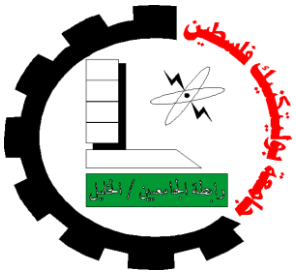
Palestine Polytechnic University

College of Administrative Science and Informatics

Department of Information Technology



Generic E-Payment System for Palestine

(PPU Student Tuition Payment Case)

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الملخص

عند الحديث عن الدفع الالكتروني فإننا غالبا ما نقصد بأنه عملية تحويل أموال هي في الأساس ثمن لسلعة أو خدمة بطريقة رقمية أي باستخدام أجهزة الكمبيوتر، الهدف الرئيسي من هذا المشروع هو إنشاء وتطوير نظام دفع الكتروني يستخدم في جامعة بوليتكنك فلسطين لدفع أقساط الطلبة لإتمام عملية التسجيل الالكتروني ، حيث يقوم الطالب بمعرفة الرسوم المطلوبة للقيام بعملية التسجيل والمنح والمساعدات التي قد حصل عليها , بعد ذلك يقوم الطالب باختيار واحده منها وبالتالي يقوم النظام بإظهار المبلغ المطلوب دفعه للطالب لإتمام عملية التسجيل الإلكتروني .

إن نظام الدفع الإلكتروني يعمل باستخدام بطاقات مسبقة الدفع ذات قيمة نقدية معينه يقوم الطالب بشرائها وذلك حسب المبلغ المطلوب دفعه، ومن ثم يقوم الطالب بإضافة المبلغ إلى رصيده عن طريق الدخول إلى موقع النظام وإدخال الأرقام السرية حسب التعليمات الموجودة على الكرت، فيقوم النظام بالتأكد من رقم البطاقة والأرقام السرية ومن ثم يرصد قيمة البطاقة المالية في حساب الطالب ،بالتالي يمكن الطالب من تسجيل ساعات دراسية معتمدة بما يتوافق مع المبلغ الموجود في حسابه.

اضافه إلى العمليات السابقة، فان المشروع يهدف إلى إنشاء بطاقات مسبقة الدفع بواسطة مدير البطاقات مسبقة الدفع ، ويمكن لمدير البطاقات مسبقة الدفع من بيع البطاقات للبنوك ،اضافه إلى إنشاء المنح والمساعدات التي تقدم للطلاب بواسطة مدير إنشاء المنح وخدمات أخرى .

ومن هنا وجد فريق المشروع بان الدفع الإلكتروني هو عبارة عن نظام مناسب للتطبيق بجانب نظام التسجيل الالكتروني المطبق في جامعة بوليتكنك فلسطين , وبالتالي فان الدفع الالكتروني لديه القدرة على تسهيل عمليه الدفع وإكمال التسجيل بفعالية وسهوله عاليه, وتوفير الوقت والجهد للطالب وموظفي التسجيل .

Abstract

When we talk about electronic payment, we often mean that the process of transfer of funds is essentially the price of a commodity or service in a digital device, the main purpose of this project is to develop electronic payment system to be used at Palestine Polytechnic University for student tuition payment, to complete the electronic registration process, where the student knowing the required fees for the registration, then grants and assistance that may be obtained, student must choose one of them, after that the system return the amount required to pay to complete the electronic registration process.

The e-payment system works using prepaid cards with the monetary value, where the student buy cards, after that the student enter E-payment system, enter the card numbers by following instructions on the card to add balance, then the system will check card numbers, if every thing is okay then system will add balance to student.

In addition to previous operations the project aims to generate prepaid cards by card generator manager, and then the manger can sell them to specific bank, also the system enable voucher manager to generate different vouchers, and other services.

The project team found that electronic payment system is a suitable system to be implemented with the e-registration system at the Palestine Polytechnic University, so the e-payment has the capacity to facilitate the payment process and complete the registration in effective and easy way, saving time and effort for both students and staff of registration.

Acknowledgment

We would like to take this opportunity to express our thanks to the GOD, who innovates our soul, help us to complete the project...

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Dedication

To those who have sacrificed much to provide us with the quality of life from Which we could choose what we want to be and to do …, to our dear mother's …

To those who never once allowed us to believe that it couldn't be done…, To our dear father's…

To those who granted us the tenderness and taught us the patience…., to our dear supervisor Dr.Radwan Tahboub…

To the teacher who gave us a lot of his time and effort … to our co-supervisor engineer Hani Salah…

To those who have contributed in the knowledge and science process…, to all those who believe in the richness of learning … to our dear instructors…

To those who have granted us respect, love, honest… To our friends, colleagues

To the flower who gave us a lot ...Abeer's mother

To all of these persons we would like to dedicate this project…

Project team

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List of Terms:

Automated teller machine (ATM):	Is a computerized telecommunications device that provides the customers of a financial institution with access to financial transactions in a public space without the need for a human clerk or bank teller.
Glossy paper:	The type used in magazines, was made using white clay the clay is used to fill the spaces between the fibers in the paper and to coat the paper so that it will have a smooth surface.
HP Color LaserJet 2605dn printer,(for print card):	Hp color printer ,print quality color Up to 600 x 600 dpi, Two-sided printing is standard on the HP Color LaserJet 2605dtn Printer, high volume.
Unified modeling language (UML):	UML is a standardized visual specification language for object modeling. UML is a general-purpose modeling language that includes a graphical notation used to create an abstract model of a system, referred to as a UML model.
Use case diagram:	It is a type of behavioral diagram defined by the (UML) created from a use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors.
Class diagram :	A UML diagram showing the object-oriented relationships among classes and their members.

Activity diagram :	In the Unified Modeling Language, an activity diagram represents the business and operational step-by-step workflows of components in a system.
Sequence diagram:	A UML diagram showing the sequence of interactions among objects shows a specific scenario of execution in the system in terms of object instances.
SQL server express :	Is the freely-downloadable and distributable version of Microsoft's SQL Server relational database management system.
Hacker :	Hacker is a term used by some to mean "a clever programmer" and by others, especially those in popular media, to mean "someone who tries to break into computer systems.
Cracker :	A cracker is someone who breaks into someone else's computer system, often on a network; bypasses passwords or licenses in computer programs; or in other ways intentionally breaches computer security.
XML web service :	Web services allow different applications from different sources to communicate with each other without time-consuming custom.
Server:	A computer or software providing services to remote client machines or applications, such as supplying page contents (texts or other resources) or returning query results.
Client:	Makes a service request from another program.
Upgrade system:	A new version of a software or hardware product designed to replace an older version of the same product.

SMS:	Short text messages between mobile telephone devices.
Deployment diagram :	Deployment diagrams show the hardware for your system, the software that is installed on that hardware, and the middleware used to connect the disparate machines to one another.
URL :	Abbreviation of ***U****niform* ***R****esource* ***L****ocator*, the global address of documents and other resources on the World Wide Web.

Chapter One 1

Introduction

- Introduction
- Definition of application
- Application objectives
- Problems
- Solutions
- Payment alternatives
- Application scope
- System importance
- Test plan

1.1 Introduction:

With technological development witnessed by the world today in various fields, there is a need to cope with developments, despite the remarkable progress achieved in the area of e-commerce in various countries around the world, there are challenges to the business dealings that take place between the consumer and seller on the Internet, also there is urgent need to facilitate the selling and buying operations, elimination of constraints of time and place in the trade, this create many payment methods in the world to facilitate the exchange of goods and services, but this payment methods are not appropriate to be used in Palestine according to the political situation, regulatory and legal Issues .

If you take a closed view at payment techniques in Palestine you notice that most companies, merchants, and consumers still use traditional ways in payment such as cash payment or cheque payment, despite that these techniques have many problems and difficulties such as consuming time, cost, and effort, also they required a lot of paper transaction, and we can't ignore that payees who use traditional payment methods does not guarantee full recovery of their sales operation .

So there is growing recognition that traditional payment methods are not going to be sufficient to meet that need and expectation of people, new way to pay will be used to facilitate payment transaction and reduce effort required by both payers and sellers.

When we come to the payment options, nothing is more convenient than electronic payment. You don't have to write a cheque, swipe a credit card or handle any paper of money; all what you have to do is to enter some information into your web browser and click your mouse. It's no wonder that more and more people are turning to electronic payment or as an alternative to sending cheque through the mail, electronic payment

system can eliminate the constraints of time, place, and save time and effort of payers and payees.

The term '**electronic payment**' is defined as: a collective phrase for the many different kinds of electronic payment methods ,it considered as an alternative to paper checks for paying bills, taxes, fees. Consumers can use PCs, telephones, screen phones or ATMs to send electronic instructions to their bank or bill payment provider to withdraw funds from their accounts and pay merchants.

The project mainly focuses on analyze generic e-payment system to be used in Palestine, that will be suitable to consistent with the need of people, and apply e-payment system on specific case, which is Palestine Polytechnic University student tuition for registration using prepaid cards .

1.2 Definition of application:

The huge evolution in e-commerce, large amount of transactions occur every day between payer and payee, and increase the competition between companies, all of this create need to provide better services to customer to use safe and trust way in handling payment transactions

Commerce and technology combined as one package this is the e-payment system mean with the advent of the internet that has becoming one of the most fundamental administrative resource all over the world, also internet helping the facilitating of online purchases and makes payment very flexible, this lead to new market for company on which the number of customers is frequently increasing, the knowledge and communication barriers were broken, also with internet came the concept of e-shops or

virtual shops became widely used , at these shops you can shop by making use of all e-payment techniques, with more and more e-shops getting setup everyday e-payment methods usage even became more popular.

In Palestine payee and payer complete there payment transactions using traditional methods, and there were trying to cope with e-payment techniques, that has been implemented in other Arab and foreign countries, at the beginning they use ATM in all banks to help bank customers to withdraw and deposit money anytime, anywhere, also telephone companies provide customers with prepaid card to give them balance to use phone services.

Unlike the situation of e-payment in other Arab and foreign countries, these countries use different and various e-payment methods such as: Credit and Debit cards, gift cards ATM, e-wallet, digital cash and other, but these methods are not suitable to be used in Palestine because it may face political constraint and socio-cultural constraint, people may reject apply e-payment as a new approach.

So after analyzing the current situation the team found that there is urgent need to apply e-payment system for Palestine to cope with the existence situation that facilitate payment transaction between payers and payee, also the system must transfer data and information in safe and trust way, so people feel more comfortable when they are using the system .

We can say that e-payment techniques have many advantages that compete the traditional ways of payment, so the advantages of e-payment can be classified as follow:

- Electronic payment makes payment very convenient for the consumer, you only need to enter your account information, such as your credit card number and

shipping address, once the information is then stored in a database on the retailer's server, Completing a transaction is as simple as clicking your mouse, all what you have to do is to confirm your purchase and you're done.

- Electronic payment means that payment ways becomes more efficient and more powerful by reduce transaction costs, also its reduced time and effort.

- Electronic payment can also help businesses improve customer retention, a customer is more likely to return to the same e-commerce site where his or her information has already been entered and stored.

- Electronic payment decreases risks, when processing the order you can be sure, that the order has been paid for. Your credit risks are thereby significantly reduced.

- Electronic payment makes payment simpler for customers; e-payment is an easy way to pay online, as there are no extra costs for using it. The customers choose company products or services, and then pay with e-payment, and the sum will be credited to companies account right away.

- Electronic payment helps in increase speed of exchange operation; confirmation of the payment made by your customers reaches you in moments.

- Electronic payment can be used for: e-commerce, e-Trade and for other purposes like paying bills, taxes, etc.

1.3 Application objectives:

The system will be develop e-payment application to be used in Palestine, the main objectives of this systems are:

- Analyze secure system that provides flexibility for paying, in addition to enable payer and payee to conduct real time paying remotely over the web.
- Analyze and develop secure e-payment system for paying students tuitions at Palestine polytechnic university to work effectively behind electronic registration system that is used.
- Decrease student effort that was requiring completing registration at Palestine Polytechnic University.
- Eliminate time and place barrier that still exist in traditional payment.
- Provide a flexible way for students to register and pay anywhere and anytime using the web site.
- Analyze and design prepaid card to be used by student's for tuitions payments instead of paying using traditional payment methods.

1.4 Problems:

The traditional payment system is suffering from several problems such as:

- Require a lot of time to complete payment transactions.
- Require a lot of paper transactions.

- Student faces many difficulties in paying to complete registration process at the university.
- Using traditional payment becomes not appropriate with technology development and evolution.
- People face difficulties using traditional payment methods, and they need to use powerful payment methods.

Solutions:

Some solutions to the previous problems can be classified as the following:

- Develop much more simple and easy methods to facilitate payment transactions.
- Design electronic web site that implement e-payment methods that will help the payers and payee in their payment and trade processes.
- Develop e-payment system to be used in PPU for tuition payment methods in order to solve tuition payments problem at the university.
- Design and implement different type of prepaid cards that can be used to pay through website that support e-payment system.

1.5 Payment alternatives:

The team will explain two alternatives of payment methods as the following:

1. **Traditional payment (cash-cheque) :**

   In this way, is either a payment to the seller in cash or by cheque, In cash payment the payer paid the required amount to payee directly in order to get goods and services, while in cheque payment the payer write a cheque with the value of amount required for the completion of the procurement process, then the payee cashes the cheque from the bank.

Advantages:

- In cash payment the payee guarantee the right to get money at the time of selling.
- The main advantage of cheque is that many people are comfortable making and receiving payments using cheque.

Disadvantage:

- Increase time and effort for both payer and payee.
- Both payer and payee should commitment to banks time, so that if the bank closed related to bank holiday, strikes, or any other conditions, the bank delayed payments, this lead leading to the delay in the completion of transactions.

- For the process of paying tuitions, university has delayed the process of registering students, because of the lack of banks trusted by the university in several regions.

- Increase paper transactions.

- Cheque may be returned by the bank if there are insufficient funds in its associated bank account.

2. Electronic payment:

In this way, customers buy prepaid cards with required value to complete selling transaction, then they enter the card no, this would add balance to customer's accounts to allow them to buy any goods or services.

In the case of Palestine polytechnic university the student buy prepaid card then he enters the card no, this also would create balance to student, so he can complete registration process.

Advantages:

- E-payment makes payment more convenient for both payer and payee.
- E-payment more efficient.
- E-payment reduces transaction costs.
- E-payment makes payment simpler.
- E- Payment helps in increase speed of exchange operation.
- E-payment eliminates time and place barriers.

Disadvantage:

- People may not accept use e-payment system.
- System breakdown cause many problems.
- Security problems.

1.6 Application scope:

The application scope is to analyze general payment method to be applied in all company in Palestine, and we want to implement the application on specific case which is student tuition payments for registration in Palestine polytechnic University.

1.7 System Importance:

E-payment change traditional payment ways , allow consumers to pay anytime and anywhere without geographical or time barriers; e-payment method don't need handles with paper transactions the customer simply buy a prepaid card , all you have to do is to enter some information into your web browser and click your mouse. This leads to the recognition that e-payment is a useful tool to help develop and improvement of e-commerce.

1.7.1 System importance to payee (merchants, PPU):

- Electronic payment helps payee improve customer retention.

- Increase number of customers, which lead to the increasing of payee profit.
- Electronic payment increases speed of exchange operation between payer and payee.
- Reduced time and effort of payee, confirmation of the payment made by customers reaches payee in moments.
- Guarantee the right of a payee to collect funds.
- At Palestine polytechnic university e-payment eliminates delay in payment related to bank holiday or strikes or any other condition, the e-payment system work at anytime.

1.7.2 System importance to payer (customer, student):

- E-payment provides the flexibility for payee to pay where and when they choose.
- Reduced time and effort of payer in order to get goods and services.
- Reduced transaction cost.
- The system helps the student to pay easily and quickly anytime anywhere.
- The system helps the student to view reports about all transaction occurred.

1. 8 Test Plan:

The process of testing the system is the most important stages throughout development process, the importance of testing the system is to verify the reliability of each unit, each part of the system to make sure it serves the specifications and requirements, here the team describes briefly the methodology that the team has adapted to test the system steps that will be followed in the system testing as described below:

1. **Unit testing:**

   Unit testing is one of the testing types that depend on separating or dividing the system into components to be tested separately to ensure that they are operating correctly and that meet the specifications.

2. **Sub-system testing:**

   Subsystem testing is another testing type that depends on testing the related system components, so it can be tested without other system components.

3. **Integration testing:**

   The integration testing which depends on testing all components together as a whole system to ensure that the system works properly and meets the specification.

4. **System testing:**

   System testing is one of the most important stages at all software projects to ensure that the system meets its specifications and is working as properly as expected, and that it avoids any problems and errors.

Chapter Two

2

Overview

- Payment method in Palestine
- E- payment definition
- Challenges of E-payment
- Component of E-payment
- Major actors of e-payment
- E-payment Phases
- Micropayment and Macropayment

2.1 Introduction:

In this chapter the team will provide overview about some important term and application that are used and taken in account in order to achieve the desired objectives of the project.

2.2 Electronic Payment Systems: an Overview:

The internet is helping the facilitating of online purchases and makes payment very flexible this has lead to new market for company on which the number of customers is frequently increasing.

E-payment often means that the process of transfer of funds is essentially the price of a goods or service in a digital device using any computer device .

2.3 Payment methods in Palestine:

- Traditional Payment methods:
  - Cash.
  - Cheque.

- Electronic Payment methods:
  - Western Union Money Transfer: Used to transfer money from abroad.
  - Card Based Payments:
    - Mobile Prepaid Card Payment System
    - Credit Card.
  - Automatic Teller Machine (ATM).

2.4 Factors Use in Comparing Payment Scheme

There are three factors used to compare payments schemes.

1. **Policy:**

   The semantics of the payment scheme. This includes refunds policies, and the liabilities incurred by customers, merchants, and financial institutions.

2. **Data flow:**

   The requirements for storage of data by and communications between the parties. This includes not only the data flows for payments themselves, but also for refunds, account enquiries and settlement.

3. **Mechanism:**

   The methods by which the necessary security requirements for messages and stored data are achieved.

All three factors are tightly coupled since policy makes requirements of data flow and data flow makes requirements of mechanism.

2.5 Electronic Payment Definition:

Payment is a major element of e-commerce. Payment in on-line transactions is generally made through electronic means (e-payment). The purpose of online transactions is to allow vendor and purchaser to conclude (electronic) agreements without the need for a physical presence. An e-commerce website may provide facility that manages the transfer of funds from the internet user to the e-merchant. The money

may come from a digital wallet (e-money), or a credit card, or mobile phone, or from a prepaid account.

E-Payment also called: Electronic Payment, Internet Payment, web Payment.

2.6 Challenges of E-Payment

E-payment as other system there is number of challenges facing it we will mention some of them below:

- **Security Challenges**
  - Disclosure of private information
  - Counterfeiting
  - Illegal alteration of payment data

But, there are possible solutions for security problem**:**

- **SSL** (Secure Socket Layer):
  A protocol developed by Netscape for transmitting private documents via the Internet. SSL used two keys to encrypt data a public key known to everyone, and a private or secret key known only to the recipient of the message.

- **SET** (Secure Electronic Transaction):
  It's a protocol specifications were defined by the credit card industry to facilitate credit card purchases over the Internet, its allow a cardholder to pay for items or services purchased from an Internet-based merchant with a more secure transaction protocol.

- **Smart Card Security**

- **Infrastructure**
  - Computer networks and other communication infrastructure.
  - Users access devices.

- **Regulatory and Legal Issues**
  - Proper legal and regulatory framework is vital for the success of e-Payment.
  - E-signature, data protection law.

