

# Course Adoption of MS Technologies – Case Study

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**Abstract**—Motivated by Microsoft Co. Academic Program initiative, the department of Information Technology in King Saud University has adopted Microsoft products in three courses. The initiative aimed at enhancing the abilities of the university graduates and equipping them with skills that would help them in the job market. A number of methods of collecting assessment data were used to evaluate the course adoption initiative. Assessment data indicated that the goal of the course adoption is being achieved and that the students were much better prepared to design applications and administrate networks.

**Keywords**—course adoption, assessment, programming, technologies

## I. INTRODUCTION

THE department of Information Technology (IT Department) of King Saud University (KSU), and the Microsoft Corporation (MS) have joined together to launch course adoption initiatives to bridge the skill gap between academia and industry.

*The motivation for this initiative was:*

1. The mission of the IT Department, which focuses on providing high quality education through the combination of: theory, practice, and real-world experience, to equip graduates with the necessary knowledge, and skills to make them competitive in the workplace [11].
2. The observation made by the Communication and Information Technology Commission in Saudi Arabia, that university graduates do not possess sufficient practical knowledge of IT subjects, and therefore, cannot be deployed on important tasks immediately after graduation. If they were to acquire sufficient experience, and training over a period of time, a number of them may be groomed to take up senior IT positions [13].
3. The importance of recognized, technical certifications (e.g., MS and CISCO) to the job market and pay growth [14].

The MS adoption program is a collaboration of the IT Department and MS, with the latter enriching the course through practical hands-on experience of ICT market needs. Therefore, the initiative aims to enhance the abilities of KSU graduates, and equip them with skills that will help them in the job market.

MS technologies were adopted in three courses, and new syllabi for the laboratory session were designed and developed. The design of the laboratory curricula was aimed at integrating practical experience with the theory presented in lectures. One of the goals of these course selections was to prepare students in the fundamental technologies required by the Saudi IT market, and the current IT program, which includes a requirement for Application Developers and Network Administrators.

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The first course, Human Computer Interaction and Visual Programming, provides an introduction to the field of Human-Computer Interaction (HCI), and an environment for the development of Graphical User Interfaces (GUI). Specifically, the course is designed to give a wider understanding of the design, implementation, and evaluation of GUI as a means by which it is easier for users to carry out their given tasks.

The second course is Network Administration, which is lab intensive and concentrates on relevant network technologies. This course provides a hands-on experience relating to a wide range of networking knowledge. It covers the tasks of installation and maintenance of the operating system, administration of active directory, file and print resources, as well as Routing and Remote Access Services (RRAS), and the monitoring and troubleshooting of a Windows server.

The third course, Advanced HCI, is a theory and project-driven course to investigate the design of more usable, pleasurable, and effective ways for people to interact with computer-based systems and applications. The course provides students with a platform to design, implement, and evaluate software products based on the HCI theories.

The goals of the course selection are: 1) to provide a basic educational foundation, 2) to provide training in fundamental MS technologies, 3) to narrow the gap between theory and practice, and 4) to provide hands-on experience and actual training in programming design issues and practices of the corporate world.

This paper presents details on the design of each course, the implementation challenges related to MS technology adoption in undergraduate courses, and the background of the students. Assessment and course enrollment data indicate that the courses have been well received by the intended audience, but a number of areas remain that still need to be addressed in order to further improve the entire course delivery.

The objectives of the study are: 1) to analyze the academic support provided by the industry, and 2) to study the effect of that support on the educational outcome.

## A. Constraints

The design of the course was constrained by a number of factors related to the institution, lab facilities, time, personnel, and students' backgrounds. Each course was designed so that all undergraduate students that were enrolled could participate.

### 1. Personnel Constraints

The IT Department has a shortage of MS certified instructors with real-world industrial experience. Also, many technicians have insufficient experience in installing, maintaining and resolving problems related to some MS products. The high turnover of faculty members was another important constraint affecting the success of the adoption program. This faculty turnover was related to an increased number of instructors going on scholarships for postgraduate programs.

## 2. Lab Facilities Constraints

In order to fully appreciate these technologies and to gain fundamental experience the students must be given hands-on opportunities. Thus, lab exercises had to be included in the selected courses. However, the hardware capability of the IT Department is not adequate for running the latest versions of the products, and the connections of the PCs incompatible for the Network Administrator course laboratories.

## 3. Timing Constraints

The KSU academic calendar is divided into two semesters, and the IT Department traditionally offers courses that contain three semester credit hours of content, of which two contact hours are dedicated to laboratory practice. A semester is an average of 15 weeks lectures. Thus, all of the MS technology adopted courses were designed to be delivered on a semester calendar, and to contain material that is consistent with the semester's actual hours.

## 4. Language Constraint

In Saudi Arabia, instruction in most secondary schools is in Arabic with English taught as a second language. However, instruction in the IT Department is in English. Thus, there is a language constraint among students on the course.

All of the constraints mentioned above had an impact on the final form of each individual course.

## B. Student Background

The backgrounds of the students are quite similar. They have basic and intermediate object-oriented programming skills, and the International Computer Driving License (ICDL) level of MS product use. Most of the students have not previously used MS platforms for programming. As for networking, all students have a good knowledge of, and fair practice in network technologies, protocol and standards. Lectures must be well equipped so that all students have the ability to understand the majority of the technical content. The HCI course is for senior level students with good programming and software designing skills.

## C. Research Method

The three courses were offered twice in the academic year 2010/2011. The assessment, evaluation and feedback for improvement of the course required the following tasks: designing assessment instruments in the form of surveys, conducting processes for assessment, analyzing the data, and suggesting corrective actions accordingly.

A number of methods of collecting assessment data were used to evaluate the course adoption initiative: instructors' surveys, instructors' feedback, student experience surveys and a Course Learning Outcomes survey.

The results of the 2010/2011 assessment and evaluation were utilized to enhance the course offered during the following academic semester.

## II. COURSES

All three courses are described in this section. The catalog description is included for each along with the results of the

assessment and evaluation. The, analysis and corrective actions are described below.

