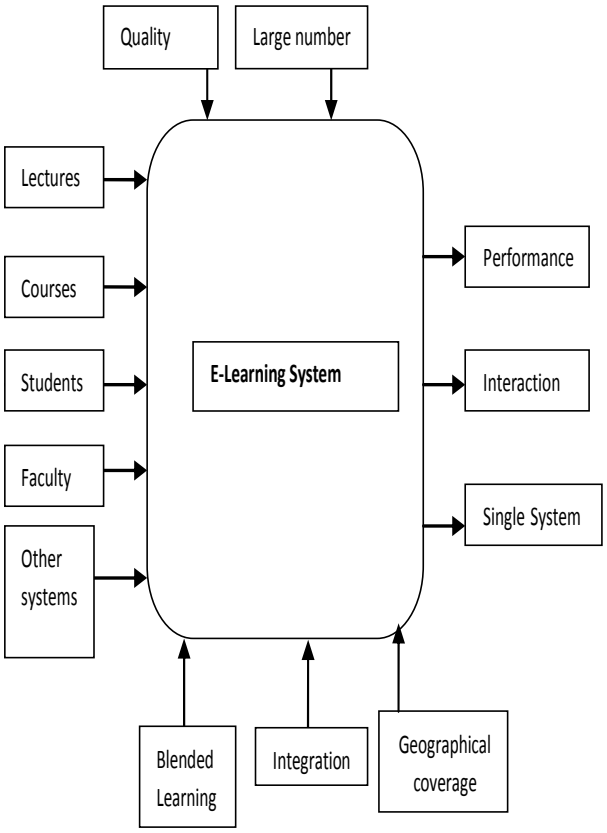

Figure. 1. Conceptual model for KSU e-learning System

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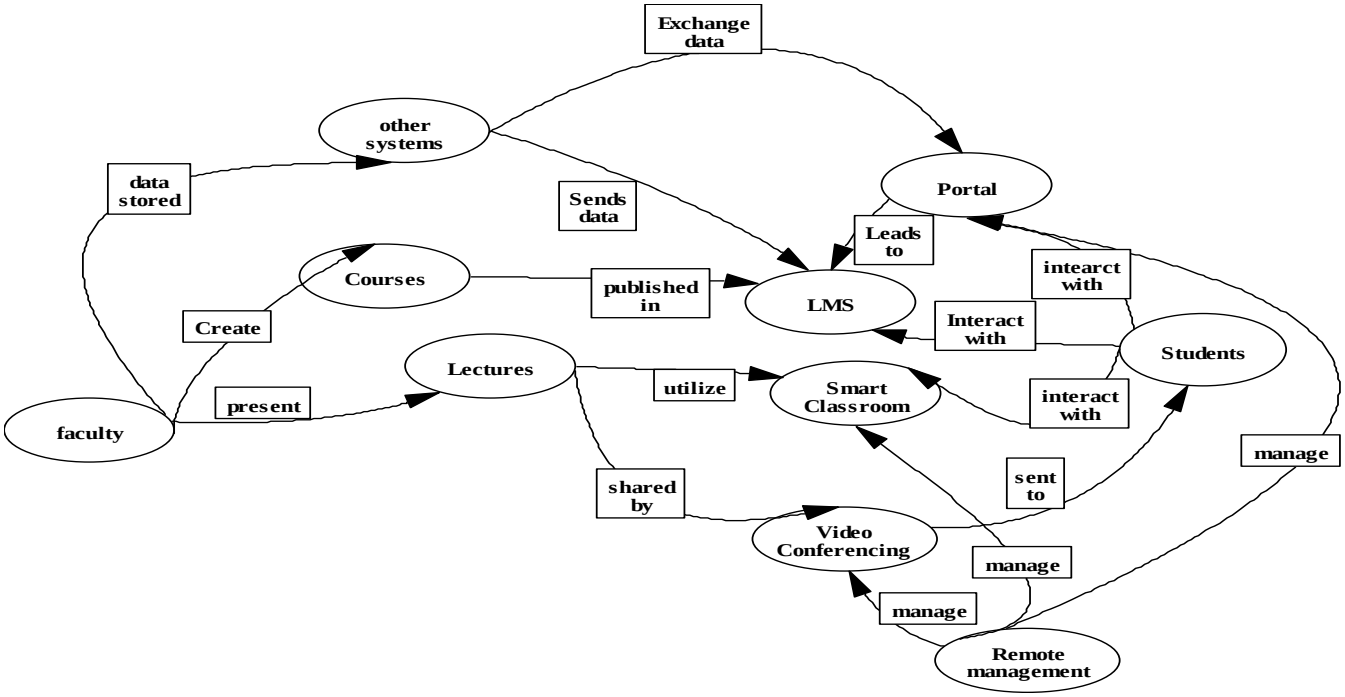

Figure. 2. System interactions

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