- **Socio-Cultural Challenges**

  Resistance to changes in technology among customers and staff due to:

  - Lack of awareness on the benefits of new technologies.
  - Fear of risks.
  - Lack of trained personnel in key organizations.
  - People are resistant to new payment mechanisms.

2.7 Many types of E-Payment system exist:

- Online credit card payment system.
- Electronic Payment based on Trusted Third Party (TTP).
- Digital Cash.
- M-Payment (Mobile Payment).
- Smart card based e-Payment system.
- Electronic billing.

2.8 Components of E-Payment system:

- Money transfer applications.
- Network infrastructures.

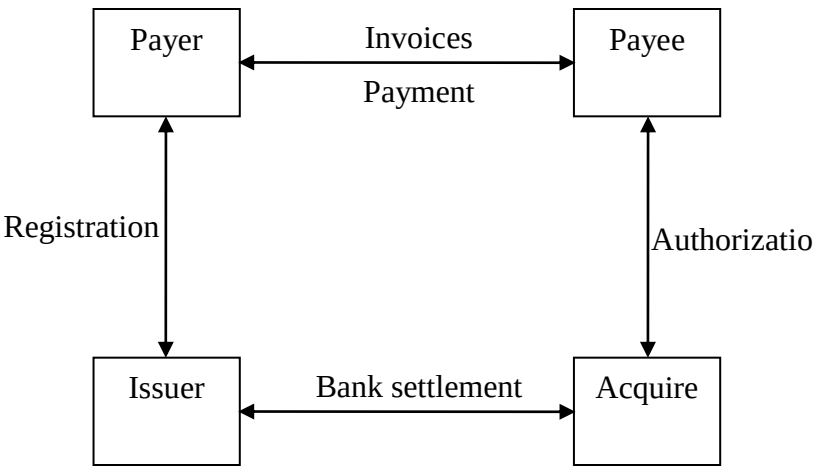
- Rules and procedures.

2.9 Major Actors of E-Payment:

- Payer (buyer or customer): is an entity who makes a payments.
- Payee (seller or merchant): is an entity who receives the payments.
- Banks (financial institution) : is an entity that transfer monetary value from payer to payee, typically financial institution participates in payment protocols in two roles :

  - ✓ Issuer: which interacts with payer and responsible for validating the payer during account registrations and holds the payer's account and assets.
  - ✓ Acquirer: which interacts with payee, that holds the payee's account and assets.

- Trusted third Party: is an entity that trusted and independent from all parties.



2.10 E-Payment Phases:

1. **Registration**:

   This phase involves the registration of the payer and the payee with the issuer and acquirer respectively. Most electronic payments designed require registration of payers and payees with their corresponding banks, so there is a link between their identities and their accounts held at the bank.

2. **Invoicing**:

   In this phase, the payer obtains an invoice for payment from the payee. This is accomplished by either browsing and selecting products for purchase from the merchant's (payee's) website in case of purchases made through the internet, or obtaining an electronic invoice using other electronic communication medium like e-mail.

3. **Payment selection and processing:**

   In this phase the payer selects type of payment, (card based, e-cash, e-cheque, etc.,) based on the type of payment the payee accepts. Based on the selection, the payer then sends the relevant payment details like account number, unique identifiers of the payer to the payee along with accepted amount based on the invoice. Certain protocols might also require the payer to obtain preauthorized token (like bank drafts) from the issuer before the payer sending the payment information to the payee.

4. **Payment authorization and confirmation:**

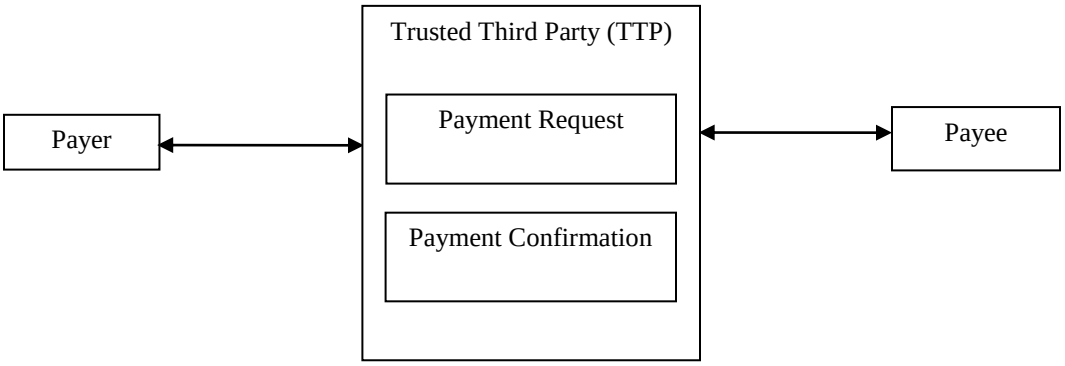
   In this phase, the acquirer on receiving payment details from the payee authorizes the payment and issues a receipt containing the success or failure of the payment to the payee. The payee based on the message may also issue a receipt of payment to the payer.

2.11 Trusted Third Party:

A trusted third party (TTP): is an entity which facilitates interactions between two parties who both trust the third party; they use this trust to secure their own interactions. TTPs are common in cryptographic protocols, for example, a certificate authority (CA).

2.12 E-Payment for E-Commerce:

In most e-payment system there are three major entities:
Payer, **trusted third party (TTP)**, **payee**, and TTP entity is divided in to tow main activities (payment request and payment confirmation).

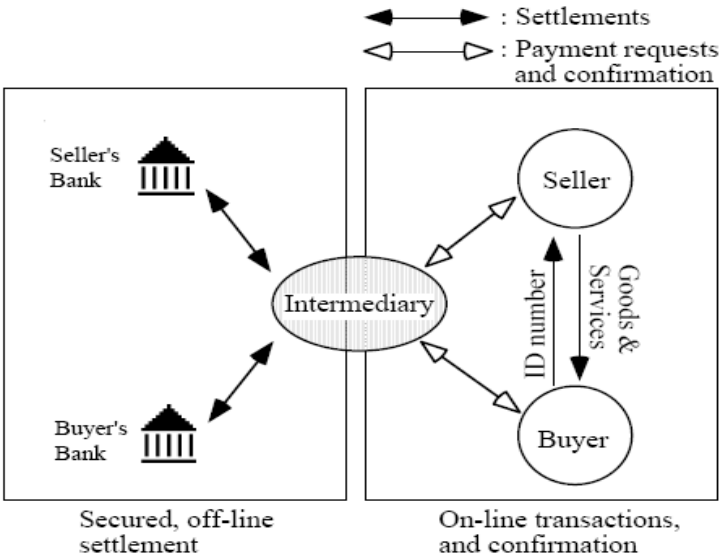


2.13 Offline and Online E-Payment systems:

Based on communicational characteristics, electronic payments systems are classified as offline and online systems.

Offline System: in this system the communication does not involve any third party, an electronic transaction takes place only between the payer and the payee, The advantages of offline payments are lower communication cost and less time, critical transaction handling at the banks.

- ✓ Online System: In an on-line system, the payee typically connects to the bank to obtain payment authorization, thus increasing the communication requirements for the payment system. The advantage is, the payee obtains a guarantee on the payment, as the bank is able to authorize and check for availability of funds in the



2.14 Micropayment system and Macropayment:

A Micropayment system: is an online payment system which supports small amounts for online content or services. Here the speed and cost of processing payments are critical factors in assessing scheme usability.

A Macropayment system: is an online payment system specialized on the processing of higher amounts. Apart from speed and costs, a high degree of protection is essential such as risk management and fraud protection**.**

Chapter Three 3

Feasibility study

- Introduction
- Risks and solution
- System resources
- Feasibility study
- Scheduling

3.1 Introduction:

Feasibility study considered to be one of the most important planning stages for the project, in this chapter we study the resources such as: the hardware, software, human and cost estimation resources ,also the benefits and risks evaluation that can be arising during the project team development process.

3.2 Risks and Solutions:

This section talks about the system risks that the project team suffering from through the development process. Then trying to put some solutions to these risks as the following lists.

3.2.1 Risks Analysis:

- The time constraint; time constraint is a main important issue; time is limited by the end of course, which is only 15 weeks.
- We should be limited with the cost that we have decided in the feasibility study.
- Achieve high level of security and reliability, since security is an important issue in e-payment system.
- Lack of trust in e-payment system in Palestine.
- Requirement confliction or new requirements may arise.
- The system should be flexible for maintenance and evolution.

- There are no projects with same specification like our project implemented in past years in Palestine, so this required accurate analysis and design.

3.2.2 Risks Solutions:

- Commitment to time schedule, but in the will of the god we will try to reduce from the importance of this point and not let this constraint affect on our work.
- Collect information related to e-payment from trusted resources.
- Scheduled task correctly.
- Use the hardware and software that have been specified in the feasibility study.
- Study the system requirements accurately and deeply to discover the problem early.

3.3 System Resources:

System resources can be classified into hardware, software, and human resources. The project team aims at specifying each alternative resources.

Development System Resources :

1. **Hardware Resources:** The following table lists the hardware resources required to develop the e-payment system :

Item	Number of units
Desktop computer Pentium 4 ,3GHz, 256KB cash memory, RAM 512 MB, Hard disk drive 40GB Monitor17, Keyboard, mouse.	1
HP Color LaserJet 2605dn printer,(for card printing)	1
A4 white glossy paper- 120GSM (250 SHEETS) for card printing	1 paper per card
Hp Color printer (for document printing)	1
Flash memory 1 G.B minimum	3

Table 3. 1: Hardware devoplement resources

2. **Software Resources**: The following table includes the software resources required to operate the e-payment system:

Item	Number of units
Microsoft windows XP professional.	1
Microsoft Office 2003 Professional Edition.	1
Visual Studio.net 2005	1
Internet Explorer	1
Photoshop CS 8	1
Microsoft office Visio 2003	1
Flash MX 2004	1

Table 3. 2: Software development resources

3. **Human Resources**: The human resources include three members of the project team, working on analysis, design, and implementation and supervisor .

4. **other resources** :
   - Pens.
   - Transportations.
   - Papers.

- **Operational System resources:**

1. **Hardware operational resources:** The following table lists the hardware resources required to operate this project.

Item	Number of units
Desktop computer Pentium 4 ,3GHz, 256KB cash memory, RAM 512 MB, Hard disk drive 40GB Monitor17, Keyboard, mouse.	1
HP Color LaserJet 2605dn printer,(for print card)	1
A4 white glossy paper- 120GSM (250 Sheets) for print card	1 paper per card

Table 3. 3: Hardware operational resources

2. **Software operational resources**: The following table lists the software resources required to operate this project.

Item	Number of units
Microsoft windows XP professional.	1
Internet Explorer	1

Table 3. 4: Software operational resources

3. **human operational resources :**

- Students.
- Balance manager.
- Card manager.
- Voucher manager.

3.4 Feasibility Study:

3.4.1 Technical feasibility:

This project requires good programming capabilities, methods and experience in designing web pages; these capabilities are available in the work team in addition to the experience in VB.Net, and in database application.

3.4.2 Economic feasibility

- **Development System Costs:**

1. **Hardware cost:** the following table lists the costs for the hardware resources required to develop this project.

Item	Unit cost	Total Costs
Desktop computers as the previous specification	$600	$600
Hp Color printer	$150	$150
Flash memory 1G.B	$10	$30
HP Color LaserJet 2605dn printer	$233.99	$233.99
A4 white glossy paper- 120GSM (250 sheets)	$0.07	$18.74/250 =$0.07 per paper
Total		$1013.99+$0.07 per card

Table 3. 5: Development hardware cost

2. **Software cost:** the following table illustrates the costs for the software resources required to develop this project.

Item	Cost
Microsoft windows XP professional.	$200
Microsoft Office 2003 Professional Edition.	$180
Microsoft Visual Studio.net 2005	$450
Photoshop CS 8.	$70
Internet Explorer	$14.95
Microsoft office Visio 2003	$137
Flash Mx 2004	$255
Total	$1306.95

Table 3. 6: Devolpment software cost

3. **Human Resources cost:** The following table lists the costs for the human resources needed to develop this project.

Member	Hours/week	Cost / Hour $	Total/Week
Student (3)	30	$10	$900
Supervisor (2)	6	$15	$180
Total	$1080		

Table 3. 7: Devploment human cost

The cost of human resources during 16 weeks:

$1080* 16 week =$17280

The cost of human resource during one month:

$1080* 4 week =$4320

4. **Other costs:**

There is another $ 200 to cover other areas (transportations, papers, pens… etc).

- **Operational System Costs:**

1. **Hardware operational Costs**: The following table lists the costs for the hardware required to operate this project:

Item	Unit cost	Total Costs
Desktop computer Pentium 4 ,3GHz, 256KB cash memory, RAM 512 MB, Hard disk drive 40GB Monitor17, Keyboard, mouse	1	$600
HP Color LaserJet 2605dn printer,(for print card)	1	$233.99
white gloss paper- 150GSM (50 SHEETS)	1	$0.07
Total		$833.99+$0.07 per card

Table 3. 8: Operational hardware cost

2. **Software operational costs**: The following table lists the costs for the software required to operate this project:

Item	Cost
Microsoft windows XP professional.	$200
Internet Explorer	$14.95
Total	$214.95

Table 3. 9: Operational software cost

- **Total System Development Costs**: The following table lists the total costs for the resources needed to develop this project**.**

Resources	Cost
Hardware Resources Development Costs	$1013.99+$0.07 per card
Software Resources Development Costs	$1306.95
Human Resources Development Costs	$4320/month
Other Resources Costs	$200
Total Costs	$2520.94+4320/month+$ 0.07 per card

Table 3. 10: Total development cost

- **Total System Operational Costs:** The following table lists the total costs for the resources needed to operate this project**.**

Resources	Cost
Hardware Resource Operational Costs	$833.99+$0.07per card
Software Resources Operational Costs	$214.95
Total Costs	$1048.94+$0.07 per card

Table 3. 11: Total operation cost

- **Total System cost:** The following table lists the total costs for the resources needed to develop and operate this project**.**

Total cost	Cost
Total Operational Costs	$1048.94+$0.07 per card
Total development Costs	$2520.94+4320/month+$0.07 per card
Total Costs	$3569.88+4320/month+0.014 per card

Table 3. 12 : Total system cost

The expected cost of system maintenance:

The expected cost of maintenance divided into two main part:

- Software maintenance costs:

  Include software maintenance costs expected for the system (the database and interface system, add new services, as well add Code).

- Physical maintenance costs:

  Include expected physical maintenance costs: computers (operate system on more than one computer), which requires linking devices with each other, especially for cable networks, services (server), router, hubs .

  As the cost of maintenance of the system a certain rate may be 15% of the cost of the system itself, and be over the age of the system, this ratio to be agreed upon in advance.

3.5 Report of feasibility study:

By studying the economic and technical feasibility the team found that the cost of the developing e-payment system for paying student tuition at Palestine polytechnic university was $3569.88+4320/month+0.014 per card, unlike current payment method that is used in Palestine polytechnic university to pay tuition which may have no physical cost to compare with this solution, but it consumes a lot of time for both students and financial employees; despite of the high costs of e-payment solution the team recommend e-payment system for paying student tuition at Palestine polytechnic university solution .

3.6 Scheduling:

3.6.1 Time Schedule:

When you want to develop any project in any field ,you must be limited to a specific time schedule to be adapted. As this project is limited to sixteenth weeks. The project team has managed this time to the activities as follows:

Activities	Description	Weeks
Activity 1:	Gathering Data.	13
Activity 2:	System planning	1
Activity 3:	System Analysis.	2
Activity 4:	System Requirements.	3
Activity 5:	System Design.	3
Activity 6:	System Implementation.	7
Activity 7:	System Testing.	2
Activity 8:	Documentation.	15

The following are the proposed and the actual time schedules needed to accomplish the project based on the "Gant Chart".

Proposed Gant chart

Week no / Activity no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Activity 1	■	■	■	■	■	■	■	■	■	■	■	■	■			
Activity 2		■														
Activity 3			■	■												
Activity 4					■	■	■									
Activity 5								■	■	■						
Activity 6								■	■	■	■	■	■	■		
Activity 7														■	■	
Activity 8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Figure 3. 1: Gant chart for proposed time schedule

Actual Gant chart

Week no / Activity no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Activity 1																
Activity 2																
Activity 3																
Activity 4																
Activity 5																
Activity 6																
Activity 7																
Activity 8																

Figure 3. 2 : Gant chart for actual time shedule

Chapter Four

4

System Analysis

- Introduction
- Traditional system analysis
- Questionnaire analysis

4.1 Introduction:

System analysis is one of the most important stages in any project. In this chapter the team will describe in details the process of analyzing the existing traditional payment system, which is represented by analyzing the results of the questioner that the team prepared and distributed to the PPU students.

4.2 Traditional System Analysis:

Depending on the results of analyzing the old system, our project team would like to illustrate some facts about the traditional ways of paying:

When we analysis traditional payment method, in Palestine we noticed that cash and cheques are the most popular way used in payment, cash is a popular form of payment with customers because transactions are completed immediately, also cash can be re-used for other transactions immediately, but cash has negative point that cash money can be Stolen , also there are another traditional payment method used, which is the cheque payment, where cheque is a paper-based form of payment effectively a promise to pay the amount stated ,cheques must be presented to a bank in order to obtain the payment ,when you complete purchasing or selling transaction, cheques may be returned by banks if there are insufficient funds in its associated bank account

If we take the case of students paying tuitions at Palestine polytechnic university, in the current system the students register in electronic way choose their courses, then go to the bank to paid the required amount, after that the bank employee give student the voucher, then student return back to the university and give the voucher to the financial employee, after that the employee compare the amount paid with amount required, and if every thing is okay the student can continue the steps to complete the registration process, but if there is any problem with student name or required amount the student return back to the bank .

According to the current situation student take a long time and effort to pay, wait a long time in bank queue, student must retain bank voucher to prove payment, also financial employee is responsible to verify all student vouchers and compare them with required amount

4.3 Questionnaire analysis:

The sample of questionnaire consists of about 160 students of both gender (male and female), selected randomly from the all level of education (first, second, third, fourth) level, also its include all colleges, college of engineering and technology, college of administrative science and informatics, college of applied science, college of applied professions, the team recollect about 154 questioners .

The percentage of male students was about 51% while the female percentage was about 49% ,the percentage of students from college of administrative science and informatics was 24% while from college of engineering and technology was 37% , about 26.6% was from college of applied professions, and about 12,3% was from college of applied science, the percentage according to level of education was about 18.18% from first year students , about 21.42% from second year students , about 35.7% from third year students ,and about 24.6% from fourth or more year students .