### A. Course 1 – HCI & Visual Programming (IT211)

Catalog Description: HCI & Visual Programming (3 credits)

Structure: 2 hours lectures/week + 2 hours laboratory/week

Prerequisite: Basic and Advanced Programming in Java.

Level at which this course is offered: 5

Number of enrolled students in Fall 2010/2011: 102

Number of enrolled students in Spring 2010/2011: 77

MS product used in Fall 2010/2011: Silver light and Visual Studio with C#

MS product used in Spring 2010/2011: Visual Studio with C#

### 1. Description

During the academic semester, the course covers two hours of lectures and two hours of lab per week. During lectures, discussion of the theories and foundations of programming are demonstrated and explained, and these theories are put into practice during the lab work through given project samples and lab exercises. At the end of the course, students develop a project with a GUI design, based on the needs of a user.

The first element is studying the field of HCI which provides an overview about the fundamental components of an interactive system, which includes the human, the computer system itself, and the nature of the interaction. It presents different interaction models, frameworks and styles. Moreover, it includes the interaction design process, and highlights the range of design rules that can help to increase the usability of software products. Furthermore, it discusses how to design a system to be universally accessible.

The second component is providing knowledge about the .NET framework and the visual development environment (C#.NET). This covers some topics which include: data structures, event driven programming, controls for windows forms, dynamic controls, GUI, graphics, multimedia, and development of windows applications. These will provide the students an opportunity to design, implement, and evaluate a software product based on the HCI theories.

The following sections present the assessments used for the two semesters: Fall 2010/2011 and Spring 2010/2011.

### 2. Fall 2010/2011 Evaluation

#### i. Grades and GPAs Distribution

Fig. 1 illustrates the students' grade distribution on the course. It shows progress of students at the end of the academic semester. Overall, the majority of grades were above average.

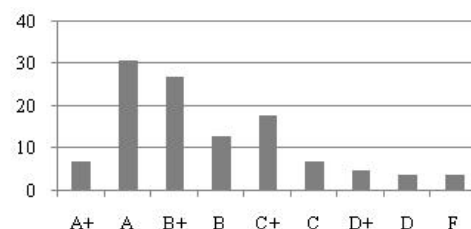


Fig. 1 Grades Distribution for IT 211 in Fall 2010/2011

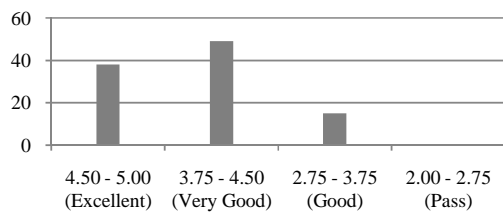


Fig. 2 GPA Distribution for IT 211 in Fall 2010/2011

Fig. 2 illustrates the GPA distribution of the enrolled students.

### ii. Course Learning Outcomes

The Course Learning Outcomes (CLOs) questionnaire was posted for students at the end of the academic semester to assess their learning outcomes from the course. The questionnaire was answered by all enrolled students. Table I summarizes the students' answers.

TABLE I  
IT211 CLOS ASSESSMENT – FALL 2010/2011

At the end of the course, I am able to:	SA	A	N	D	SD
1 Develop an understanding of user interface design principles, guidelines and standards.	42%	46%	8%	1%	4%
2 Develop an understanding of User Centered Design UCD and universal design.	29%	46%	14%	6%	5%
3 Ability to describe and apply theoretical concepts for analyzing observed problems in interfaces, models and methodologies from the field of HCI	19%	48%	24%	5%	4%
4 Ability to evaluate the usability and accessibility of user interfaces	30%	41%	19%	5%	5%
5 Select and apply appropriate evaluation techniques in HCI	23%	46%	23%	6%	3%
6 Introduction to visual and event-driven programming using C#	43%	41%	11%	3%	3%
7 Use features of a visual development environment to implement an application (C#, .NET)	39%	46%	8%	4%	4%
8 Implement HCI applications and GUIs in C#	38%	42%	14%	3%	4%
Total	33%	44%	15%	4%	4%

### iii. Instructors' Evaluation

A questionnaire was also given to the course instructors at the end of the academic semester to evaluate their experience, related to the course adoption initiative. The questionnaire had the same focus as the students' evaluation questionnaire, and included an open question related to suggestions for improvement. The course textbooks [7]–[9], are the main sources for course preparations, lectures and laboratory hours. Supplement material [18], and additional online resources have been considered for this course as well. The MS Faculty Connection [8], was also used in preparing the class materials. This Faculty Connection is a web portal provided by MS with a variety of tools for effective teaching, and includes: lesson plans, innovative teaching kits, online video materials, software, and more. The instructors' evaluation data shown in Fig. 3, indicates that MS provided them with excellent support in terms of the selection of textbooks, and assistance in developing the course syllabus, and was given a ranking of 5 out of 5, where 1 is the lowest and 5 the highest. Provision of online resources was ranked second, and materials for

developing instructors, as well as training support, and lab exercises were ranked third with a score of 2 out of 5. This followed a 15 hour workshop for the instructors, provided by MS, titled "C# and Silverlight" and a second 15 hour workshop customized to the course delivery. The data indicates: 25% of the instructors felt that they covered the importance of certification, and the relation of the course content and the lab tools to the ICT market, 40% of the instructors felt that they related the course content to other courses in the IT program, and 70% of instructors felt that they had covered the technical issues.

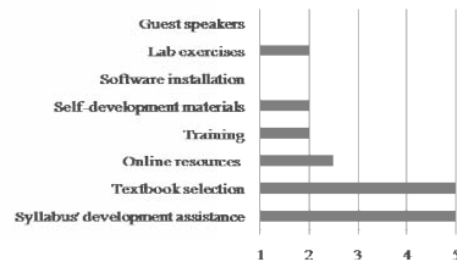


Fig. 3 Instructors' rating of MS support in IT211 course

The availability of resources for covering lab exercises was another constraint raised by the instructors. As for the course difficulty, instructors felt that the time constraint did not allow them to cover most of the controllers on Integrated Drive Electronics (IDE), which affected the quality of the students' projects. Thus, Silverlight topics were replaced with advanced topics in C# in Spring 2010/2011.