Qno	Question text	Percentage				
		yes	no	good	Very good	excellent
3	Do you have a computer?	96.8%	3.2%	_____	_____	_____
4	Do you use the internet?	89.7%	10.3%	_____	_____	_____
5	If you have a computer and you use the Internet, how you evaluate your skills?	_____	_____	13.6%	49.3%	35.7%
1	Do you have any background of the "e-commerce" term?	85.8%	14.2%	_____	_____	_____
2	What payment methods did you used in Palestine?	_____	_____	_____	_____	_____
3	Do you have problems in traditional payment methods (cash, cheque)?	53.3%	46.7%	_____	_____	_____
4	Do you have any background of the "e-payment" term?	85.8%	14.2%	_____	_____	_____
5	Would you like using electronic payment methods rather than traditional methods?	88.4%	11.6%	_____	_____	_____
6	In your opinion, do you believe that the e-payment techniques can be a good alternative rather than the traditional payment techniques?	66.8%	33.2%	_____	_____	_____
7	In the event of the development of secure electronic payment system in Palestine, do you deal with it?	93.5%	6.5%	_____	_____	_____

8	If applied electronic payment, what are the ways you prefers to be used to pay?	_____	_____	_____	_____	_____
9	Do you have fears of the use of electronic payment?	45.45%	54.55%	_____	_____	_____
10	Do you will deal with the simple purchase of some services (price of less than 100 shekels) through an electronic website used prepaid method?	56.4%	43.6%	_____	_____	_____
11	Do you think that electronic payment save time and effort required in the selling and buying?	93.5%	6.5%	_____	_____	_____
12	Do you believe in the system of electronic payment guarantee for the rights of the seller to collect the money?	77.9%	22.1%	_____	_____	_____
13	Do you believe in the system of electronic payment guarantee for the rights of the buyer to obtain service?	72.72%	27.8%	_____	_____	_____
	Section related to student	Yes	No	Suitable	Not suitable	
3	What do you think of payment mechanism used in the current registration system?	_____	_____	37.1%	62.9%	_____
4	Do you want to use the payment system and management of the university tuitions electronically (secure), in addition to the electronic registration?	90.9%	9.1%	_____	_____	_____
5	Do you have confidence in the use of the payment of tuitions and management of the university electronically (secure), in addition to the electronic registration?	82.4%	17.6%	_____	_____	_____

6	What are the payment methods you prefer?	_____	_____	_____	_____	_____
7	Do you think that the use of the payment system and management of the university premiums electronically overcome the problem of waiting in the queue?	88.9%	11.1%	_____	_____	_____
8	What are your suggestions for the electronic payment system along with electronic registration?	_____	_____	_____	_____	_____

Table 4.1 : Questionnaire analysis specification:

Analysis General Section:

According to survey on question 3:

The team has noticed that 96.8% of the students have a computer device, and about 3.2% of students don't have a computer , which is positive result that support the ability to continue working on the project idea .

According to survey on question 4:

The team has noticed that most of the students deal with World Wide Web (internet) they present about 89.7%, which give us good indication to continue working in this project.

According to survey on question 5:

The team has noticed that the students who have very good skills at using the internet represent high percentage, and these skills enough to use the system in efficient way.

Analysis Using E-Payment System Section:

According to survey on question 1:

The team has noticed that a good number of students have an idea about the term e-commerce, and this is positive result because e-commerce concept related to e-payment concepts which help student to understand the functionality of the system in short time and in good way.

According to survey on question 2:

The team has noticed that the largest segment of students use cash as payment method follow in order cheque with percentage nearly 20.7%, then ATM with percentage 18.18% then Jawwal card with percentage 11.6%, then Visa with percentage 6.4%, finally Prepaid card with percentage 1.9%, so using card in payment is not familiar , related to this reason card acceptance face difficulties, and not suitable to be used in Palestine, from this point the team decided to develop prepaid cards as the most suitable way to pay in Palestine.

According to survey on question 3:

The team has noticed that large percentage of student facing difficulties in traditional payment methods, and this is normal result as the familiar way in paying in Palestine was traditional payments (cash and cheque).

According to survey on question 4:

The team has noticed that a lot of students have good idea about the term of e-payment, and this is positive result to continue work in our project.

According to survey on question 5:

The team has noticed that a lot of students agree to use e-payment methods instead of traditional payment methods and according to the question number eight, students suggest that if e-payment system applied they preferred to use the following methods:

- Visa card.
- Credit card.
- Cheque.
- Bank account.
- Prepaid card.
- Card with secret number.

According to survey on question 6:

The team has noticed that about 66.8% of the students believe that the e-payment techniques can be a good alternative rather than the traditional payment technique, and about 33,2% answered with no ,so the project team role is to persuade the students that the e-payment can change the negative believes "from their point of views".

According to survey on question 7:

The team has noticed that In the event of the development of secure electronic payment system in Palestine, a percentage about 93.5% will deal with the system and nearly about 6.5% of student don't deal with secure electronic payment if developed, but the large

number of student, have positive view, this gives us strong incentive to build system in right way and make payment methods easier.

According to the survey on question 9:

The team has noticed that 55% of the students do not have any fears of the use of electronic payments while 45% of the students have fears of using electronic payment method.

For the students who have fears of using electronic payment, these fears summarized as following:

- A break in the Internet.
- Theft.
- Penetration.
- Mistrust.
- Lost of the card.
- Fear of dealing with the devices.
- Failure to ensure the rights of the buyer or seller.
- Account number theft.
- Non-recognition of the amounts paid.
- Transfer of funds to the wrong places.

According to survey on question 10:

The team has noticed that about 56.14% of the students agree to deal with the simple purchase of some services (price of less than 100 shekels) through an electronic website used prepaid methods and about 43.6% don't agree to use e-payment system for small amount of money, this result may return to that the idea of e-payment still new idea in Palestine and students cant imagine how the system work in current time.

According to survey on question 11:

The team has noticed that large number of students represent a percentage nearly 93.5% answer with yes to this question, so they believe that electronic payment save time and effort required in the selling and buying, and its a high result give us good incentive to develop system facilitate way of payment, and reduce time and effort required to complete purchasing transactions.

According to survey on question 12:

The team has noticed that a significant proportion of students from almost 77.9% believes that the use of electronic payment by the seller's guarantee his rights to collect the money, but there is a percentage of 22.1% from students don't agree, this may return to the reason that students fear from the use of new critical system, but these largest rate encourage and motivate the team to develop our e-payment system that achieves security ,trust, and confidence to seller's in obtaining their funds.

According to survey on question 13:

The team has noticed that the percentage about 72.72% from students believes that buyer guarantee the rights to obtain service through using of e-payment system, but there was about 27.8% of student don't believe that buyer has rights to obtain service in this way, but this positive rate encourage to continue develop our project.

Analyzing student section:

According to survey on question 3:

The team has notice that the a percentage 62.9% of students think that the currently mechanism (traditional payment mechanism) that used in electronic registration system not suitable, and 37.1% think that mechanism is okay and suitable, but most opinions

encourage our team to enhance and continue working in develop e-payment system that most appropriate with electronic registration for students.

According to survey on question 4:

The team found that most students want to use payment system and management of the university tuition electronically in secure way besides electronic registration, these students represent about 90.9%, and a few of the students not exceed 9.1% don't want to use e-payment and management of the university premium system beside electronic registration, these positive result support our team to develop new e-payment technique to facilitate premium payment for student.

According to survey on question 5:

The team found that large rate of students up to 82.4% trust in the use of electronic payment and management of the university tuition system beside electronic registration, and few of students don't trust in the use of these electronic system not exceed 17.6%, also those who trust in the use of e-payment system have supported our idea to develop the system.

According to the survey on question 6:

The team has noticed that 24% of the students are prefer the use of prepaid cards in the process of electronic payment ,19% of the students would prefer to use credit cards, 18% of the students would prefer to use Automatic Teller Machine in the payment and 39% of the students would prefer to use bank deposits.

According to the survey on question 7:

The team has noticed that the result was positive for most of the students there are 89% of the students think that the use of the payment system and management of the university premiums electronically overcome the problem of waiting in the queue, and this is a good indication to apply our project.

According to the survey on question 8:

The team has noticed that the students suggest the following for e-payment system:

- Use cards which deducted the required value from the card and allow the student to complete registration.
- Develop electronic payment system where students using card and complete payment via the Internet directly.
- Build secure system suitable for the situation of Palestine polytechnic university.
- The possibility of payment at anytime either before or after registration.
- Use protection mechanisms based on the encryption of student's accounts.
- Possibility of returns required amounts to the students in the case of postponing or withdrawing the course.
- Students have bank account and university deduct required amount from it.

4.4 Questionnaire analysis according to managerial person:

The sample of questionnaire consists of about 20 managerial person of both genders (male and female), about 60 % male and nearly 40% female there point views were as the following:

The team found that all of them have a computer device and they deal with the internet, there skills in using the internet was different 65 % excellent, and nearly 35% answer that

they have very good skills in using the internet, which is positive result that support the ability to continue working on the project idea.

When we analyzed the question that talk about what payment methods did they used in Palestine we found that the largest segment of them use cash as payment method with percentage nearly 100 %, follow in order ATM with percentage nearly 100%, then Jawwal card with percentage 50%, finally using cheque with percentage 49%, there are nearly 70%, of them facing problems in traditional way of payment, but 30% of them don't face problem in traditional payment methods.

The team has noticed that a large percentage of them have good idea about the term of e-payment nearly 90 % of them, and this is positive result to continue work in our project, and there are 80 % of them prefer to use e-payment system instead of traditional payment techniques, about 70 % of them believe that the e-payment techniques can be a good alternative rather than the traditional payment techniques, and about 30% answered with no ,so the project team role is to persuade them that the e-payment can change the negative believes "from their point of views".

The team noticed that managerial person have positive point of views to deal with e-payment system if its developed ,they percentage 90 % , when we analyze there view points about the benefits of e-payment system we noticed that large number of them represent a percentage nearly 95% answer that they believe that electronic payment save time and effort required in the selling and buying , we noticed that a significant proportion of them from almost 92% believes that the use of electronic payment by the seller's guarantee his rights to collect the money, but there is a percentage of 8% from them don’t agree, this may return to the reason that they fear from the use of new critical system, but these largest rate encourage and motivate the team to develop our e-payment system that achieves security ,trust and confidence to seller’s in obtaining their funds.

Also when we asked about if the system enable the buyer guarantee the rights to obtain service through using of e-payment system, there was about 89.11% of them believe that buyer has rights to obtain service in this way, but this positive rate encourage to continue develop our project.

Some Suggestions of managerial person about that if e-payment system applied the answers was that they preferred to use the following methods:

- Visa card.
- Credit card.
- Prepaid card.

Also some of them have a fear from using electronic payment system, they represent About 30%, there fears were summarized as following:

- Security.
- Stolen of the card.
- Fraud.
- Error in the system.
- Lack of trust.

Requirement Analysis

- Introduction
- Functional requirement
- Non-functional requirement
- Context diagram
- Illustrate diagram

5.1 Introduction:

In this chapter we describe in detail system requirements after we categorized into functional and nonfunctional requirements also this chapter will contain the following:

- Context Diagram.
- Block Diagram.

5.2 Functional Requirements:

This system contains many functions, in this section the main functions and descriptions for each will be covered.

The functional requirements can be classified into categories: general e-payment system requirements and PPU e-payment system requirements, then each category classified into types that show below.

5.2.1 Requirement Definitions:

5.2.1.1 General Functional Requirements for E-Payment System:

- **Customer Requirements:**

1. Create account and profile.
2. Add balance using card.
3. Manage user account and profile information.
4. Query balance transaction, which contain all kind of reports.

- **Merchant Requirements:**

1. Create account and profile after accept agreement and approval.
2. Balance transfer from merchant to customer.

3. Report for all transactions.
4. Manage profile.
5. Provide XML web services to be integrated in his site.
6. Request for settlement.

- **Balance Manager Requirements:**

1. Manage customers, merchants, and cards balances.
2. Approve or Disapprove when transfer money from merchant to customer.
3. Manage request for settlement from merchant.
4. Comprehensive report system for cards or customers.

- **Card Seller Requirements :**

1. Specify which card is sold.

- **Card generator manager:**

1. Generate card.
2. Determine card status, sold and who bought it.
3. View card design.
4. Reports.

5.2.1.2 PPU Functional Requirements for E-Payment System:

- **Student Requirements:**

1. Precreated accounts through PPU registration team, who will manage creation of student accounts.
2. View profile information and change password .
3. Query balance transaction, which contain all kind of reports.
4. Add balance using card and different voucher (loan, scholarship, assistance).
5. Send suggestion or contact us email to system administrator.
6. View his financial state.

- **Balance Manager Requirements :**

1. Comprehensive reports from the system.
2. Manage student, PPU, card, voucher and fees system balances.
3. Manage system settings.
4. View personal profile and change password.
5. Send e-mail to system administrator.
6. Transfer bank report.

- **Card Seller Requirement (Banks):**

1. Specify which card is sold.
2. Specify a relation between each card and student.

- **Card generator manager Requirements:**

1. Manage card with a bank.
2. Generate cards.
3. Determine card status, sold and who bought it.
4. Comprehensive reports.

5. Send e-mail to system administrator.
6. View personal file and change password.

- **Voucher generator manager Requirements :**

1. Generate voucher.
2. Send e-mail to system administrator.
3. View personal file and change password.
4. Reports.

5.2.2 Requirement specification:

- Manage account and view profile information:

Function: Manage account and view profile information. **Description**: This function enables all users to manage and update their profile information. **Inputs**: old password, new password. **Source:** User page. **Outputs:** updated profile. **Requires:** login. **Precondition:** login into the site as authorized user. **Post condition:** password updated in the user profile. **Procedure:** User login into his account, and view the profile then update password by type old password and new password then click change password button.

Table 5. 1: Description of manage account and view profile information.

- Contact us:

Function: Contact us.

Description: This function enable all user to communicate with the system administrator By send problems, suggestions, every thing by send email.

Inputs: user email address, message text.

Source: user page.

Outputs: Suggestion, problems, notes send to the administrator.

Requires: login.

Precondition: login as authenticated user.

Post condition: nothing.

Procedure: user login to his page then select contact us after that he complete all fields from,to,message then click on the button send so if the email is correct message will be sent to the system administrator .

Table 5. 2:description of contact us.

- Add balance using card:

Function: Add balance using card.

Description: This function enable student to add balance into his account by using prepaid cards.

Inputs: Add random numbers of the card.

Source: Student add balance page.

Outputs: Update balance (balance added to student account).

Requires: login.

Precondition: login into the site as a student.

Post condition: balance update.

Procedure: student login into the system then select add balance from the menu, after that he enter the first number click send button ,the system will send the response number to the student, then the student compare response number on the card with response number appear on the screen, if it's the same the student enter the second number and click send button , if everything is correct balance added to student account .

Table 5. 3: Description of Add balance using card.

- Add balance using different vouchers (loan, scholarship, assistance):

Function: Add balance using different voucher issues.
Description: this function enable student to add balance into his account by select existing voucher.
Inputs: choose one voucher form the list.
Source: Student registration page.
Outputs: new balance (voucher value added to student account).
Requires: login.
Precondition: login into the site as student, voucher must be pregenerated by voucher manager and assigned to the student.
Post condition: balance update.
Procedure: student login into the website and click on registration link then choose only one voucher before complete registration.

Table 5. 4:Description add balance using different vouchers.

- Query reports:

Function: Query reports.
Description: This function enables all users to perform different types of queries.
Input: select query type and input data.
Source: reports page.
Outputs: required information.
Requires: login**.**
Precondition: login into the site as his role .
Post condition: return reports.
Procedure: the user login to his Page and chooses report, then make query ,then the system return the result of query .

Table 5. 5: description of query reports .

- Comprehensive reports for cards or students:

Function: Comprehensive reports for cards or students.
Description: This function enables balance manager to view comprehensive report about the students, cards.
Input: Query data.
Source: Balance manager page.
Outputs: Comprehensive report.
Requires: Login**.**
Precondition: Login as balance manager.
Post condition: Return reports.
Procedure: Balance manager login into his page, then select report type, so he can view the report.

Table 5. 6: Description of Comprehensive report s for cards or students.

- Edit settings:

Function: Edit setting. **Description:** This function enables balance manager to change the settings of the system such as year, hour price and everything stored in the setting table. **Inputs:** previous year, current year, previous semester, current semester, hours price, instructions. **Source:** balance manager page. **Outputs:** new settings. **Requires:** Login. **Precondition:** Login as balance manager. **Post condition:** update setting table. **Procedure:** The balance manager login into his page, then select edit settings from the menu make all changes then click save button, by this new settings save at database.

Table 5. 7: Description of edit settings .

- Manage card with banks:

Function: Manage cards with banks.
Description: This function enable card generator manger to determine which bank sold cards.
Input: Bank name to which card generator manager want to sell cards.
Source: Card generator manager page.
Outputs: update card database to change card status to be in bank.
Requires: Login.
Precondition: Login as card generator manager, sell cards to bank.
Post condition: Update card database.
Procedure: card generator manager specify each card to which bank sold and change card status to be in bank.

Table 5. 8: Description of manage card with banks.

- Specify a relation between each card and student:

Function: Specify the relationship between each card and student who purchase it.
Description: This function enable bank employee to determine student purchase which card.
Input: Student Number, card number.
Source: Noting.
Outputs: paper list contain student number, card number .
Requires: Noting.
Precondition: student buy the card from the bank .
Post condition: nothing .
Procedure: Bank employee determines student number who purchases each card.

Table 5. 9: Description for specify a relation between each card and student.

- Generate card:

Function: Generate card.
Description: This function enable card generator manager to specify card fixed information card value, quantity, random parameters, that is used to generate card s .
Input: card quantity, card value, expire date.
Source: Card generator manager page.
Outputs: insert card into card database.
Requires: Login.
Precondition: Login as card generator manager.
Post condition: insert card to card database.
Procedure: Card generator manager login into the website and select generate card from the menu then enter card quantity, value, expire date, and click generate card button, so card save at card database.

Table 5. 10 : Description for Generate card.

- Generate voucher:

Function: Generate voucher.

Description: This function enable voucher generator manger to specify voucher information that is used to generate voucher.

Input: Voucher no, voucher type, from ,to ,voucher state .

Source: Voucher generator manager page.

Outputs: add voucher to balance database.

Requires: Login.

Precondition: Login as voucher generator manager.

Post condition: voucher added to specific student.

Procedure: Voucher generator manager login into his page then select generate voucher form the menu after that he determine information that used to generate voucher , voucher no, voucher value,type,from,to,then voucher save at the database to specific student who identified by the manager .

Table 5. 11:Description for generate voucher .

5. 3 PPU Non-Functional Requirements for E-Payment System

The non-functional requirements are those related to the system, but they are not related to the user needs such as software requirements or any thing related to the functionality of the system, which is explained as the following:

5. 3.1 Product requirement

- **Ease of use:** The system must provide a friendly interfaces and easy to be used across all its functions.

- **Coherency and Consistency:** The system must support consistence interface with its buttons, colors, actions and appearance.

- **Accessibility and availability:** The system must be easy to access, login, navigate and use, and to be updated ,recovered easily .

- **Flexibility and high speed display:** The system must allow the users to access the website from different locations as faster as possible.

- **High efficiency:** The system must provide high efficiency website in a way that no error can be occurred in its transactions.

- **Accuracy:** The system must provide a high level of accuracy especially in its transactions, because our system deals with financial data where every error occur cause loss.

- **High robustness:** The system must provide high robustness for any failure and should work the longest time before coming down.

- **Security:** the system must support high level of security for data and different user's accounts by prevent illegal access and transactions since the system deal with sensitive financial data, and by support database security.

- **Safety:** The system must apply different safe authentication and backup methods.

- **Reliability:** the processes are designed to prevent the error occurrence before causing large problem.

- **Comfortable interface:** the system develops to support comfortable and suitable interface that use suitable color.

- The PPU e-payment system developed for the purpose of supporting integration between existing electronic registration system and future system.

5.3.2 Process Requirements:

- The system and its documents must be delivered on 10 June, 2008.

5.4 Block diagram:

The following diagram illustrates the whole e-payment system:

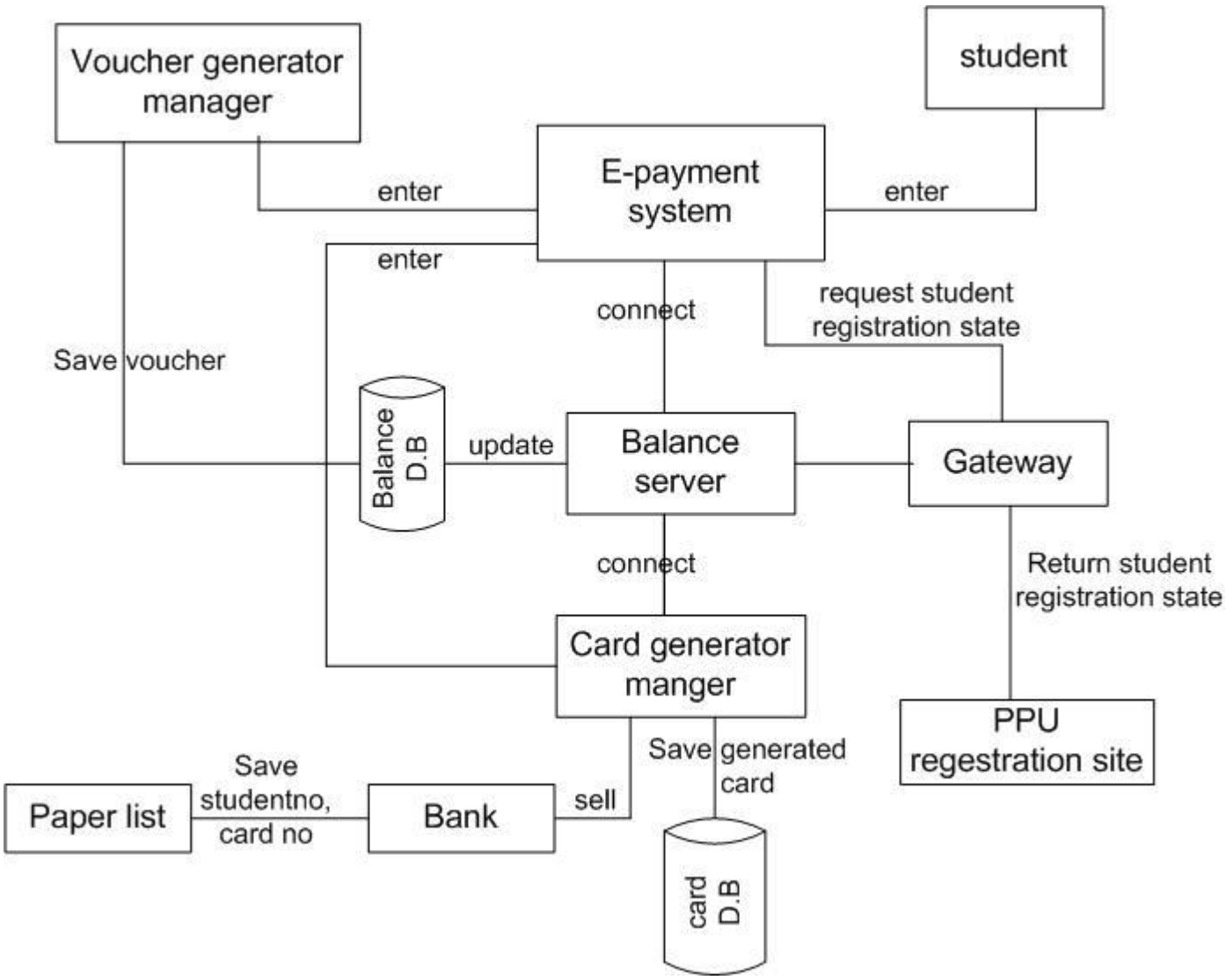


Figure 5. 1: Block diagram for E-payment system

5.5 Context diagram:

The diagram below shows the system and its relationship with other systems.

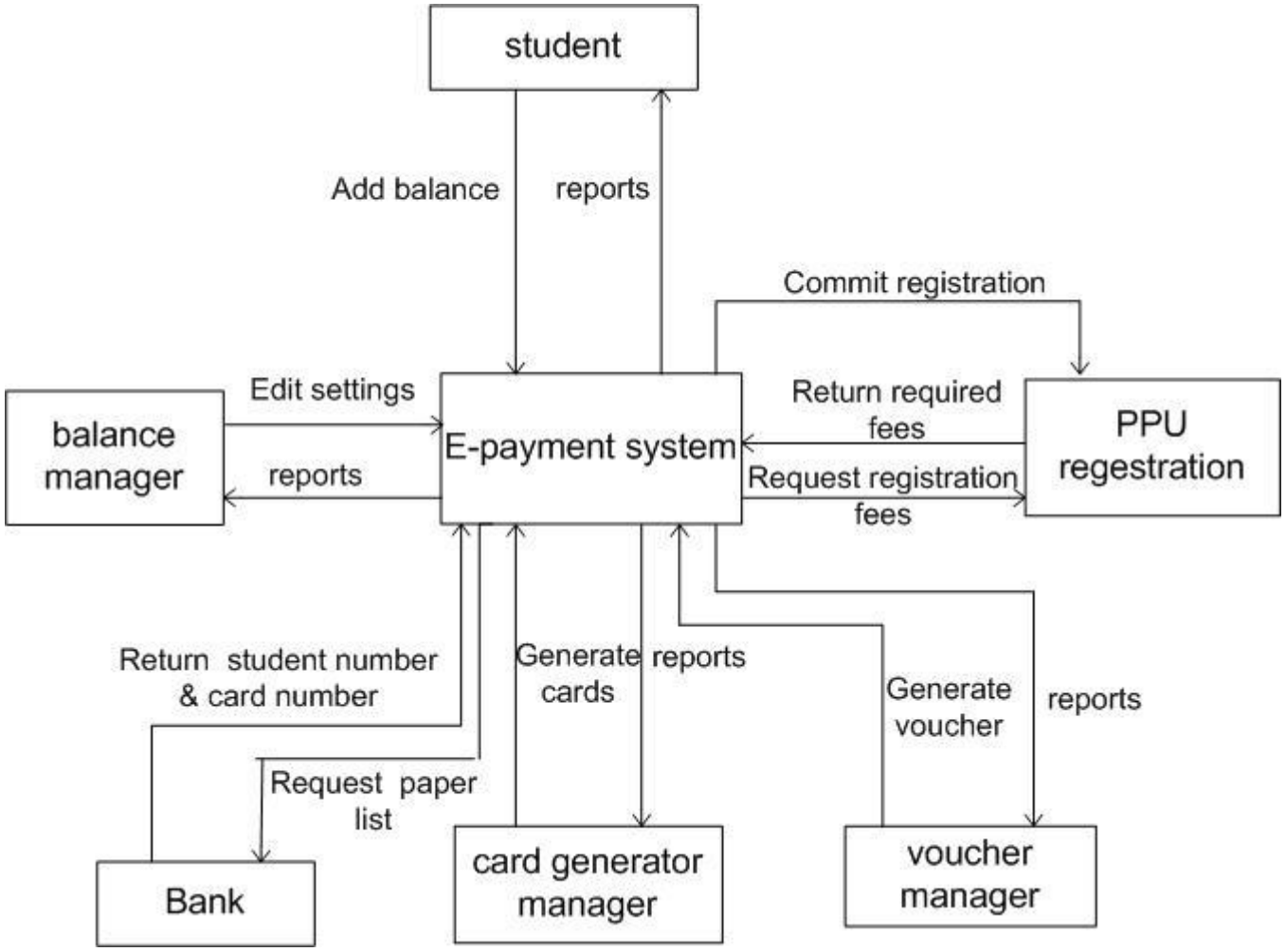


Figure 5. 2: context diagram

System Design

- Introduction
- Use case diagrams
- Class diagram
- Sequence diagram
- Activity diagram
- Functional design
- Screen design
- Database design
- Entity relationship diagram

6.1 Introduction:

This chapter will describe the design and the structure of the system to be implemented. This will include the following:

- Unified Modeling Language (UML) Diagrams:
  - Use case diagram.
  - Class diagram.
  - Object diagram.
  - Sequence diagram.
  - Activity diagram.

- Interface Design
  - Input screen design.
  - Output design.
  - Card design.

- Database design
  - Entity relationship diagram (E_R diagram).
  - Tables design.

6.2 Unified Modeling Language (UML) Diagrams:

The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the artifacts of software systems, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems. The UML uses mostly graphical notations to express the design of software projects. Using the UML helps project teams communicate, explore potential designs, and validate the architectural design of the software.

6.2.1 Use case Diagram

The diagram below shows the main actors and processes done by actors.

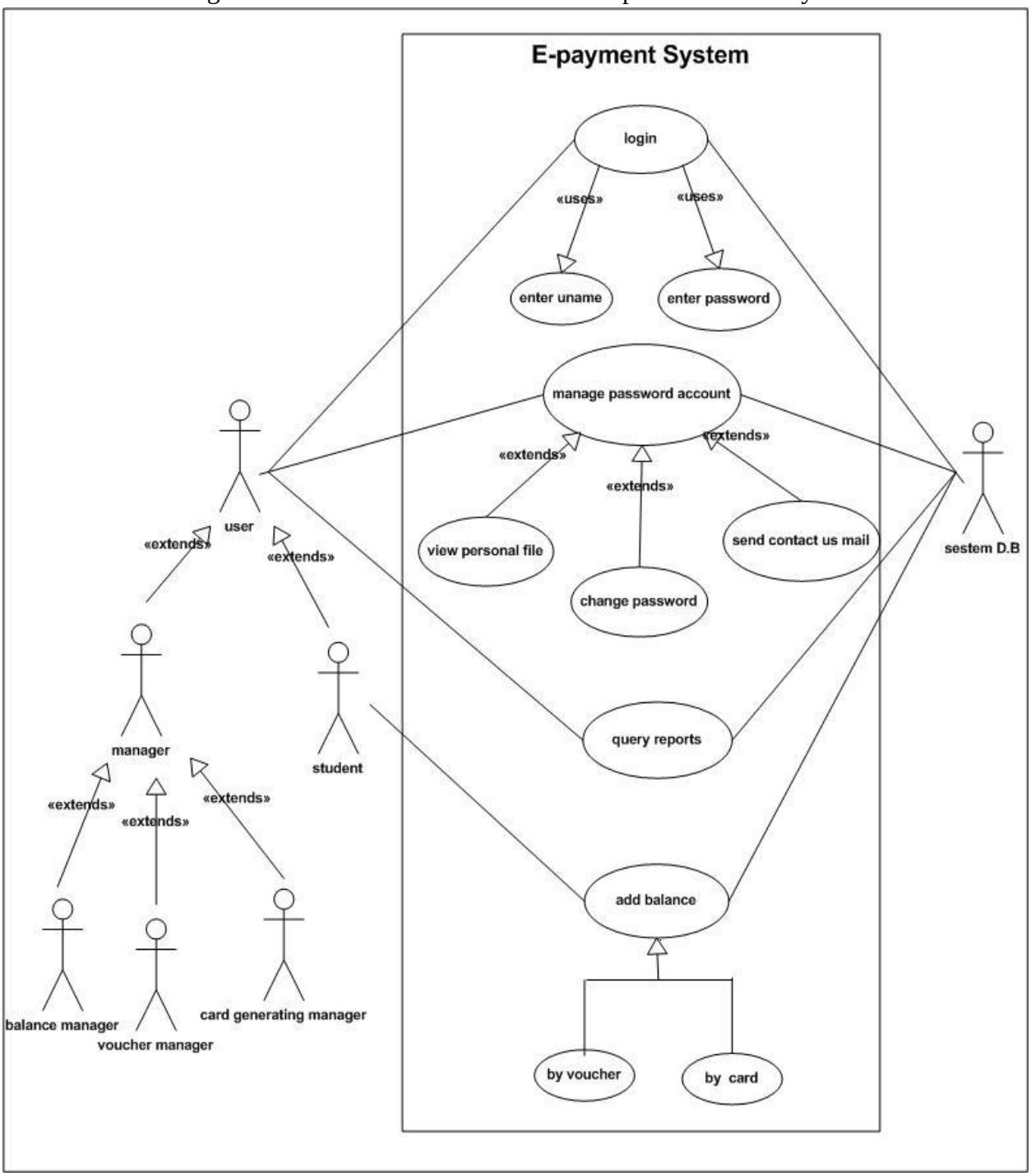


Figure 6. 1: use case diagram

6.2.1.1 Use case Diagram for managers:

The diagram below show the use case for managers in e-payment system.

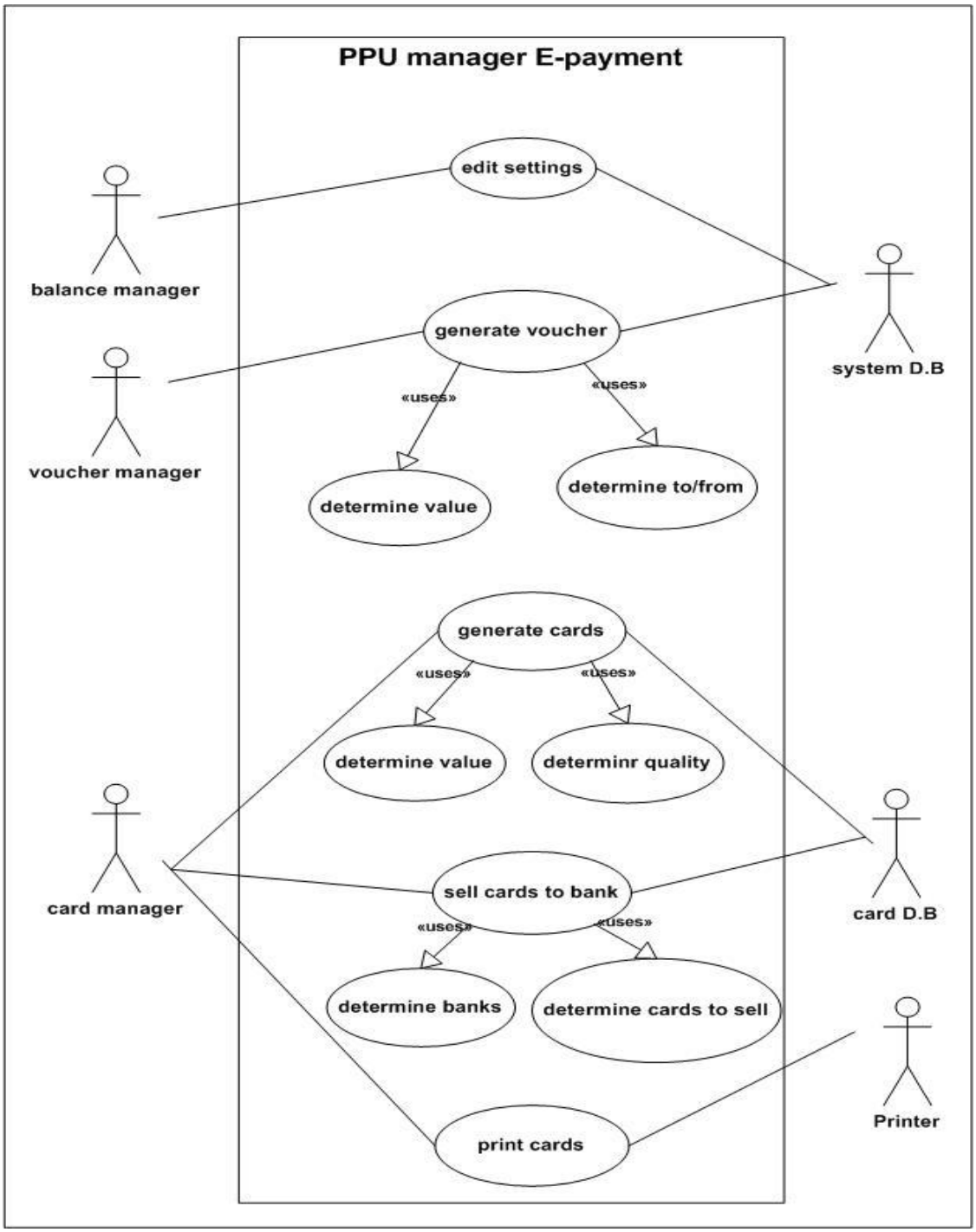


Figure 6. 2 : Manager Use case diagram

6.2.1.2 Login Use case description:

Use Case ID:	E-payment_01.
Use case name :	Login.
Created by :	Team members.
Date created :	7/5/2008.
Description:	Enable different user to log into the system.
Actor:	Student, balance manager, voucher manger, card generator manager.
Precondition:	Users must be pre-registered (have an accounts username and password).
Basic Flow:	1- User open the website 2- User enters the username. 3- Then enters the password. 4- Click login button.
Post Conditions:	Distinguish user according to his type and forward him to his main page.
Alternative Scenarios :	
Business Rules:	
Priority :	High
Special requirements:	
Exceptions:	If the user name or password invalid message will appear to the user with syntax "invalid user name or password" so the user must try again with valid username and password.
Includes :	
Notes and issue :	

Table 6. 1 : Login Use case description

6.2.1.3 Manage personal account use case description:

Use Case ID:	E-payment_02.
Use case name :	Manage personal account.
Created by :	Team members.
Date created :	7/5/2008.
Description:	Enable all users to manage their account such as change password, view personal file, and send email using contact us.
Actor:	Student, balance manager, voucher manger, card generator manager.
Precondition:	Every user must be login into his main page.
Basic Flow:	1. User login into his main page. 2. Then select personal information from menu. 3. There are three choices change password or view personal information or send contact us email. 3.1. If the user selects view personal information then he can view his profile. 3.2. If the user change password then he can change his password. 3.3. If the user select contact us he can send email to tell about problem or suggestion or complain.
Post Conditions:	If the user changes password then update password in user account.
Alternative scenario :	

Business Rules:	
Priority :	Medium
Special requirements:	
Exceptions:	
Includes :	Login use case
Notes and issue :	

Table 6. 2 : Manage personal account use case description

6.2.1.4 Request report use case description :

Use Case ID:	E-payment_03.
Use case name :	Query reports.
Created by :	Team members.
Date created :	7/5/2008.
Description:	Enable all users to request report.
Actor:	Student, balance manager, voucher manger, card generator manager.
Precondition:	Every user must be login into his main page and select report from the menu.
Basic Flow:	1- User login to his page. 2- Then select report from the menu. 3- If there is results the results display on the screen else message appear to the user that no result found.
Post Conditions:	Report results appear on the user screen
Alternative Scenarios :	
Business Rules:	
Priority :	High.
Special requirements:	
Exceptions :	
Includes:	Login use case.
Notes and issue :	

Table 6. 3 : Request report use case description.

6.2.1.5 Edit settings use case description:

Use Case ID:	E-payment_04.
Use case name :	Edit settings.
Created by :	Team members.
Date created :	7/5/2008.
Description:	Enable balance manager to edit the system settings.
Actor:	Balance manager.
Precondition:	Login as balance manager.
Basic Flow:	1- balance manager login into his page. 2- Then select edit settings from menu. 3- Then save change to database.
Post Conditions:	
Alternative Scenarios :	
Business Rules:	
Priority :	Medium.
Special requirements:	
Exceptions :	
Includes :	Login use case .
Notes and issue :	

Table 6. 4 : manage balance use case description.