### 3. Spring 2010/2011 Evaluation

#### i. Grades and GPAs Distribution

Fig. 4 illustrates the students' grade distribution on the course. It shows that the average of students' grades was 4.03, which is roughly B.

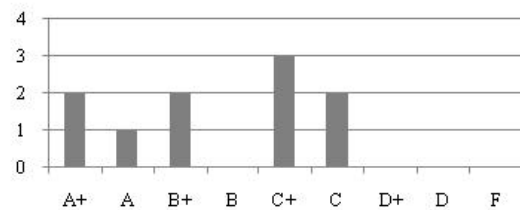


Fig. 4 Grades Distribution for IT211 for Spring 2010/2011

The GPA distribution of enrolled students is illustrated in Fig. 5.

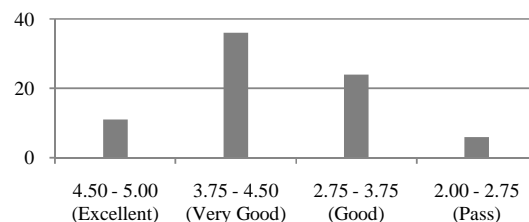


Fig. 5 GPA Distribution for IT211 for Spring 2010/2011

### ii. Course Learning Outcomes

The CLOs' questionnaire was posted for students at the end of the academic year to assess the learning outcomes of the course. Table II summarizes the students' answers.

TABLE II  
IT211 CLOS ASSESSMENT – SPRING 2010/2011

I am able to:	SA	A	N	D	SD
Describe and apply theoretical concepts for					
1 analyzing observed problems in interfaces, models and framework from the field of HCI	50%	50%	0%	0%	0%
Describe the interaction design process and					
2 develop an understanding of different types of design rules that supports the usability	38%	50%	13%	0%	0%
Select and apply appropriate evaluation					
3 techniques in HCI and develop an understanding of universal design	38%	50%	13%	0%	0%
4 Identify the components of .NET framework	38%	50%	13%	0%	0%
Use features of a visual development					
5 environment(C#, .NET) and theories of HCI to implement an effective and usable application	38%	25%	38%	0%	0%
<b>TOTAL</b>	<b>41%</b>	<b>45%</b>	<b>15%</b>	<b>0%</b>	<b>0%</b>

### iii. Instructors' Evaluation

As for the MS support shown in Fig. 6, the instructors' evaluation data indicates that MS has provided them with adequate learning materials (e.g., textbooks, references, online resources, and software) for developing the course content. In addition, MS assisted the instructors in the textbook selection and the development of the course syllabus. However, the instructors reported that no training was conducted by MS during this semester.



Fig. 6 Instructors' rating of MS support in IT211 course

With regard to the instructors' statements of the covered aspects of the course: 40% of them felt that they covered the relationship of the course content to other courses in the IT program, and 70% of them felt that they covered in-depth technical issues of the course. However, the course's importance in certifications and its relationship to the industry were not emphasized.

### iv. Students' Evaluation

A questionnaire was distributed to the students at the end of the academic semester to evaluate their experience of the course. The questionnaire focused on the learning resources used, as well as the MS technologies adopted in the course.

A summary of the students' evaluation results reveals: 80% of students used the course presentation slides as the primary learning resource, different online websites were used as the second learning resource by 37% of students for more

examples and open source code, and the textbook was used by 31% of students. Although the textbook covered most of the topics discussed in the lectures, its content was found to be too complex.

The students' evaluation data indicates that the "MS product is suitable for teaching the course", with 70% of students' responses agreeing, or strongly agreeing with that statement. Only 3% of students either disagreed, or strongly disagreed.

MS support of the course is reflected in four different aspects: online resources, software, tutorials, and lab exercises. Fig. 7 summarizes the students' evaluation of MS support. The data indicates that the main MS support was in providing software, with a total of 65% responding that they agreed, or strongly agreed with that statement. Second in ranking was the provision of lab exercises with 51% of responses agreeing, or strongly agreeing with the statement. Even though, MS provided part of the curriculum by conducting a 3 day intensive workshop on C#, and an online tutorial from MS (DreamSpark [15] and MSDN [16]), it ranked only third with 33% of responses agreeing, or strongly agreeing, whilst 32% of students agreed that online resources served as a learning source.

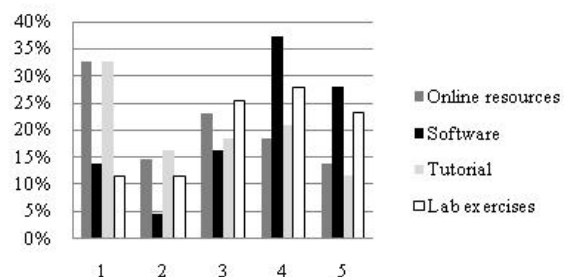


Fig. 7 Students' Evaluation of MS support

In terms of course difficulty, including the adopted tool: 11% of students perceived the course to be difficult, 82% of students perceived it to be within their level, and only 11% of students found it very easy.

As for the knowledge the students obtained from the course, the students' evaluation data indicates that: 53% of students felt that the course prepared them to be MS certified, 58% of students felt that the course provided them with in-depth knowledge of technical issues, and 59% of students felt that the course was related to the needs of the industry.

The data also indicates that 91% of students were not aware of the potential employment positions in the ICT market. The responses show that 18% of the students see the course preparing them for a position of "programmer and developer", and 9% believe that it prepares them for a "software designer" position.

The course is project driven with an emphasis on practical visual programming. The project was identified by 12% of the students as the main difficulty encountered on the course. This project required advanced technical skills which were not provided in the course due to time constraints. In connection

to this, the students were unable to directly apply theories presented in class in their projects.

The amount and depth of information, and the language were listed as the second greatest difficulties faced by 9% of respondents. 5% of responses ranked the lack of practical exercises as the third highest difficulty. Overall, 67% of respondents stated that no difficulties were encountered during the course.

#### 4. Analysis of Fall and Spring Assessment Results

This section provides an analysis of the assessments results for the two semesters during the academic year 2010/2011.

The comparison of the GPA distribution with the grades distribution indicates that both have a similar distribution curve. In Spring 2010/2011 the course scored a little below average on student evaluations when compared to their GPA distribution curve.

The results of the CLOs show that the majority of students agreed, or strongly agreed on the acquisition of stated knowledge and skills. This clearly indicates that the design of the course and the adopted tools satisfied its learning objectives. Some neutral responses indicate that some students cannot decide on their perception of the course's focus.

According to the instructors' feedback, most of the students were able to describe, and apply theoretical concepts for analyzing observed problems in interfaces, models and frameworks from the field of HCI. This was revealed in the results by 19% strongly agreeing during Fall 2010/2011, and a 50% increase in strongly agreeing responses during Spring 2010/2011. This was achieved by presenting more examples in the class, alongside the analysis and discussion of real cases. The instructors also stated that some students were not able to integrate features of a visual development environment (C#.NET) and theories of HCI to implement an effective and usable application.

As for the instructors' evaluation of MS support, the software installation in laboratories during Fall 2010/2011 was not emphasized because there was no need for it, as Silverlight and MS Visual Studio C# were used in the previous academic year. However, the software installation was emphasized during Spring 2010/2011, following the release of a new version of MS Visual Studio C#, and the need for software updates. Training was provided by MS only during Fall 2010/2011, but it is concluded that MS supported the design and delivery of the course throughout the whole academic year.

With regard to the aspects covered in the course, the results reveal that the use of the course in relation to other IT courses was given enough emphasis. Other aspects such as the importance of certification, the relationship of the course content to the ICT market, and advanced technical issues should be given more emphasis.

Based on the students' evaluation, it was found out that MS products were suitable tools for teaching and learning visual programming, and HCI concepts and practices. Also, the students believed that the course and adopted tool were within their level of understanding.

Based on the assessment results, several suggestions have been stated for the course improvement:

First, at the end of Fall 2010/2011, the instructors found out that Silverlight's focus was on the web and xml, which are not directly related to the course goals. Thus, at the beginning of Spring 2010/2011, they decided to remove Silverlight and concentrate on advanced .NET programming which includes an introduction to .NET Framework, its major components (e.g., Framework Class Library (FCL), Common Language Runtime (CLR), and Common Language Specification (CLS)), and namespaces. All of these will be beneficial in the development of the students' projects, and will better prepare them for MS certification.

Second, even though the textbook was the main source for course preparation, only 31% of students used it as a learning resource. The main reason this being that the instructor claimed the textbook was not about event and visual programming which is the course's requirement, but rather its focus was C# programming. Hence, the instructors proposed to change the textbook.

Third, the average results of 19% during Fall 2010/2011, and 50% during Spring 2010/2011 on the CLOs "Applying theoretical concepts for analyzing observed problems in interfaces, models and methodologies from the HCI field", clearly showed the need for extra effort in giving examples of real systems problems for analysis and discussion by the students. In addition, since 12% of the students indicated that the project was the main difficulty they have encountered, the instructors have to concentrate more on the application of the theoretical contents of their lab sessions and give more case studies to narrow the gap between theory and application.

Fourth, given 39% on the "Use features of visual development environment to implement an application (C#, .NET)" learning outcomes during Fall 2010/2011, and 38% during Spring 2010/2011, the instructors suggested adding more homework lab sheets to make the students more familiar with C# and .NET programming languages and its environment.

#### B. Course 2 – Network Administrator (CAP333)

Catalog Description: Network Administration (3 credits).

Structure: 2 hours lectures/week + 4 hours laboratory/week.

Prerequisite: Principals of Computer Networks.

Level at which this course is offered: 5.

Number of enrolled students in Fall 2010/2011: 75.

Number of Certified students in Fall 2010/2011: 10.

Number of enrolled students in Spring 2010/2011: 96.

MS product used in Fall and Spring 2010/2011: Windows Server 2008 R2 based on "6425B Course".

##### 1. Description

The course covers four hours of lectures and a one hour tutorial class. It prepares the student to be a Network Administrator and provide them with the knowledge to successfully complete necessary tasks, including: installing and maintaining the operating system, administrating Active Directory, administrating file and print resources,

administrating Routing and Remote Access Services (RRAS), and monitoring and troubleshooting Windows Server 2008.

The students are given practical quizzes which will be the actual application of the installation, network connections, troubleshooting and administration of Active Directory.

Upon the completion of the course, students should be able to administer MS Server 2008, and configure a networking environment.

## 2. Fall 2010/2011 Evaluation

### i. Grades and GPAs Distribution

Fig. 8 illustrates the students' grade distribution on the course. Overall, the majority of grades scored average, or a little below average.

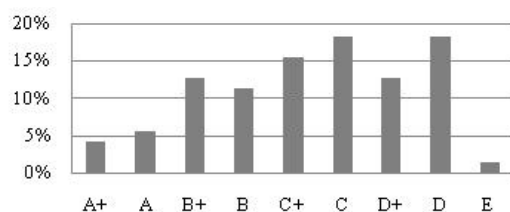


Fig. 8 Grades Distribution of CAP333 for Fall 2010/2011

Fig. 9 illustrates the GPA distribution for the enrolled students.

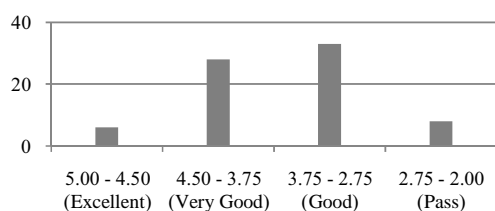


Fig. 9 GPA Distribution of CAP333 for Fall 2010/2011

### ii. Course Learning Outcomes

This section details the assessment of the course by the students, through CLOs and Table III summarizes their answers.

TABLE III  
CAP333 CLOS ASSESSMENT – FALL 2010/2011

I am able to:	SA	A	N	D	SD
1 Install and maintain server operating system in client-server network	40%	41%	12%	7%	0%
2 Apply business organization's needs to logical and physical structure of network.	11%	37%	41%	9%	1%
3 Organize, manage and control network objects, such as Organizational units, users and computers into Active Directory.	51%	33%	13%	3%	0%
4 Identify and troubleshoot Active Directory group types and scopes.	23%	45%	13%	3%	1%
5 Incorporate Group Policy into Active Directory to manage and control various configurations, such as desktop settings, security, scripts, folder redirection and software deployment. Manage and trouble shoot group policy inheritance.	15%	43%	34%	7%	1%

Understand, install and troubleshoot most 6 important network services such as Domain Controller and DNS.	16%	41%	24%	13%	5%
7 Configure suites, subnet and active Directory replication.	15%	41%	15%	12%	7%
<b>TOTAL</b>	<b>24%</b>	<b>42%</b>	<b>23%</b>	<b>8%</b>	<b>2%</b>

### iii. Instructors' Evaluation

Below is a summary of the results of the instructors' evaluation of MS support to the course.