6.2.1.6 Add balance use case description:

Use Case ID:	E-payment_06.
Use case name :	Add balances.
Created by :	Team members.
Date created :	7/5/2008.
Description:	Enable student to add balance by using prepaid cards or select one voucher if he have voucher.
Actor:	Student.
Precondition:	Student must be login.
Basic Flow:	1. Student login to his page. 2. Then add balance using card or add voucher. 3. Add balance by insert random number one. 4. If random number one is valid then the system sends response number. 5. Finally student inserts random number two.
Post Conditions:	Balance added to student account.
Alternative Scenarios :	1. student login to his page 2. If there is voucher then select one voucher only. 3. Then voucher added to his balance.
Business Rules:	
Priority :	High.
Special requirements:	
Exceptions :	If the random number one of the card was invalid then student has three tries only, if all was failed no response number send to the student, also if the student enter the first number and receive the response number then he can enter the second random number, if its invalid number he have three tries only to enter the

	second random number.
Includes :	Login use case.
Notes and issue :	

Table 6. 5: add balance use case description

6.2.1.7Generate card use case description:

Use Case ID:	E-payment_08.
Use case name :	Generate cards.
Created by :	Team members.
Date created :	7/5/2008.
Description:	Enable card generator manager to generate cards.
Actor:	Card generator manager.
Precondition:	Card generator manager must be login into his main page.
Basic Flow:	1. card generator manager login into his page. 2. Then select generate card from the menu. 3. Determine value of the card, card quantity, expire date, instructions and click on generate button.
Post Conditions:	Card generated saved at card database and set created status = true.
Alternative Scenarios :	
Business Rules:	
Priority :	High
Special requirements:	
Includes :	Login use case
Notes and issue :	

Table 6. 6: generate card use case description

6.2.1.8 sell card to bank use case description:

Use Case ID:	E-payment_09
Use case name :	Sell card to bank
Created by :	Team member
Date created :	7/5/2008
Description:	Enable card generator manager to sell cards to the bank.
Actor:	Card generator manager.
Precondition:	Card generator manager must be login into his main page.
Basic Flow:	1. card generator manager login into his page. 2. Then selling card to banks. 3. change cards status make in bank=true.
Post Conditions:	Change card status in bank= true.
Alternative Scenarios :	
Business Rules:	
Priority :	Medium
Special requirements:	
Exceptions :	
Includes :	Login use case
Notes and issue :	

Table 6. 7: sell cards to bank use case description.

6.2.1.9 Generate voucher use case description :

Use Case ID:	E-payment_010.
Use case name :	Generate voucher.
Created by :	Team member
Date created :	7/5/2008
Description:	Enable voucher manager to generate different type of vouchers.
Actor:	Voucher manager.
Precondition:	Voucher manager must be login into his account.
Basic Flow:	1. Voucher manager login into his page. 2. Select generate voucher from his menu. 3. Then he generate voucher by determine the type of voucher, value, from and to.
Post Conditions:	
Alternative Scenarios :	
Business Rules:	
Priority :	High
Special requirements:	
Exceptions:	
Includes :	Login use case
Notes and issue :	

Table 6. 8 : generate voucher use case description

6.2.2 Class Diagram:

This diagram below show main classes in PPU e-payment system.

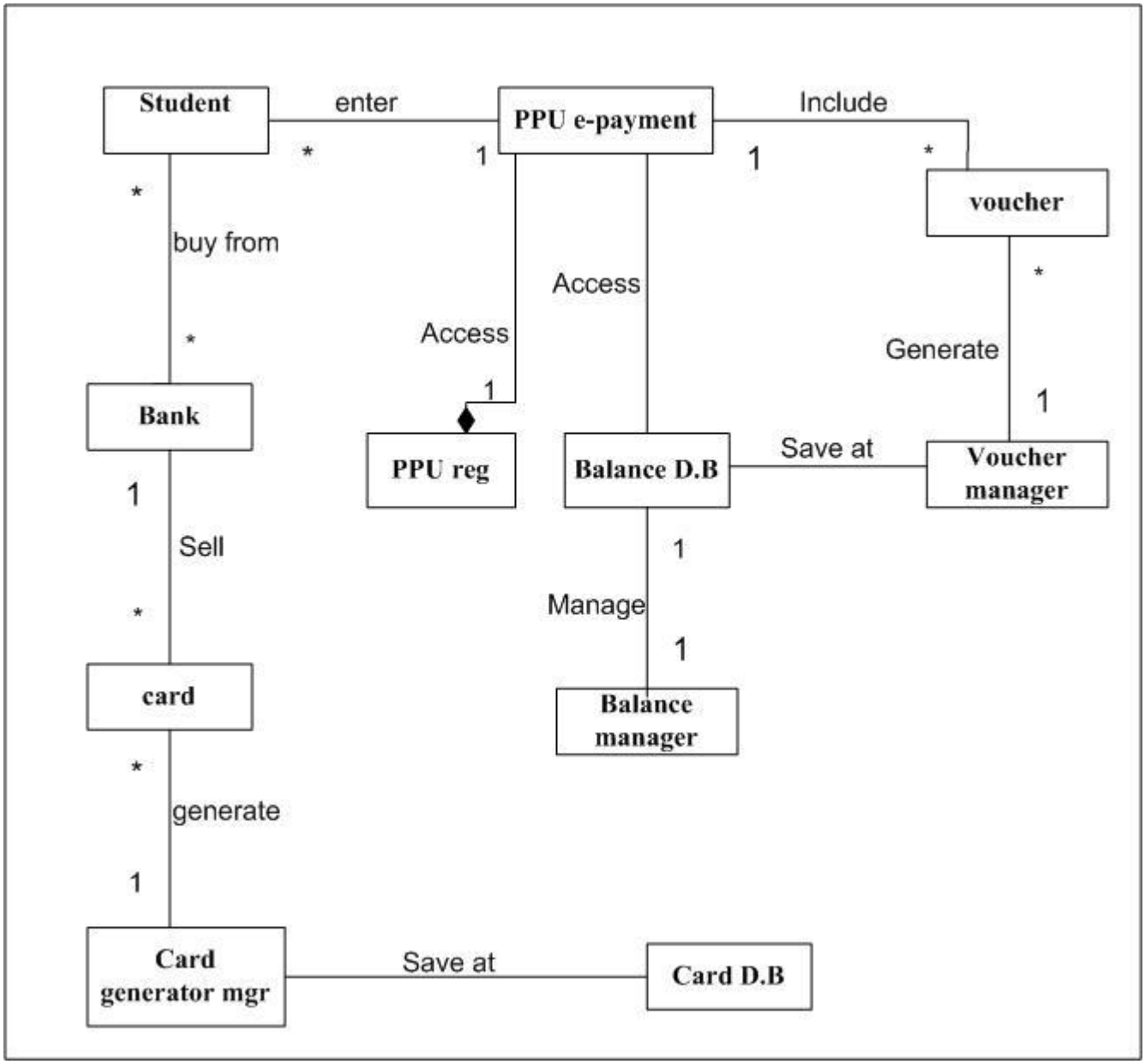


Figure 6. 3 : Class diagram for E-payment system .

6.2.3 Object Diagram:

This diagram below illustrate object diagram for PPU e-payment system.

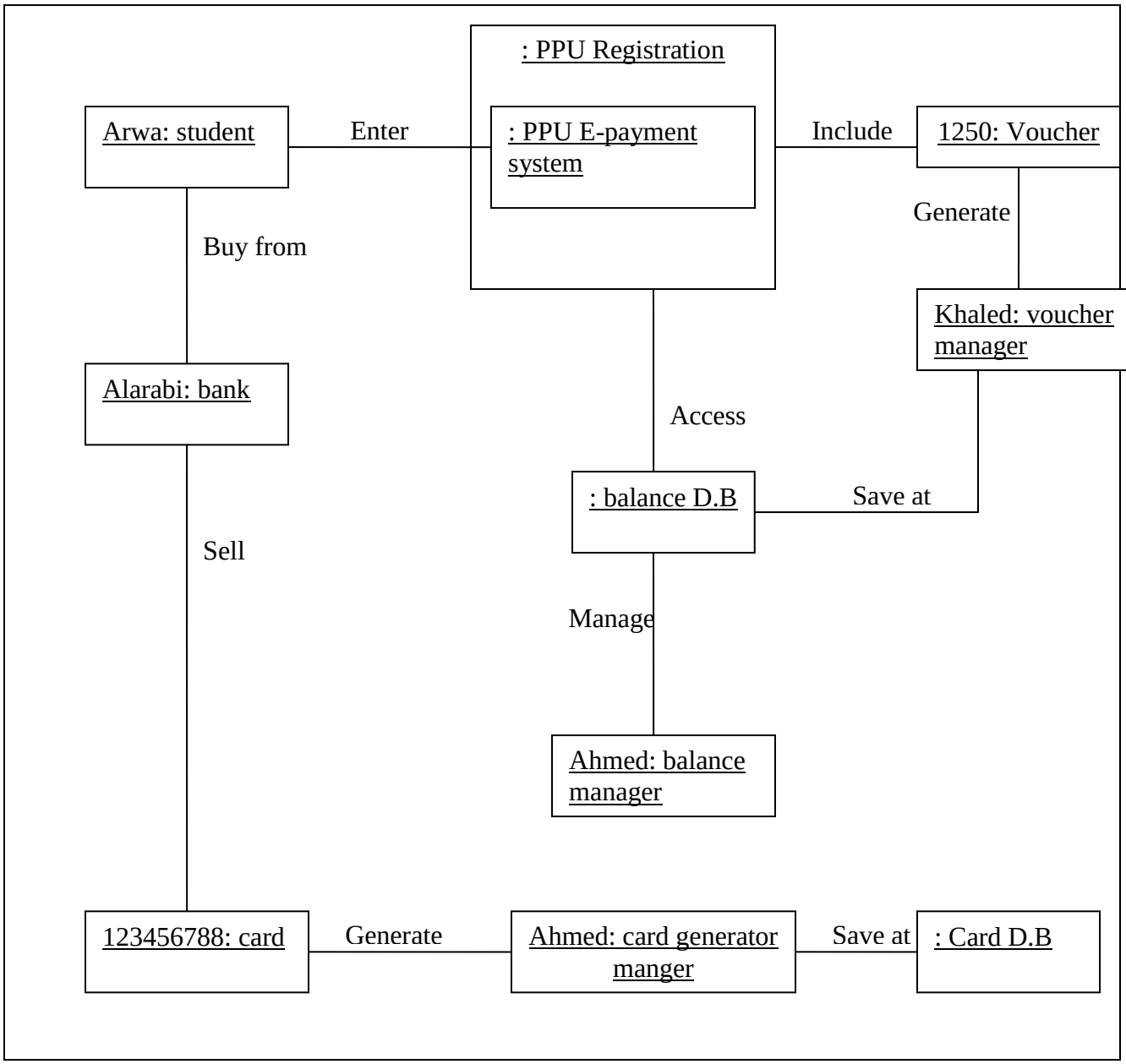


Figure 6. 4 : object diagram for E-payment system.

6.2.4 Sequence diagram:

The diagram below illustrate sequence diagram for add balance by student in PPU e-payment system.

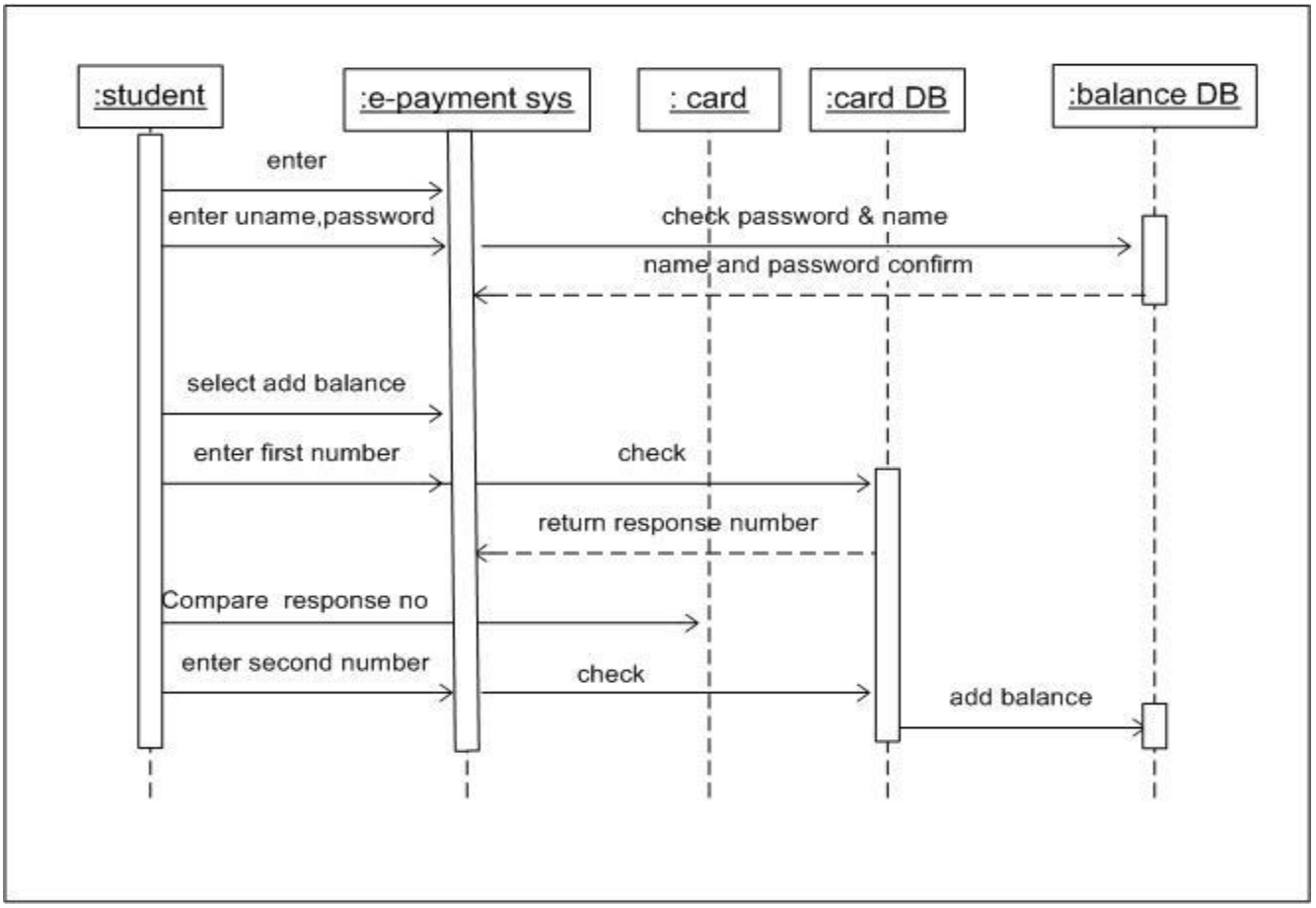


Figure 6. 5 : Sequence diagram for student.

6.2.4.1 Sequence diagram for card generator manager:

The diagram below illustrate sequence diagram for card generator manager in PPU e-payment system.

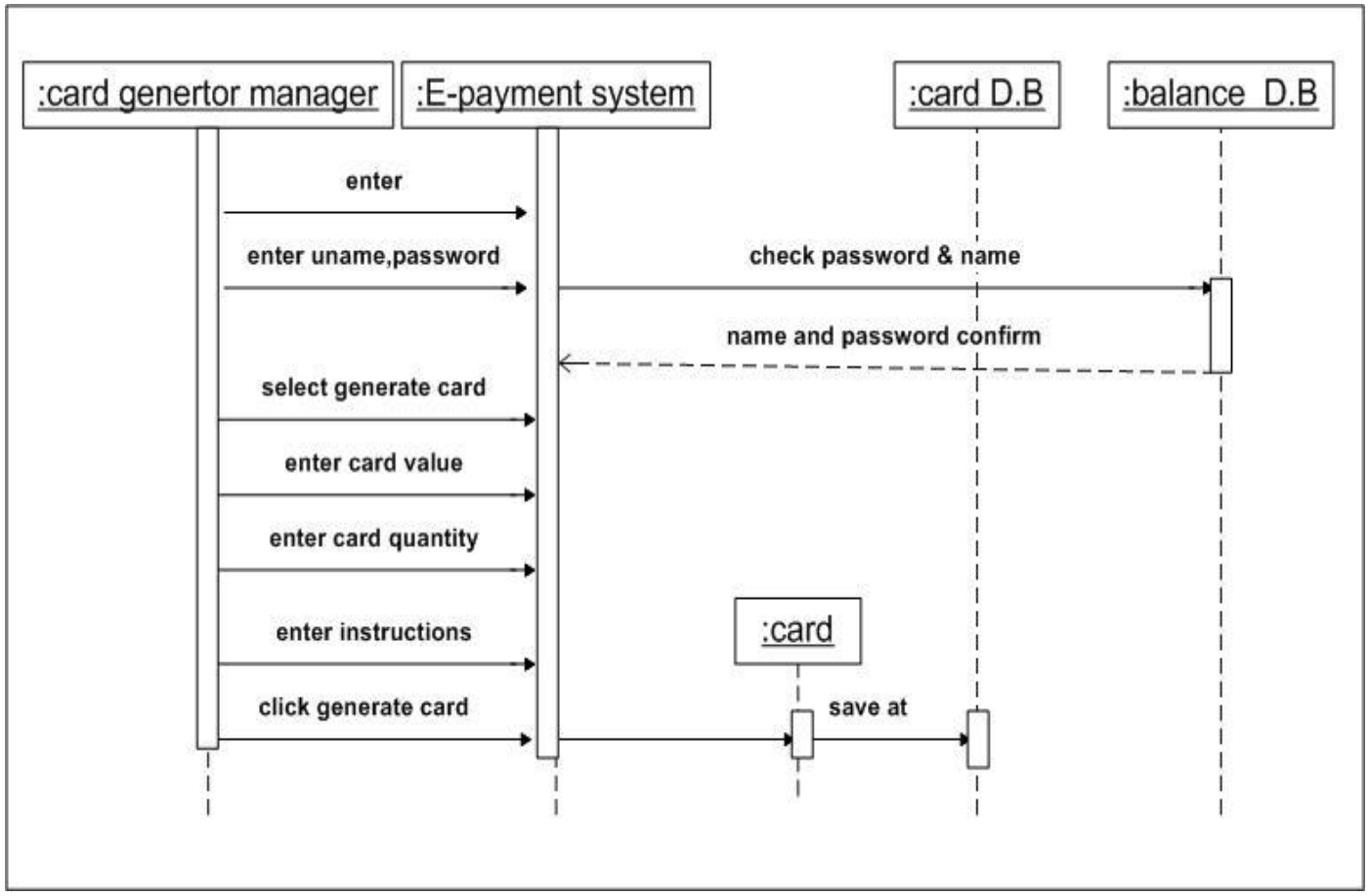


Figure 6. 6 : Sequence diagram for card generator manager

6.2. 5 Activity diagram:

The diagram below illustrate activity diagram for the system.