MS learning materials and MS website (Windows server tutorials) [22] are the main source for course preparation.

As for the course difficulty, the lack of lab exercises was the main constraint raised by instructors.

Fig. 10 shows the instructors' evaluation data which indicates that MS provided them with excellent support in terms of: software, online resources, textbook selection, assistance in developing the course syllabus, and materials for self-reading. Thus, MS was, given a 5 out of 5 rating for support. Training support was ranked second with 4 out of 5. And last in the ranking was MS provision of qualified guest speakers as part of the curriculum. The instructors indicate no support from MS in relation to the lab exercises, which was one of the main difficulties faced by the instructors, as indicated earlier.

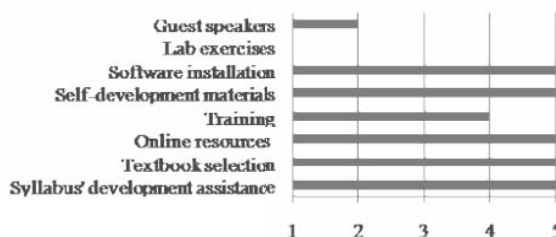


Fig. 10 Instructors' rating of MS support in CAP333 course

As for the aspects covered in the course: 100% of the instructors felt that the importance of certification and technical issues were addressed in the course's lectures and practical applications, 80% of the instructors felt that they covered the relationship of the course content to the ICT market needs, and 50% felt that they related the course content to other courses in the IT program.

## 3. Spring 2010/2011 Evaluation

### i. Grades and GPAs Distribution

Fig. 11 illustrates the students' grade distribution on the course. It shows that the average grade of the students was 3.12.

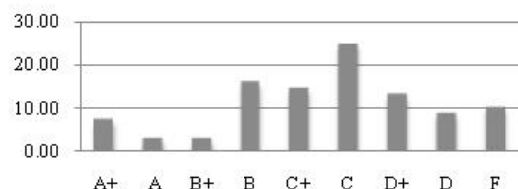


Fig. 11 GPA Distribution of CAP333 for Spring 2010/2011



Fig. 12 illustrates the GPA distribution of enrolled students.

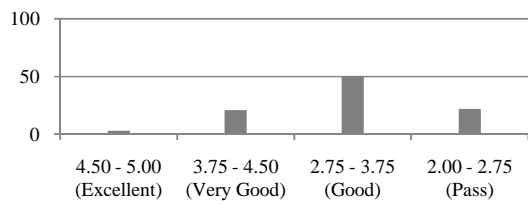


Fig. 12 Grades Distribution of CAP333 for Spring 2010/2011

### ii. Course Learning Outcomes

The CLOs questionnaire was posted to assess the learning outcomes from the course. Table IV summarizes the students' answers.

TABLE IV  
CAP333 CLOS ASSESSMENT – SPRING 2010/2011

I am able to:	SA	A	N	D	SD
1 Installing and maintain server operating system into client-server network	43%	38%	11%	2%	6%
2 Organize, manage and control network objects, such as organizational units, users, computers and groups into Active Directory	38%	43%	15%	2%	2%
3 Integrate Group Policy into Active Directory and manage group policy inheritance	32%	45%	17%	6%	0%
4 Understand, install and troubleshoot most important network services such as Domain Controller and DNS	9%	38%	32%	13%	9%
5 Configure sites, subnet and Active Directory replication	6%	38%	30%	13%	13%
<b>TOTAL</b>	<b>26%</b>	<b>40%</b>	<b>21%</b>	<b>7%</b>	<b>6%</b>

### iii. Instructors' Evaluation

A questionnaire was given to the course instructors at the end of the academic semester to evaluate their course adoption experience. An open question was presented for suggestions and improvements of the course.

Fig. 13 shows the assessment of the instructors regarding MS support. It shows that the provision of materials and training was given a score of 4 out of 5, which clearly states that the given support was sufficient to the learning objectives. A score of 3 out of 5 was given to lab exercises, online resources and software in labs.

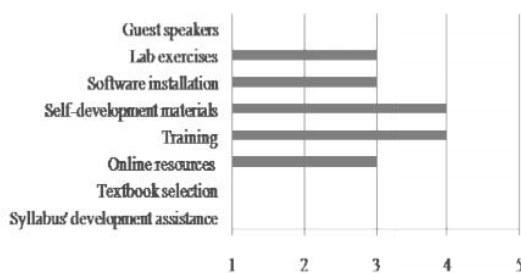


Fig. 13 Instructors' rating of MS support in CAP333 course

As for the aspects covered in the course: 90% of the instructors felt that they had covered the importance of certification, 85% of them felt that they covered the technical issues both in lectures and in labs, and 70% of them felt that

they related the course content to the other courses of the IT program.

### iv. Students' Evaluation

A questionnaire was distributed to students at the end of the academic semester to evaluate their experience of the course. The questionnaire focused on the use of learning resources as well as the MS product adopted in the course.

A summary of the students' evaluation results shows: 96% of the students agree that the textbooks [1]–[19] were the main source for the preparation of the course, 25% of the students used a variety of online websites for additional examples, while 3% of respondents used online videos as references for the same purpose.

Fig. 14, showing students' evaluation data, indicates students felt that the "MS product is suitable for teaching the course", with 32% of responses agreeing, or strongly agreeing with that statement. The majority of students also felt that the suitability of the MS product for the course was average, but 27% of respondents either disagreed, or strongly disagreed.

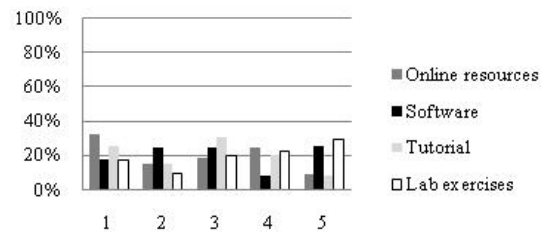


Fig. 14 Students' Evaluation of MS support

With regard to course difficulty: 53% of students perceived the course and the MS tools to be difficult, 44% of students perceived them to be within their level, and only 3% of students found them to be very easy. The amount and details of information was listed as the number one difficulty faced by 48% of students. Technical problems were listed as the second greatest difficulty faced by 32% of students, whilst 11% of students listed lack of practical exercises as another difficulty they faced during the learning process of the course.

As for the knowledge that students obtained from the course, the students' evaluation data indicates that: 48% of students felt that the course prepared them to be MS certified, 46% of student felt that the course provided them with in-depth knowledge of technical issues, and 40% of students felt that the course showed the relationship of the course in the industry.

Also, the evaluation data indicates that: 67% of students were not aware of the potential employment positions in the ICT market, 29% of responses showed that students claimed the course prepared them for the position of a "Network Administrator", and 10% claimed that it prepared them for a technical support position.

### 4. Analysis of Fall and Spring Assessment Results

This section provides analysis of the assessment results from the two semesters during the academic year 2010/2011.

The comparison of the GPA with the grade distribution indicates that both have a similar distribution.

CLOs results over the two academic semesters indicate that the students' responses of agrees, and strongly agrees were more than half, which means that in general, the course design and tools meet the learning objectives of the course.

During Fall 2010/2011, most of the responses were agree, or strongly agree with the statement indicating the degree of students' acquisition of knowledge and skills from the course. Learning outcome #2 had a lower percentage of strongly agree responses, which was due to the limited case studies provided in class. Learning outcomes #4, #5, and #6 also had lower percentages of strongly agree responses, and the students attributed this to the advanced topics which were above background level. The students also commented that there was insufficient practice in lab, and suggested that the IT Department should put less credit hours on lectures, and more on the lab sessions. During Spring 2010/2011, most of the responses were strongly agree, or neutral, which is an indication of the students' elevation of acquired knowledge and skills from the course. Learning outcomes #4 and #6 showed that students were having difficulty in topics such as Domain Controller, Domain Name System (DNS), and Active Directory configuration and replication.

As for the instructors' evaluation of MS support, assistance on developing course syllabus and textbook selection were not emphasized during Spring 2010/2011. This is because the syllabus of the course was developed in the previous academic semester, and the textbook used had not been changed. MS support in providing lab exercises was not provided during Fall 2010/2011, but it was given to the department during the next semester.

Instructors recommended cooperating with MS and suggested having more online training sessions for faculty members. They suggested having a well set up lab with Virtual Hard Disk (VHD) software installed. MS support in setting up the lab, and in providing real case studies and guest speaker is recommended as well.

With regards to the aspects covered in the course, the relationship of the course content to other courses in IT program was not emphasized.

In general, 32% of the instructors stated that one of the factors of the course's difficulty was its technical problems. Due to this, instructors recommend further collaboration with MS, and having a helpdesk available which they believe will have a great impact on the course.

Despite of all the above, the students felt that the MS product was suitable for teaching the course.

### C. Course 3 – Human Computer Interaction (CAP490)

Catalog Description: Human Computer Interaction (3 credits)

Structure: 2 hours lectures/week + 2 hours laboratory/week

Prerequisite: Visual Programming

Level at which this course is offered: 7

Number of enrolled students in Fall 2010/2011: 97

Number of enrolled students in Spring 2010/2011: 79

MS product used in Fall and Spring 2010/2011: Expression Studio 4.0 Blend "Sketch flow".

### 1. Description

This course focuses on: psychological aspects of the individual user, universal design principles, and User Centered Design (UCD) models. The topics include: interactive system development lifecycle and its requirements, major themes and recent trends in HCI, interaction design models, participatory design, Information Architecture (IA), adaptive interfaces, measuring the User Experience (UX), social computing and online communities, mobile computing and issues surrounding the design for smaller screens, ubiquitous computing, Computer Mediated Communication (CMC), and Computer Supported Cooperative Work (CSCW).

The course consists of two inter-related strands: The central focus is exposure to HCI models, theories and frameworks in order to provide students with an understanding of the range of issues addressed in the field. Fundamental aspects of human psychology are introduced, and key features of interaction and common interaction styles delineated. The second focus is a semester-long team project, in which students will design, implement, and evaluate a user interface. A steady stream of project-related practical activities involving iterative design, prototype development and evaluations of interfaces will be conducted throughout the course. This provides an opportunity to learn about a range of theoretical approaches that have been developed specifically for use in HCI. A number of relevant, hands-on, practical activities are carried out to complement the literature covered in the lectures.

The objective of adopting MS technologies in this course is to provide students with the tools to design HCI. Accordingly, a significant portion of the course is spent on teaching analysis and design techniques to provide a strong foundation, and fundamental understanding of the strengths and weaknesses of the potential methods available to HCI design. The last few weeks of the course focus on implementing an application in a practical environment, taking into consideration HCI principles learned in the lectures. HCI design is taught by reviewing case studies, both successful and unsuccessful, and delivering an overview of the challenges associated with working at HCI.

The topic of each design project is chosen by individual students, who are then required to develop the system. All topics are required to be approved by the instructor. The design projects are to be completed using MS Expression Studio Blend software. The results of the project are presented at a presentation session near the end of the academic semester. The projects are expected to include prototype, and of course iterative designs, which involve user-centered interfaces.

### 2. Fall 2010/2011 Evaluation

#### i. Grades and GPAs Distribution

Fig. 15 illustrates the students' grade distribution on the course. Overall, the majority of grades scored average and above.



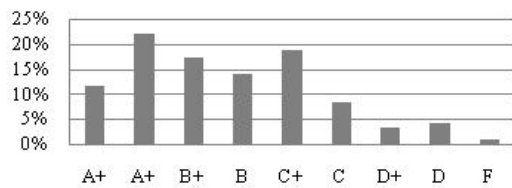


Fig. 15 Grades Distribution of CAP490 for Fall 2010/2011

Fig. 16 illustrates the GPA distribution of the enrolled students.