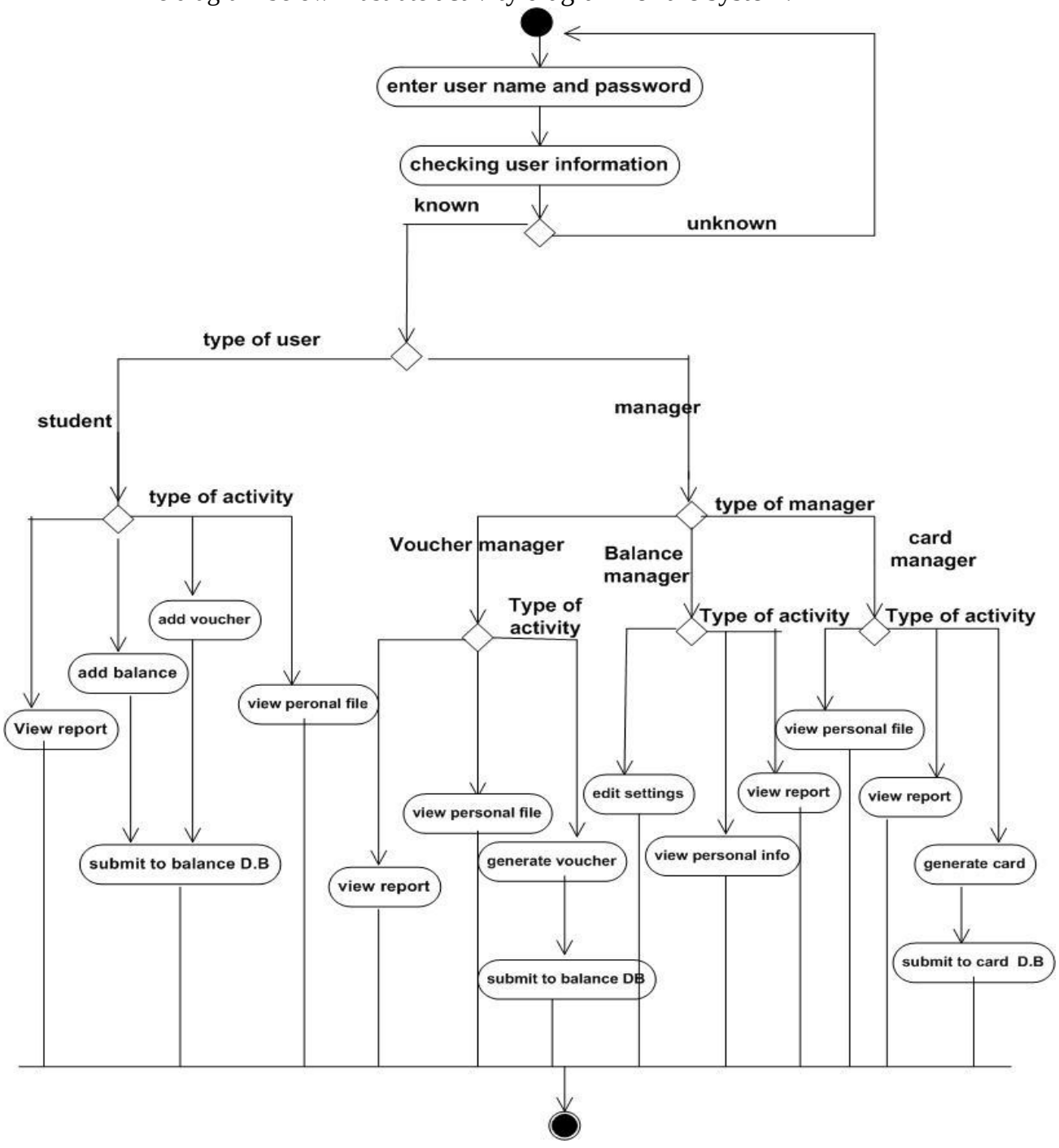


Figure 6. 7: Activity diagram

6.2.5.1 Add balance using card activity diagrams:

- Description: this function enables student to add balance using cards.
- User interface :
  - ✓ Input: random one, random two.
  - ✓ Output :balance added to student
- Constraints:
  - ✓ Random number one should be valid before the system sends response number to the student, then the student response by send random number two.
- Activity diagram :

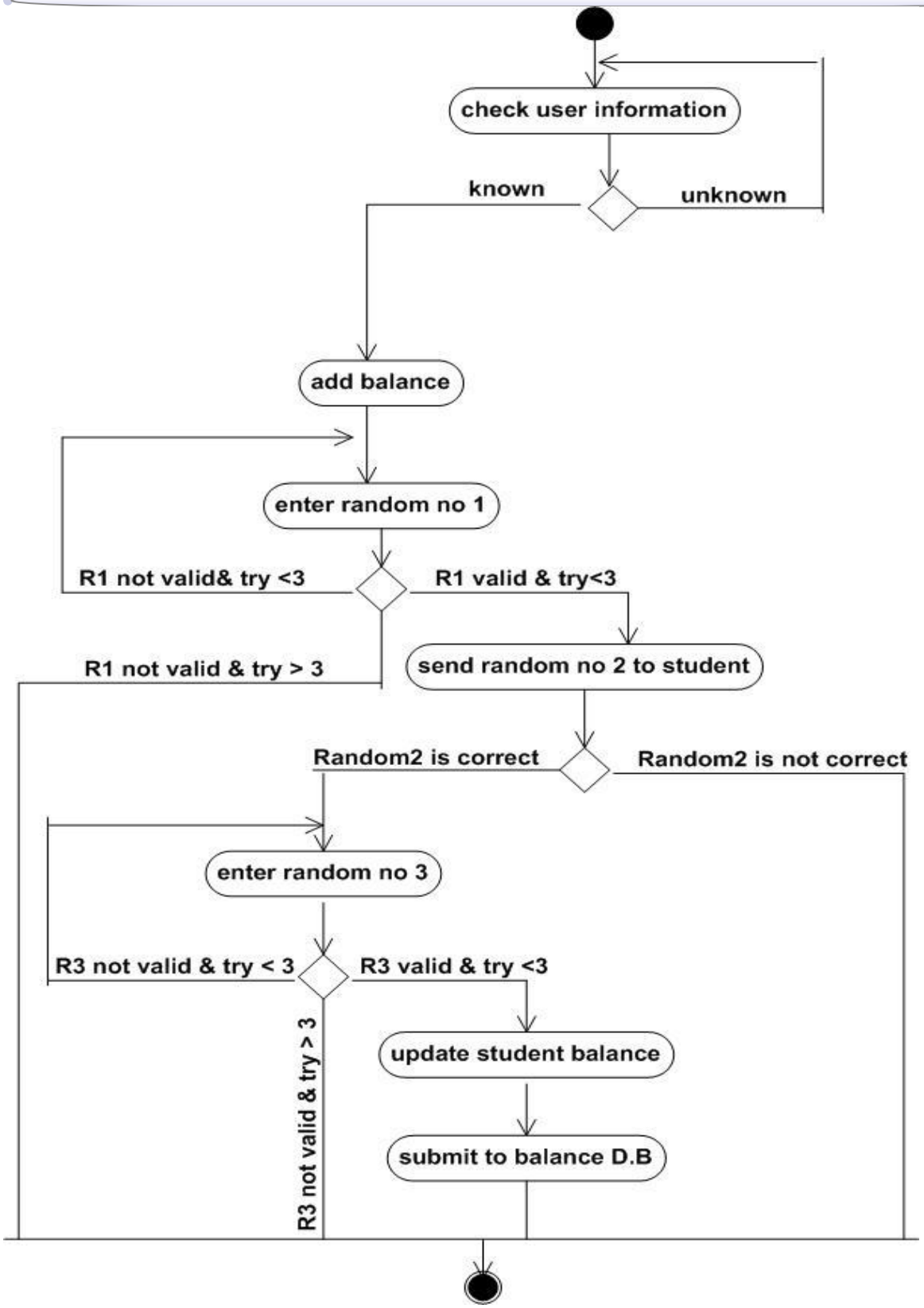


Figure 6. 8: Add balance activity diagram .

6.3 Screen design:

This section contains user interface, and user interface is essential in the development of any system that operates within an environment containing a large number of users.

6.3.1 Main screen:

This screen represent main screen in the system where the user login here by enter user name and password in the text box.

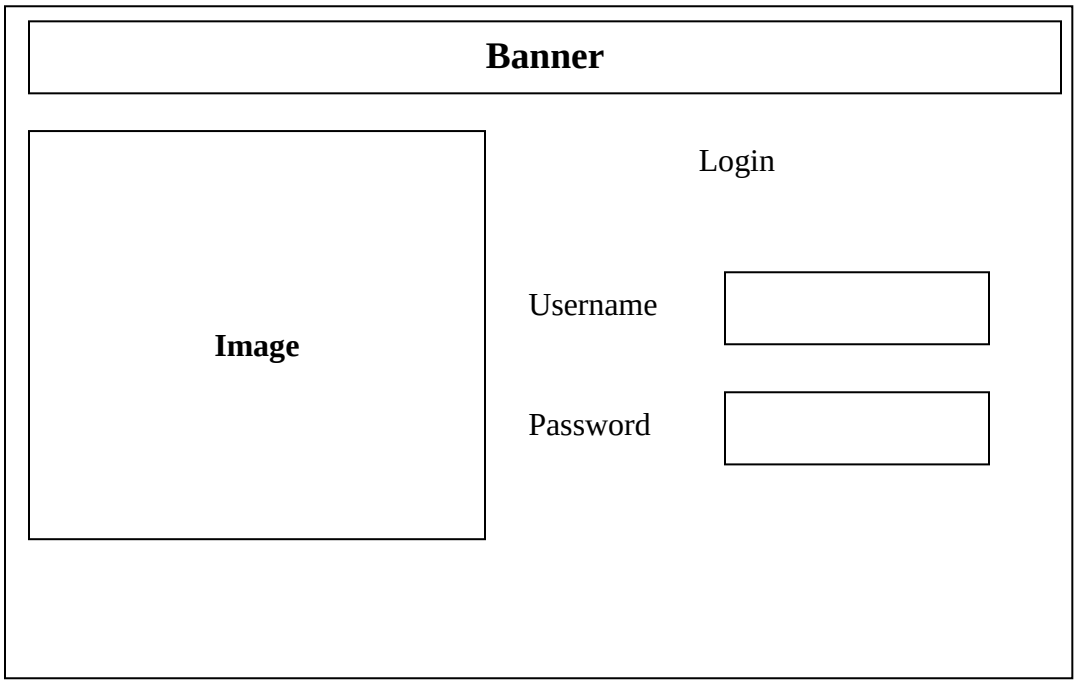


Figure 6. 9 : Main screen

6.3.2 Main Student screen

This screen appears when student login to the system by enter valid username and password a menu appear in the left of the screen contain many items add balance, personal file, request for settlement, report, registration, contact us, financial state.

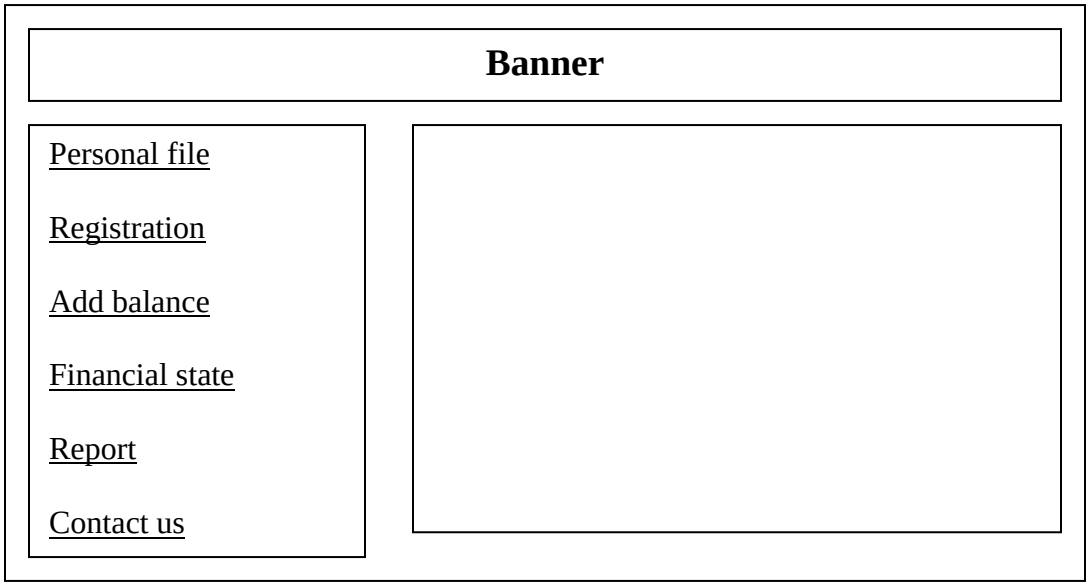


Figure 6. 10 : Main student screen

6.3.3 Change password screen:

When student choose personal file link from the previous screen the next screen appear to the student this screen enable student to change password, by enter old password and new password then click change password button .

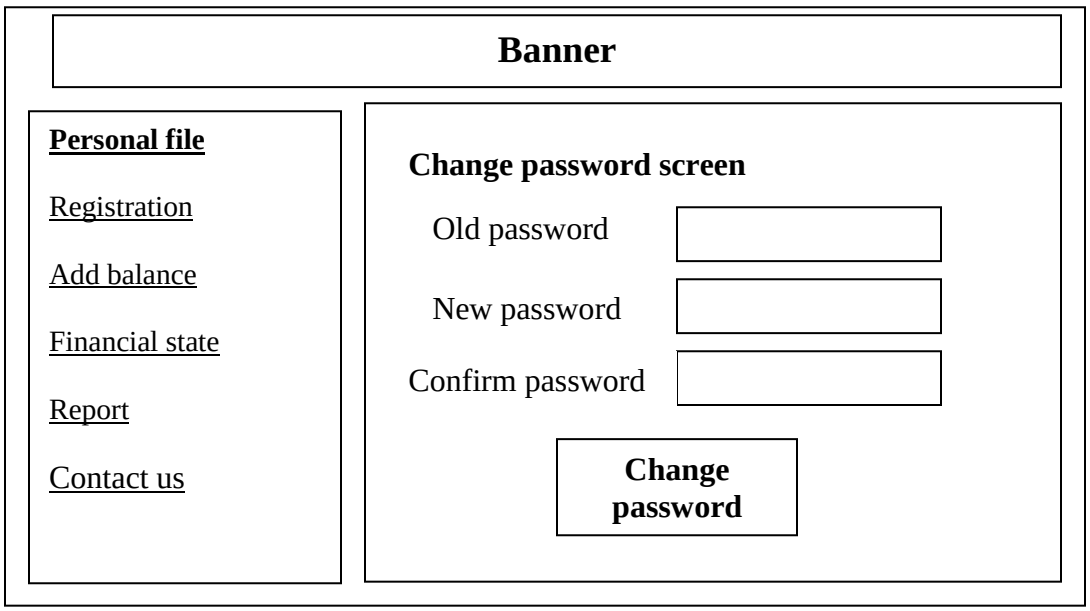


Figure 6. 11 : change password screen

6.3.4 Add balance screen:

When student click the link add balance, the next screen appear to the student enable him to add balance to the system using card, he must enter the first number of the card then click send button then he compare response number after that he must enter the second number of the card..

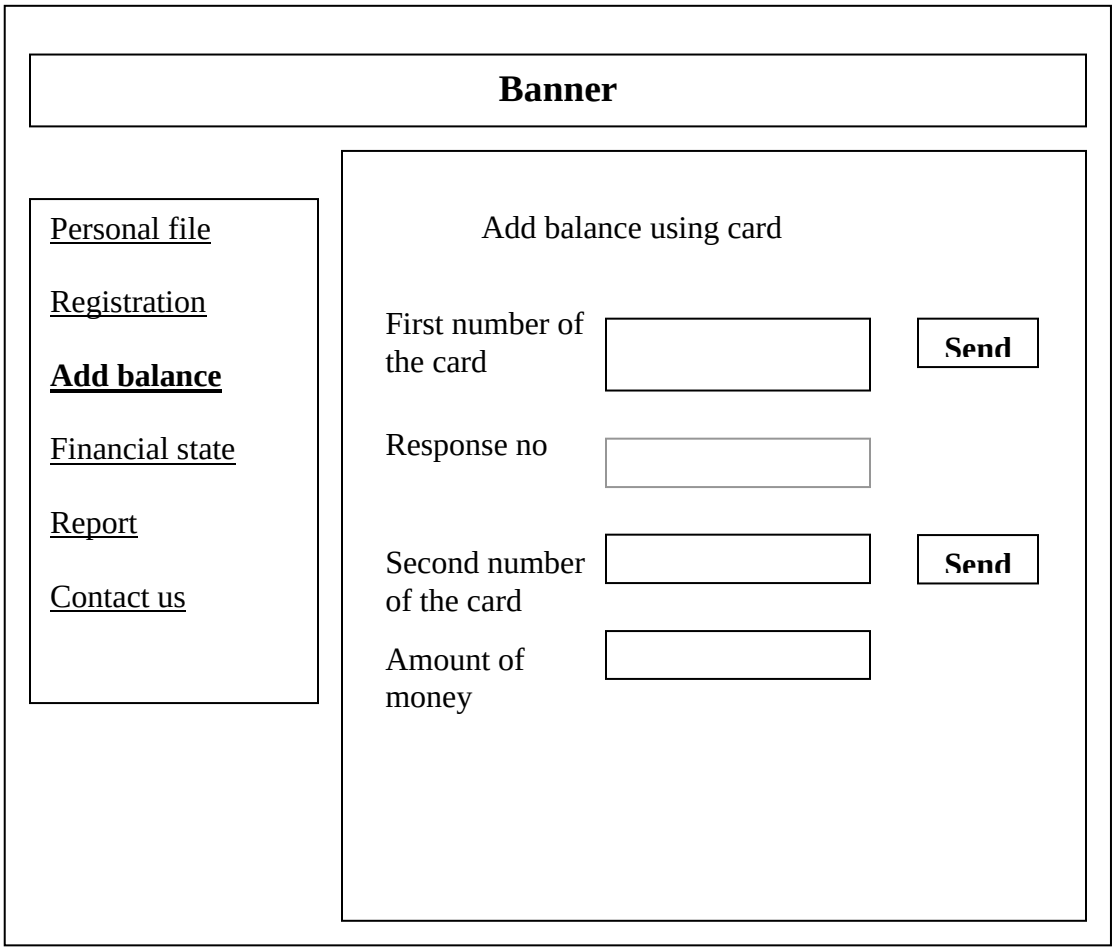


Figure 6. 12 : Add balance screen

6.3.5 Registration screen:

This screen represents simulation of registration on PPU when student click registration from menu the next screen will appear, he must enter in the first box the number of registration hours, then the money required for payment appear in the box number two then student clicks on the button to complete registration.

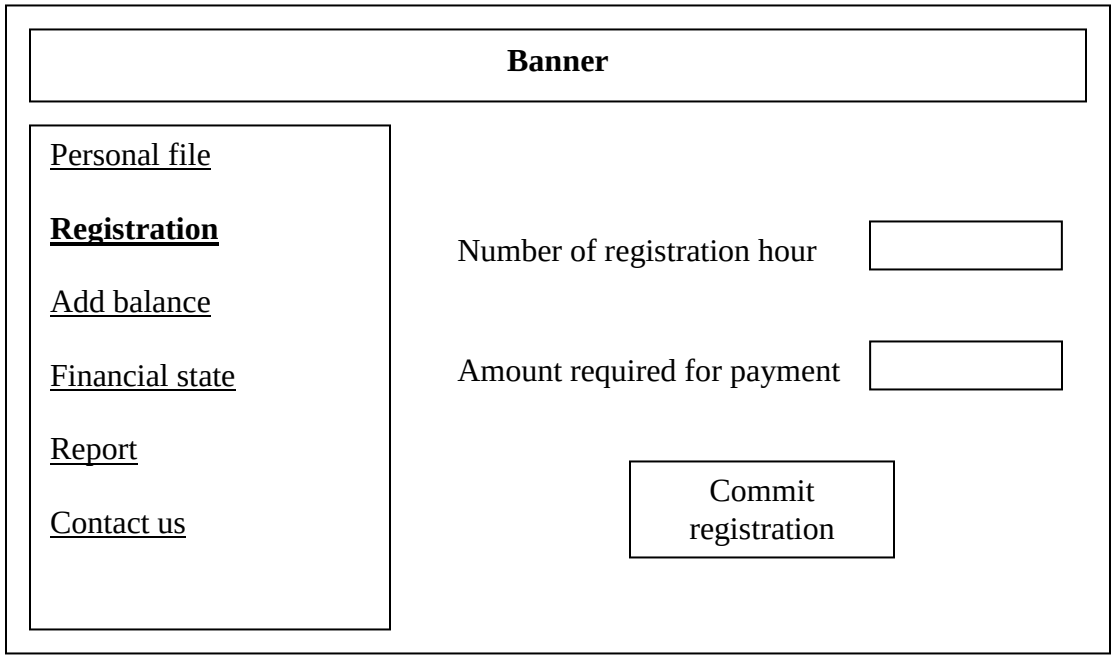


Figure 6. 13 : Registration screen

6.3.6 Financial state screen:

This screen appear when student select financial state from the menu .by select on this item he can view his financial state , registered hours, paid amount, semester ,year ,assistance amount and required fees .