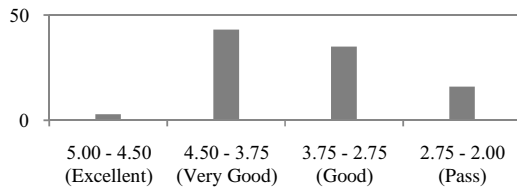


Fig. 16 GPA Distribution of CAP490 for Fall 2010/2011

### ii. Course Learning Outcomes

A CLOs' questionnaire was posted for students to assess their learning outcomes from the course. Table V summarizes the student's answers.

TABLE V  
CAP490 CLOS ASSESSMENT – FALL 2010/2011

At the end of the course, I am able to:	SA	A	N	D	SD
1 Understand the role of user research in the design process.	29%	61%	5%	4%	2%
2 Explain and discuss practical and theoretical aspects of Human-Computer Interaction (HCI).	32%	53%	11%	4%	1%
3 Apply Human-Computer Interaction (HCI) design principles to practical problems.	50%	45%	9%	3%	1%
4 Conduct analysis and design solutions for practical problems.	33%	54%	13%	3%	1%
5 Understand how to apply principles of User-Centered Design (UCD) in the design of interactive systems.	28%	21%	16%	7%	3%
6 Understand the principles of Interaction Design, particularly those within the universal access domain (people with special needs such as the elderly and disabilities).	34%	49%	14%	2%	2%
7 Understand how to measure usability and user experience (UX) in interactive systems	41%	42%	12%	3%	2%
<b>TOTAL</b>	<b>35%</b>	<b>46%</b>	<b>11%</b>	<b>4%</b>	<b>2%</b>

### iii. Instructors' Evaluation

The textbooks [5]–[18], were the main source for course preparations. In addition, the following resources were also considered: reference books [4]–[7]–[17], online resources [2]–[3]–[10]–[12]–[20]–[21], and the MS faculty connection [8].

With regard to the course difficulty, instructors felt that the MS online learning resources were not friendly enough, and preferred developing their own learning materials and uploading them on to the course's blog.

As for MS support shown in Fig. 17, instructors' evaluation data indicates that MS provided them with excellent support in textbook selection, and assistance in developing the course's

syllabus, and was given a 5 out of 5 score. The provision of lab exercises was ranked second with 3 out of 5, whilst software, online resources and materials for self-learning were ranked third, scoring 2.5 out of 5. Training and invitations to guest speakers were given a low rank in the list.

Of the aspects covered in the course: 50% of the instructors felt that they covered in-depth technical issues, 40% of them felt that they covered the courses relationship to the ICT market, and 25% felt that they related the course content to the other courses of the IT program, as well as to the importance of being MS certified.

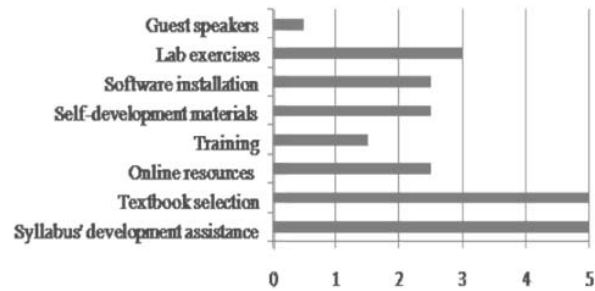


Fig. 17 Instructors' rating of MS support in CAP490 course

### 3. Spring 2010/2011 Evaluation

#### i. Grades and GPAs Distribution

Fig. 18 illustrates the students' grade distribution on the course.

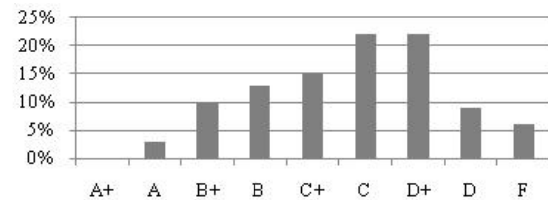


Fig. 18 Grades Distribution for CAP490 for Spring 2010/2011

Fig. 19 illustrates the GPA distribution of the enrolled students.

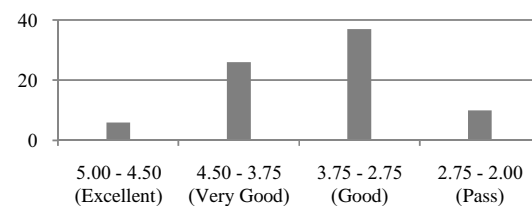


Fig. 19 GPA Distribution for CAP490 for Spring 2010/2011

#### ii. Course Learning Outcomes

A CLOs' questionnaire was posted for students to assess their learning outcomes from the course. Table VI summarizes the student's answers.

TABLE VI  
CAP490 CLOS ASSESSMENT – SPRING 2010/2011

At the end of the course, I am able to:	SA	A	N	D	SD
1 Understand the role of users in the design process.	40%	51%	8%	0%	2%
2 Explain and discuss practical and theoretical aspects of Human-Computer Interaction (HCI).	17%	53%	26%	1%	3%
3 Apply Human-Computer Interaction (HCI) design principles to practical problems.	23%	62%	13%	2%	0%
4 Conduct activities related to data gathering, as well as designing solutions for practical problems.	32%	46%	21%	1%	0%
5 Conduct usability evaluation of interactive systems.	32%	52%	16%	0%	0%
6 Understand ethical considerations for computer based systems	24%	53%	18%	3%	1%
TOTAL	28%	53%	17%	1%	1%

### iii. Instructors' Evaluation

A summary of the instructors' evaluation results shows that textbooks serve as the main source for the course preparations, supplemented by a number of electronic materials and websites. The MS support provided to the IT Department as a necessary online resource was given a score of 4 out of 5.

The aspects covered in the course are: 60% of the instructors felt that they covered the course relationship to the ICT market, 50% of them felt that they covered in-depth technical issues, 15% of them felt that they related the course to the other courses of the IT program, and 5% of them felt that they covered the importance of being MS certified.

### iv. Students' Evaluation

The questionnaire was answer by 69 students, and a summary of the results shows that: the textbook for this course, which covers all the topics in the lectures, was primarily used as a main source in course preparations by 98% of the students, 66% of the students found the presentation slides were useful source for learning. 17% of students used a variety of online websites for additional examples which were not drawn from the textbook, 8% of students used online videos as references, and 2% of students used social connectivity sites as learning tools.

The students' evaluation data indicates that 52% agree, or strongly agree with the statement that the "MS product is suitable for teaching the course". 35% of students felt that the suitability of the MS product for the course was average, and only 12% of students either disagreed, or strongly disagreed with the statement.

MS support of the course is reflected in four different aspects: online resources, software, tutorials and lab exercises. In Fig. 20, the students' evaluation data indicates that MS support in providing software, obtained a total of 50% of students' responses that agreed, or strongly agreed with the statement. Second, lab exercises which obtained a total of 40% responses of agreed, or strongly agreed with the statement. Tutorials ranked third of MS support, with a total of 34% responses agreeing, or strongly agreeing with the statement. Lastly, 28% of students agreed with the statement with regard to online resources provided as a learning source by MS.

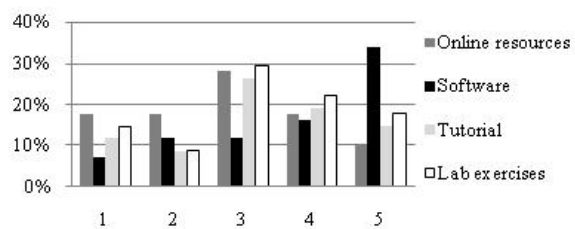


Fig. 20 Students' Evaluation on MS Support

As for the course difficulty: 14% of students perceived the course to be difficult, 53% of students perceived it to be within their level of understanding, and only 5% of students found it to be very easy.

The students' evaluation data regarding the knowledge gained from the course indicates that: 51% of students felt that the course prepared them to be MS certified, 55% of students felt that the course provided them an in-depth knowledge of technical issues, and 50% felt that the course showed the relationship of MS products in the industry.

The evaluation data also indicates that: 66% of students were not aware of the potential employment positions in the ICT market, 30% of responses showed that students claimed that the course prepared them for the position of "Software Designing", 14% of respondents claimed that it prepared them for a position of "Usability Tester", 7% of students felt that the course prepared them for a web designer position, 5% for programming positions, and 3% for a software engineering position.

The amount and depth of information, and the language were listed as the two main difficulties faced by 31% of students.

### 4. Analysis Between Fall and Spring Results

The grade distribution and the GPA distribution gathered from both the Fall and Spring semesters exhibit a similar curve distribution.

The results of the CLOs show that the students felt that the course satisfied its learning objectives, as clearly indicated in Fall 2010/2011.

As for the instructors' evaluation of MS support, the authors concluded that MS has provided an excellent support for the course in Fall 2010/2011, and the support was extended in Spring 2010/2011.

With regards to the aspects covered by the course, the instructors covered all of the areas concerning the course's importance to MS certification, and its use in other IT courses. The higher percentages for technical issues and the relationship to the ICT market for both semesters, with just a few percentage points difference, is clear evidence of the satisfaction of the course requirements, based on the aspects covered.

The students' evaluation revealed that MS products were within their level of understanding, and suitable for teaching the course. Furthermore, the instructors recommended continued co-operation with MS, and suggested the provision

of SketchFlow manuals, or tutorials would have benefits for the students. During Fall 2010/2011, lab sessions were not sufficiently stimulating, and some indicated that these sessions often simply re-iterate the lecture contents, without any supplementary material. In fact, lab sessions supplement the concepts presented in class with opportunities to gain insight, and apply concepts with hands-on activities.

Despite the difficulties faced, the responses to the questionnaire by the students and instructors clearly show that the support of MS in adopting the course throughout the academic year was exceptional.

### III. SUMMARY AND CONCLUSIONS

MS products were adopted in three courses in the bachelor program of the IT Department in KSU. The courses were designed so that the learning experience was maximized when provided with practical learning tools used in the industry. Feedback from both students and instructors showed positive responses towards the collaboration with MS in designing and delivering the courses. However, some suggestions were given by both students and instructors which were used for course improvement. The currently improved versions of the courses have been deemed effective by the vast majority of students as indicated by the assessment data.

In general, there is much support provided by the industry to academic institutes, yet this support needs to be properly planned, and carefully implemented. It is highly recommended to have an assessment of needs of the academic institution and plan accordingly to provide the necessary resources. A follow up process by the industry, MS in this case study, is necessary. The authors plan to work on developing a detailed collaboration model between the educational institute and industry as a future work.

Assessment data indicated that the restricted lab exercises was one of the major constraints faced by instructors. It is therefore, highly recommended that technology providers supply enough exercises, and real-life cases as part of their academic programs.

The level of knowledge and skills gained by the students in a class during an academic semester is insufficient to prepare them for the existing technical certifications. Therefore, "light" version of certification for students is recommended.

With the continuous advance in technology, specialized "train the instructors" programs need to be provided by industry to educational institutes, to ensure that the students are better equipped with competitive up-to-date skills, and knowledge.

Lastly, most of the students claimed that they were not aware of the potential employment positions in the ICT market of the courses they were enrolled in, and they cannot see how the course content will help them in their career path. Therefore, the instructors need to emphasize on the market needs of the knowledge or skill they are addressing in their course. In addition, instructors should take advantage of the college cooperation with MS to give planned sessions by guest speakers according to the students' level and needs. Educational trips and client-centric projects would also be

beneficial for students' awareness of potential job positions in ICT market, and this will narrow the gap between academia and industry.

In conclusion, the students' responses to the course adoption experience have been excellent. Also, a number of students commented that this was one of their most enjoyable courses, and that they were satisfied with the learning-process they had experienced especially in IT 211 and CAP490. As for the instructors, they believed that the course adoption contributed to the design of the course, and helped in equipping the students with the knowledge and skills needed in the ICT market. More strategies need to be taken into consideration to narrow the gap between the class and the real-world application in terms of case studies and lab exercises.

### ACKNOWLEDGMENT

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