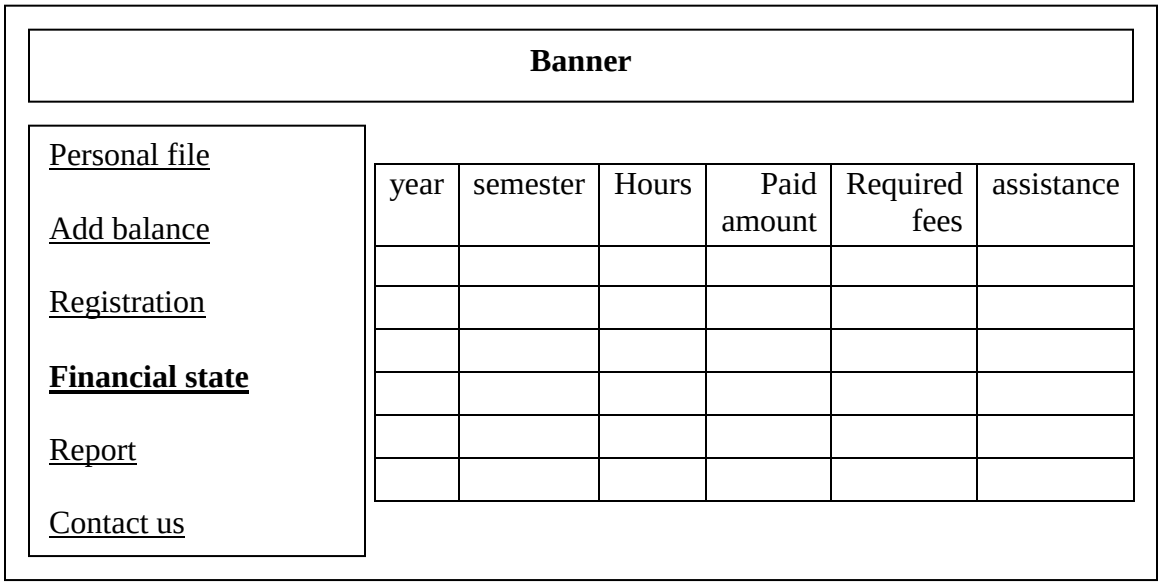


Figure 6. 14 : Financial state screen

6.3.7 Report:

Report screen appear when student click report item from the menu, student must enter what he query about in the box then click search.

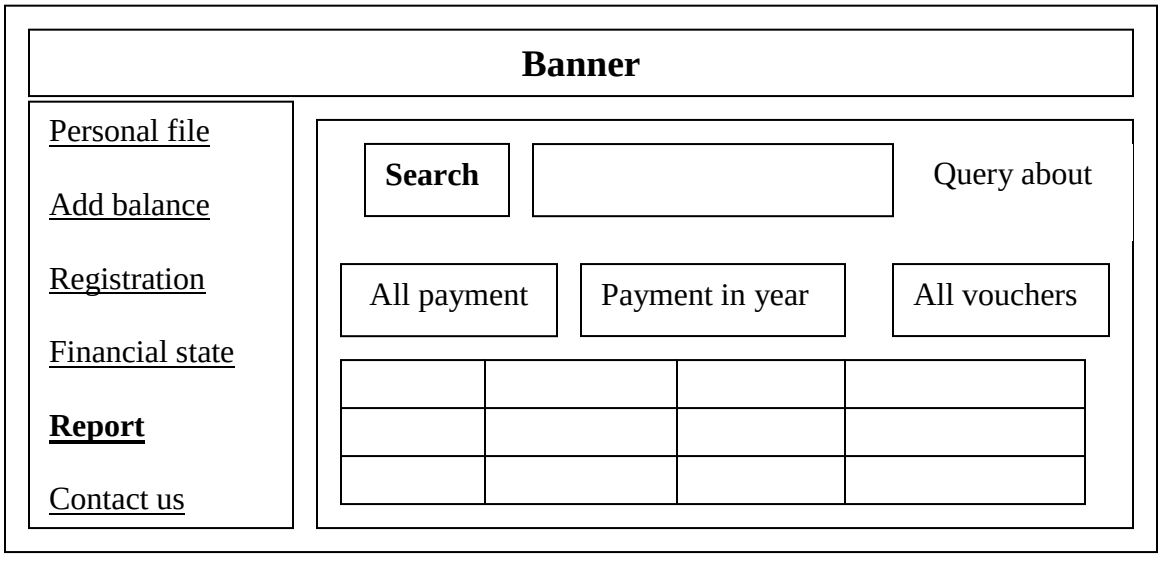


Figure 6. 15 : Report screen

6.3.8 Voucher generator manger screen:

This screen will appear to voucher generator manger enables him to generate voucher to student, he must fill the field student no, name of the student, voucher no, assistance part, value of voucher, date then click generate.

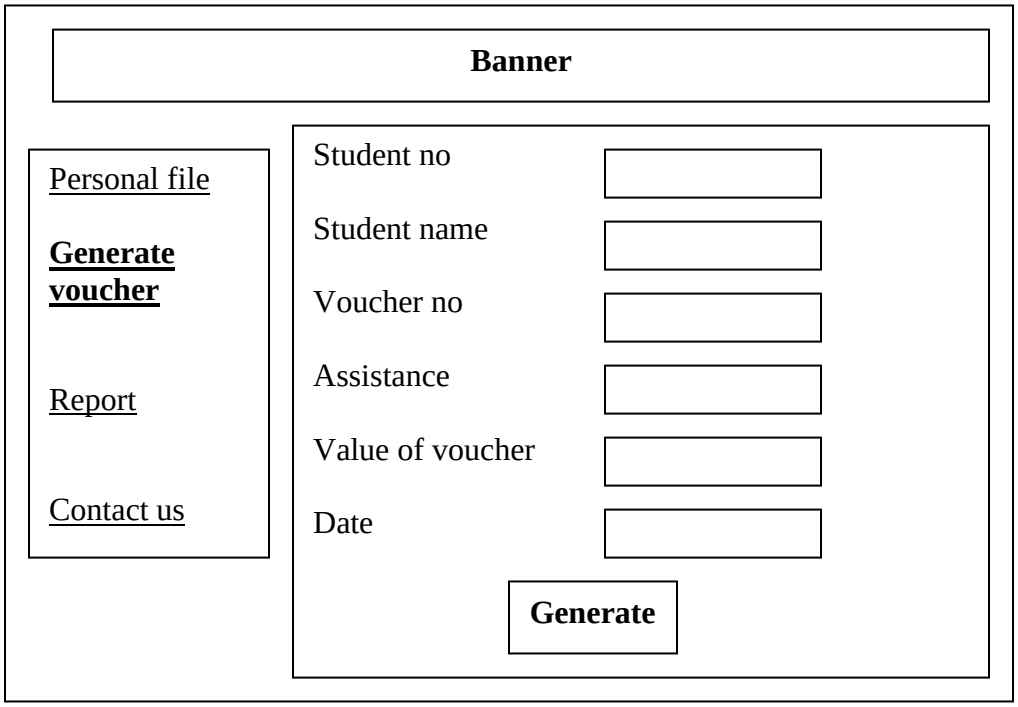


Figure 6. 16 : Voucher generator manager screen

6.3.9 Card generator manager screen:

This screen will appear to card generator manager enable him to generate card to student, he must fill the field card no, expire date of the card for example one year from the generation date , value of the card 50,100,200 J.D, number of cards he want to generate by fill the quantity then click created.

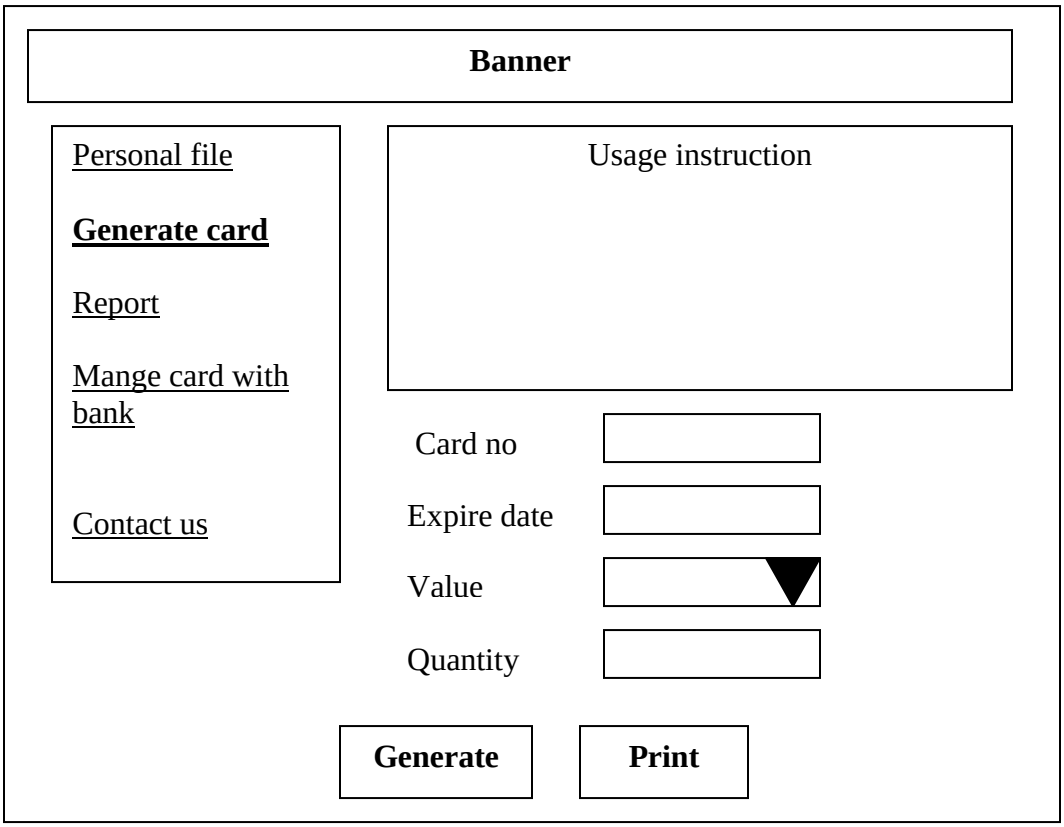


Figure 6. 17 : Card generator manager screen

6.3.10 Edit setting screen:

This screen enable balance manager to change the setting, by enter the setting here and click save then new setting save.

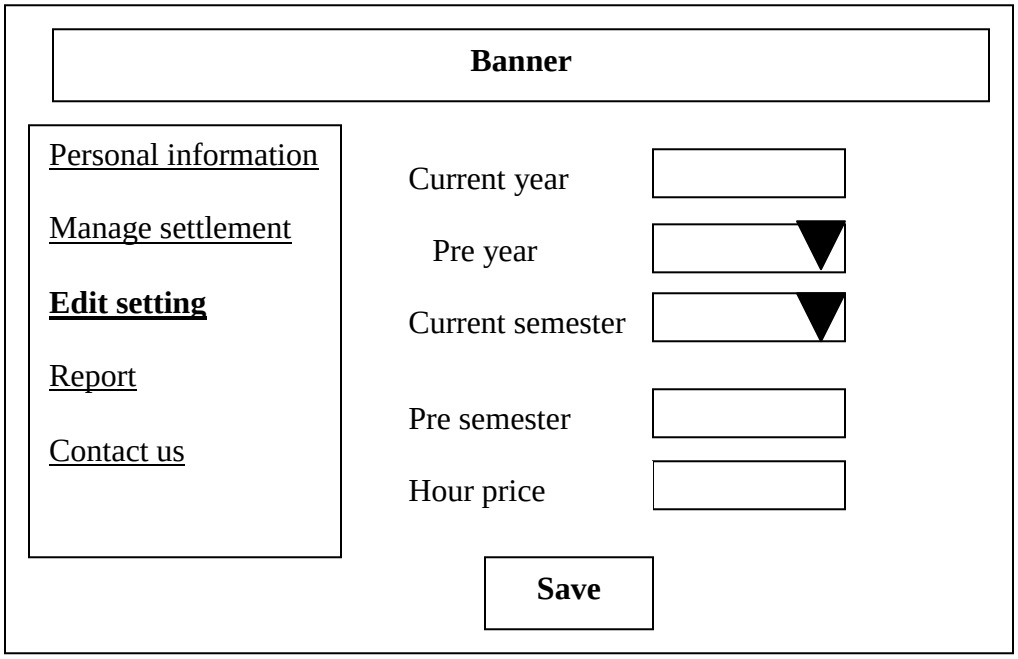


Figure 6. 18 :Balance manager edit setting screen

6.3.11 Contact us screen:

This screen available to all user of the site after they choose contact us from the menu the following screen will appear to them, the user fill from using his email address then identify the subject and the message text then click send button.

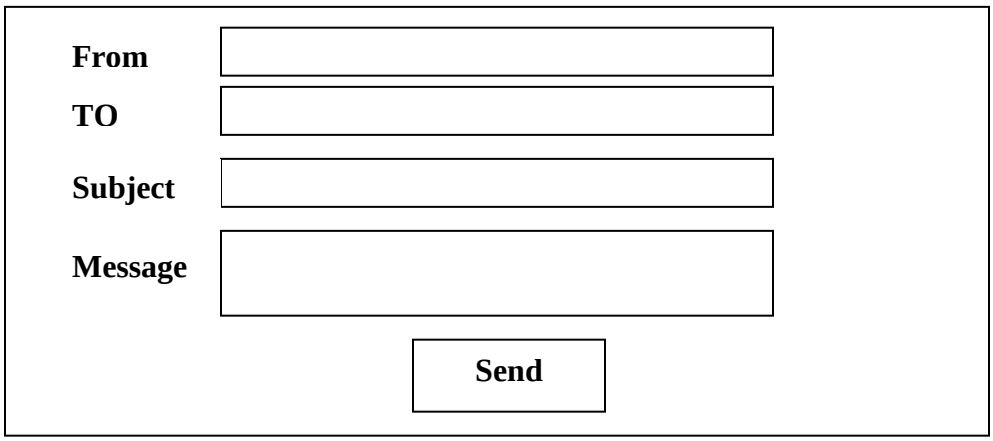


Figure 6. 19 :Contact us screeen

6.4 Card design:

The idea was that student buy a card from the bank, then go to our e-payment website to pay tuition, the responsibility of card generation is assigned to card generator manager, he enter the system generate all cards save them at card database, then sell them to the bank, as we mention in feasibility study the paper which we recommend to used in printing card is a glossy paper, and print the card using Laser hp printer, support two side printing, and large volume of cards.

Card includes two side front side and back side the figure below illustrates the front side of the card:

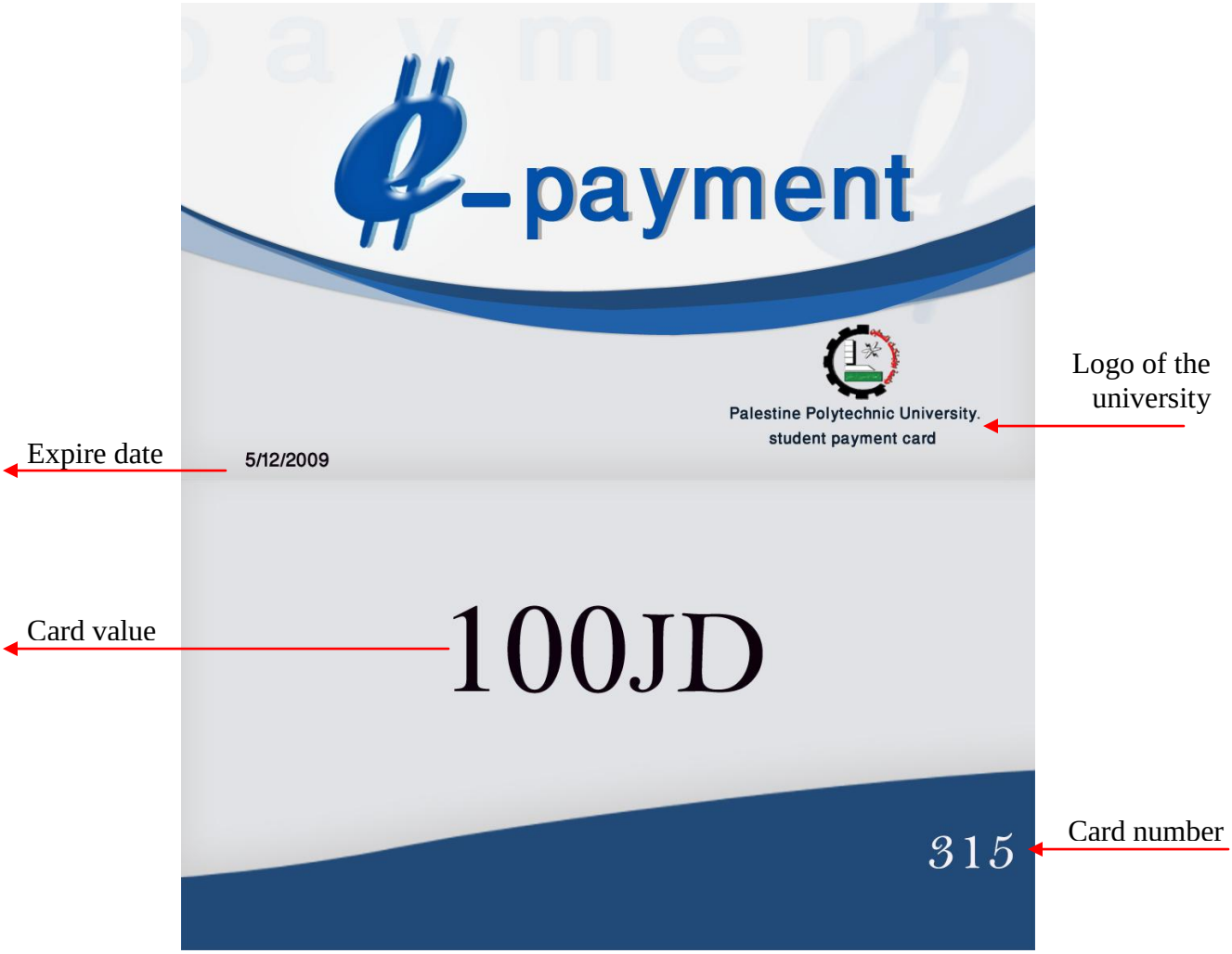


Figure 6. 20 : Front side of the card

Expire date: this item identifies the expiration date of the card when card generator manager generate the card he identify expire date for the card for example one year from the date of card generation or he can identify the expiration more than one year when the card expired its become invalid card and the system doesn't accept this card .

Card value : this item identify the actual value of the card we use different card values 10 JD,20JD,50 JD,100JD,200JD this value represent balance added to student account when he enter the card successfully to the system.

Card number: this number represent serial number of the card, each card has unique number ,so it's impossible to find two cards with the same number.

The following diagram shows the back side of the card:

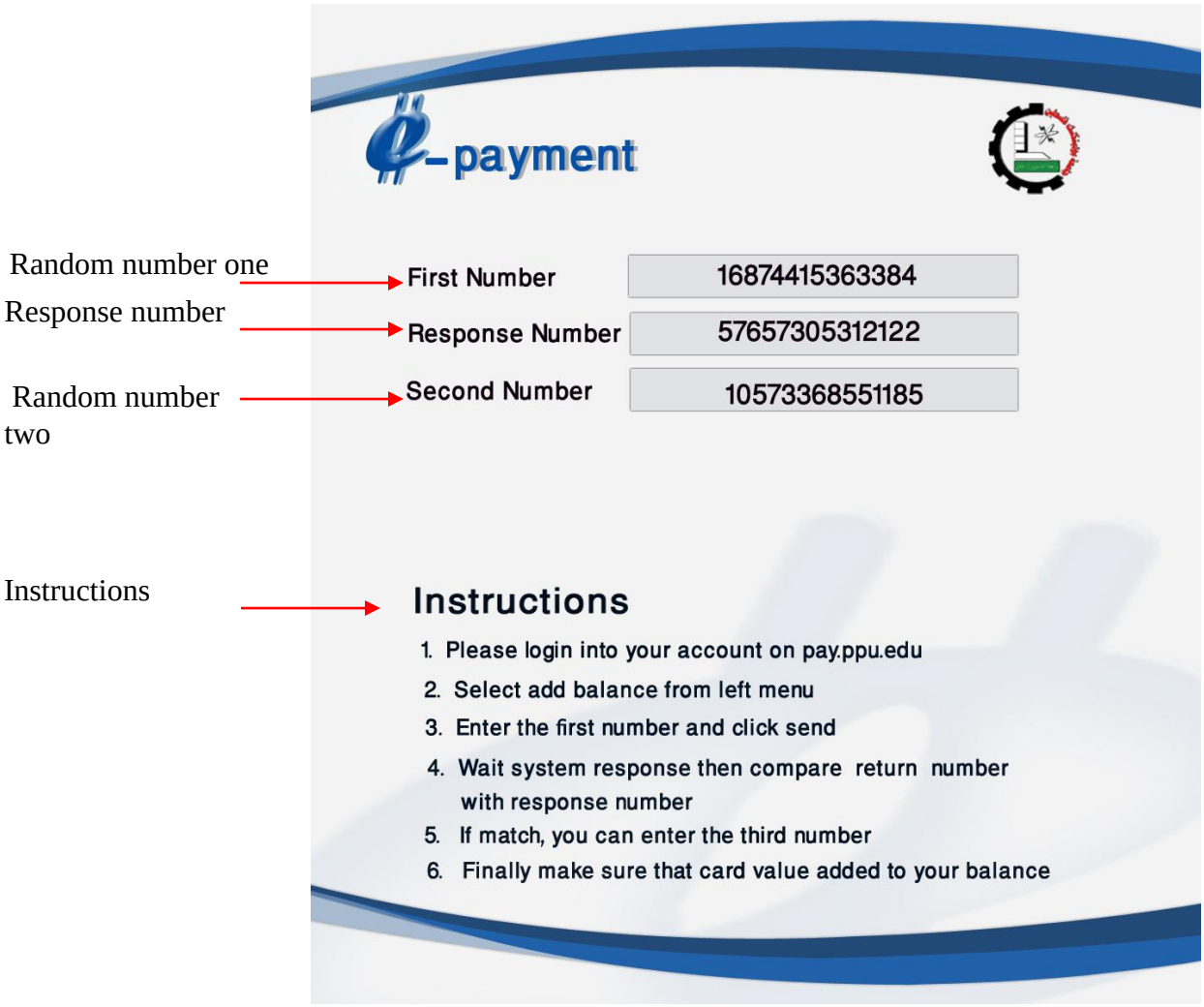


Figure 6. 21 : Back side of the card

6.4.1 Random number generation:

The card contains three random numbers random number one, response random number and random number two ,we use random numbers because no one can guess the second number what it will be , the idea of use three random numbers was after long search and study in this

field done by the engineer Hani Salah ,the idea say that there must be three random number of each card the user send the first number to the server , then the server check the number and response with another random number called response number this number is send to the client computer which send the first number , if the user on the client computer receive the response number he make sure that he talk to the right server , then he send the second number again to the server ,this process using three random numbers will achieve high level of security .

So the team takes the idea understand it well, then the team generates these three numbers using Visual studio.net 2005 random function, and stored the generated numbers in the database, but for security purpose we can't describe the way of generation here, the team achieve three security mechanism here one security mechanism in the idea of use three random numbers, second mechanism in generating the card the team don't use Asp.net random function as it is, we made additional calculation on the digits of each random number during the generation process , and third mechanism in store numbers in the database because we store each number at separate table and this point illustrate in database design .

Random number one:
This represents the first number printed on the card the number compose of fourteen digit generated randomly.

Response Random number:
This number returns by the server to the students the student only must compare the number appears on the screen with second random number on the card, this number also compose of fourteen digits.

Random number two: This represents the third number printed on the card the number compose of fourteen digits generated randomly the user send it to the sever after he receive the response number.

The following Figure illustrate the process of sending and receiving of three random numbers .

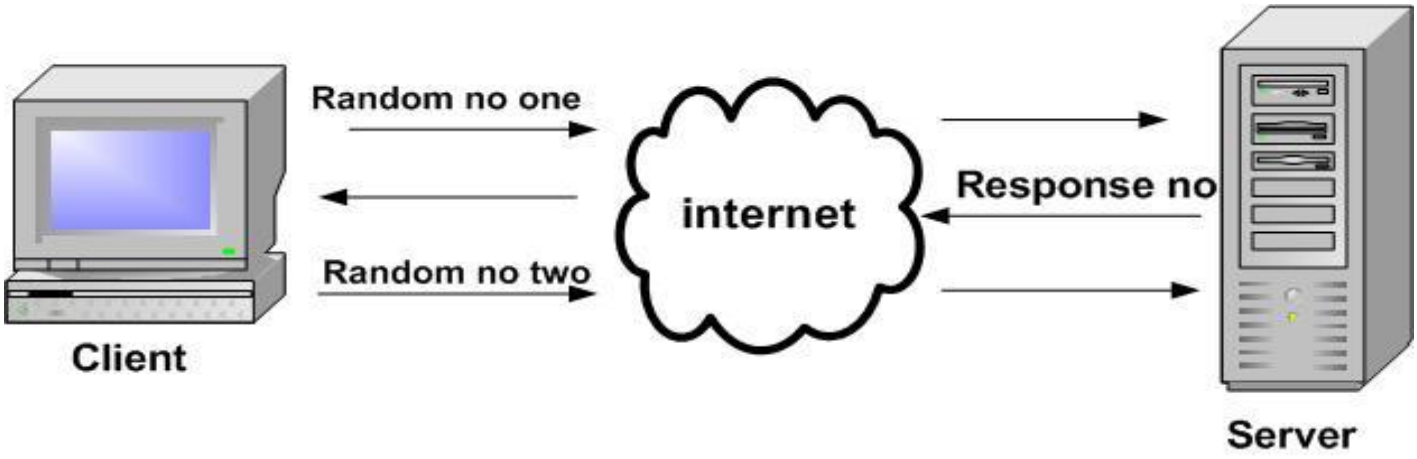


Figure 6. 22 : process of sending and receiving of three random numbers

Instructions:

This item provide guidelines to the user how to add balance to his account using this card ,its away of help since the card idea to pay tuition is a new idea, student need clear steps to follow form the beginning to the end .

6.5 Database Design:

6.5.1 Entity relationship diagram:

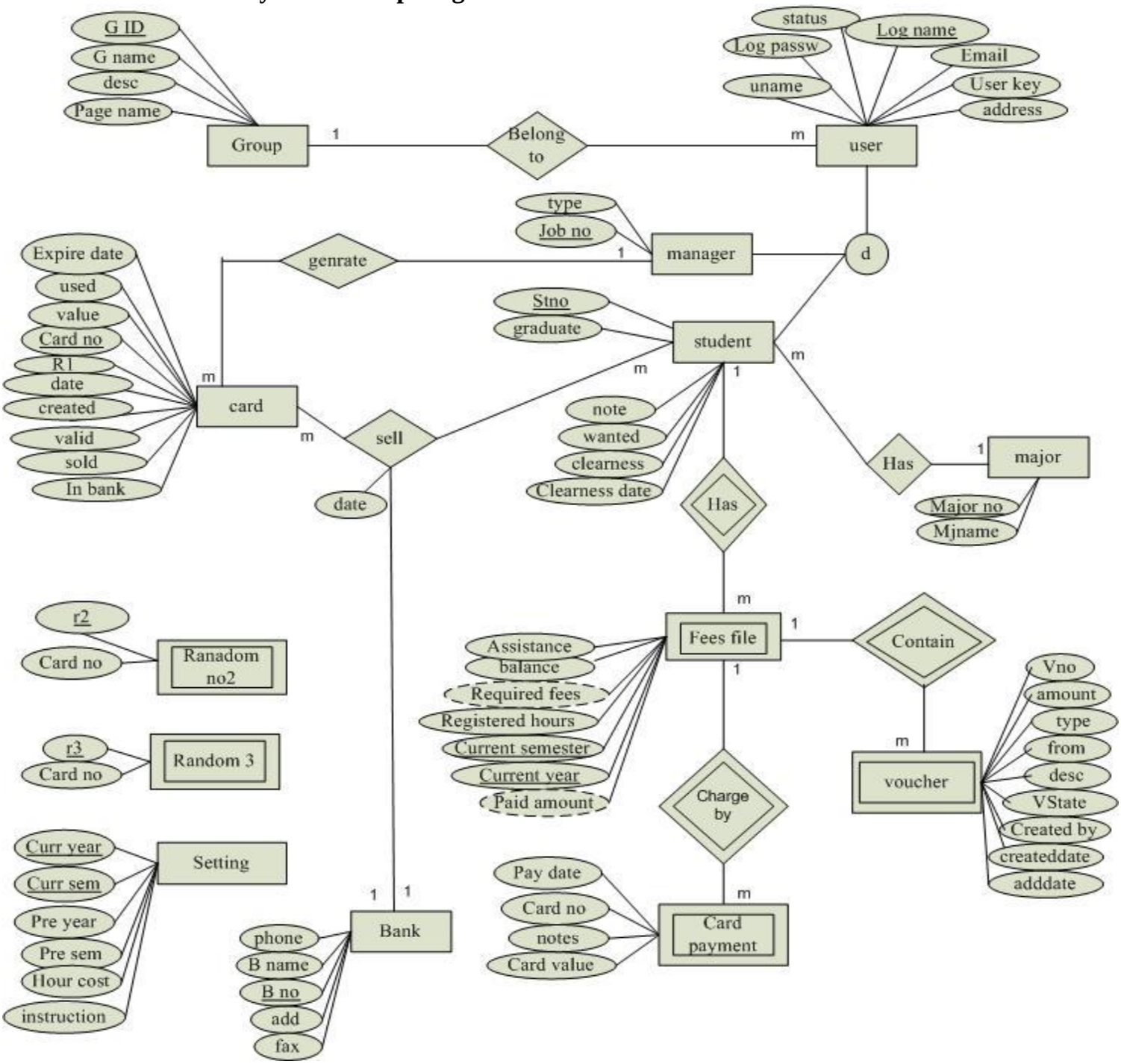


Figure 6. 23: Entity relationship diagram

6.5.2 Database Mapping:

User (log name, user key, status, log passw, address,name ,email,Gid).

Manger (job no, type).

Student (stno, major no, graduate, note, wanted, clearness, clearness date).

Major(majorno,majorname).

Group (Gid, Gname, desc, pagename).

Card (card no, r1, value, date, created, valid, sold, in bank, job no, bankno, Expire date, used).

Bank (Bno, Bname, add, phone, fax).

Setting (Currsem, Curryear, presem, preyear, instruction, hourcost).

Voucher (vno, currsemester, curryear,Stno amount, type, from, desc, created by, Vstate, createdate, adddate).

Fees file (stno, currentsemester, current year, balance, reqiuered fees, paid amount, assistance, registered hours)

Card payment (card no, stno, pay date, card value, notes, current year, currentsemester).

Sell (card no, stno, bank no, date).

Random no 2 (r2, card no).

Random 3 (r3, card no).

6.5.3 Database tables design:

In this section we will describe tables and field that contain table.

User table:

Field Name	Data Type	Null	keys	References	Length	Description
Log name	Nvarchar	No	PK		30	Each user has log name
Log pass	Nvarchar	No			50	Each user has password
Status	Nvarchar	No			50	Show the status of user enable disable
User key	Int	No	FK	Student table, Manager table	4	It may be job no or student no
name	Nvarchar	No			50	Each user has a name
address	Nvarchar	No			50	Each user has address
Email	Nvarchar	yes			200	Each user has an email
Gid	Int	No	FK	Group table	4	Each user in group has an id

Table 6. 9 : User table

Group table:

Field Name	Data Type	Null	keys	References	Length	Description
Gid	Int	No	PK		4	Each group has id
Gname	Nvarchar	No			50	Each group has name
Desc	Nvarchar	Yes			200	Describe the group
Pagename	nvarchar	No			200	Each group has main page

Table 6. 10 : Group table

Manager table:

Field Name	Data Type	Null	keys	References	Length	Description
Job no	Int	No	PK		4	Each manager has job no
Type	Nvarchar	No			200	manager may be balance manger or , voucher manger or , Card manager.

Table 6. 11 : Manager table

Student table:

Field Name	Data Type	Null	keys	References	Length	Description
Stno	Int	No	PK		4	Each student has no

majorno	Nvarchar	No	FK	Major table	50	Each student has major number
graduate	bit	No			1	Whether student graduate or not
Wanted	Bit	No			1	Determine whether student financial wanted or not
Note	Nvarchar	Yes			200	Note about student
Clearness	Bit	No			1	Financial clearness
Clearness date	Date time	Yes			8	Date of financial clearness

Table 6. 12 : Student table

Major table:

Field Name	Data Type	Null	keys	References	Length	Description
Majorno	Int	No	PK		4	Each Major has no
Majorname	Nvarchar	No			30	Each Major has name

Table 6. 13 : Major table

Card table:

Field Name	Data Type	Null	keys	References	Length	Description
Cardno	Int	No	PK		4	Each card has no

R1	Int	No			4	Each card has random no
Value	Int	No			4	The value of the card
Date	Datetime	No			8	Date when card created
Created	Bit	No			1	The card status take 1 when card created 0 if card uncreated
Valid	Bit	No			1	The card status take 1 when card valid 0 if card invalid
Sold	Bit	No			1	The card status takes 1 when card soled 0 if card unsold for bank.
In bank	Bit	No			1	The card status take 1 if card in bank 0 if card out of bank
Job No	Int	No	FK	Manager table	4	Each manager has job no
expire date	date time	no			8	The expire date of the card
Used	Bit	No			1	The card status take 1 when card used 0 if card unused
Bank no	Int		FK	Bank table	4	Bank number which purchase the card.

Table 6. 14 : Card table

Banks table:

Field Name	Data Type	Null	keys	References	Length	Description
Bno	Int	No	PK		4	Each bank has no
Bname	Nvarchar	No			30	Each bank has name
BAddress	Nvarchar	No			128	Each bank has address
BPhone	Int	No			4	Each bank has phone
BFax	Int				4	Each bank has fax

Table 6. 15 : Bank table

Setting table:

Field Name	Data Type	Null	keys	References	Length	Description
Curr year	Int	No	PK		4	Current year
Curr sem	Int	No	PK		4	Current semester
Pre year	Int	No			4	Previous year
Pre sem	Int	No			4	Previous semester
Hour cost	float	No			4	Price of course hour
Card instruction	Nvarchar	No			250	Instruction of the card

Table 6. 16 : Setting table

Random two table:

Field Name	Data Type	Null	keys	References	Length	Description
R2	Int	No	PK		4	Random number two
Card no	Int	No			4	Each card has no

Table 6. 17 : Random number two table

Random three table:

Field Name	Data Type	Null	keys	References	Length	Description
R3	Int	No	PK		4	Random number 3
Card no	Int	No			4	Each card has no

Table 6. 18 : Random number three table

Sell table:

Field Name	Data Type	Null	keys	References	Length	Description
Card no	Int	No	PK,FK	Card table	4	Each card has no
Stno	Int	No	PK,FK	Student table	4	Each student has no
Bno	Int	No	PK,FK	Bank table	4	Each bank has no
Date	Date time	No			8	Date of sell

Table 6. 19 : Sell table

Fees file table:

Field Name	Data Type	Null	keys	References	Length	Description
Stno	Int	No	Pk ,FK	Student table	4	Each student has no
Current year	date time	No	PK		8	Current year
Current semester	Int	No	PK		4	Current semester
Paid amount	Int	No			4	This field represent total amount paid using cards
Registered hours	Int	No			4	The hours registered by the student
Assistance	Int	No			4	This field represent total voucher value that the student get
Balance	float	No			4	Student total balance
Required fees	float	No			4	Reqiuered fees paid by student to register.

Table 6. 20 : Fees file table

Card payment table:

Field Name	Data Type	Null	keys	References	Length	Description
Pay date	Date time	No			8	Date of payment
Card value	Int	No			8	The card value that represent amount of money

Notes	Nvarchar	No			200	Notes
Stno	Int	No	PK,FK	Student table	4	Each student has no
Card no	Int	No	PK		4	Each card has no
current year	Int	No	FK,PK	Fees file table	4	Current Year
Current semester	Int	No	FK,PK	Fees file table	4	Current Semester

Table 6. 21 : Card payment table

Voucher table:

Field Name	Data Type	Null	keys	References	Length	Description
Vno	Int	No	PK		4	Each voucher has no
Desc	Nvarchar	Yes			200	Each voucher has description
Current semester	Int	No	FK,PK	Fess file table	50	Semester of get voucher
current year	Int	No	FK,PK	Fees file table	4	Year of get voucher
Amount	Float	No			4	Amount of voucher
Type	Nvarchar	No			50	The type of voucher (loan,…)
From	Nvarchar	No			50	Assistance
Created by	Int	No			4	Person who create voucher

Stno	Int	No	FK,PK	Student table	4	Each student has no
Vstate	Int	No			4	Determine status of voucher generated, rejected, selected
createddate	datetime	No			8	Date of create the voucher by voucher manager
adddate	datetime	Yes			8	Date of add voucher by student

Table 6. 22:Voucher table

System implementation

.

- Setting up the Required H/W and S/W.
- Establishment of development environment.
- Operating the System.

7.1 Introduction:

In this chapter the team will describe in detail the process of implementing the system and the environment that used in those processes.
Convoying the development and evaluation of the modern technology, it becomes important to develop the appropriate environment in order to implement and operate such e-payment project and its components. This environment consists of hardware and software components that are required for the operation process.

This chapter also describes these software and hardware used in the system for the operation phase, and how they are installed and prepared for work the database and web interfacing, and the user interface implementation.

7.2 UML deployment diagram:

The following diagram represents the division of the system into tiers, there are three tiers client tier, server tier, and database tier, the system here is called complex system.

Client tier contain four modules student module, voucher manager module, card generator manager module, balance manager module and the middleware tiers contain e-payment handler and database interface, the third tier represent the servers the system has two server card servers and balance servers .

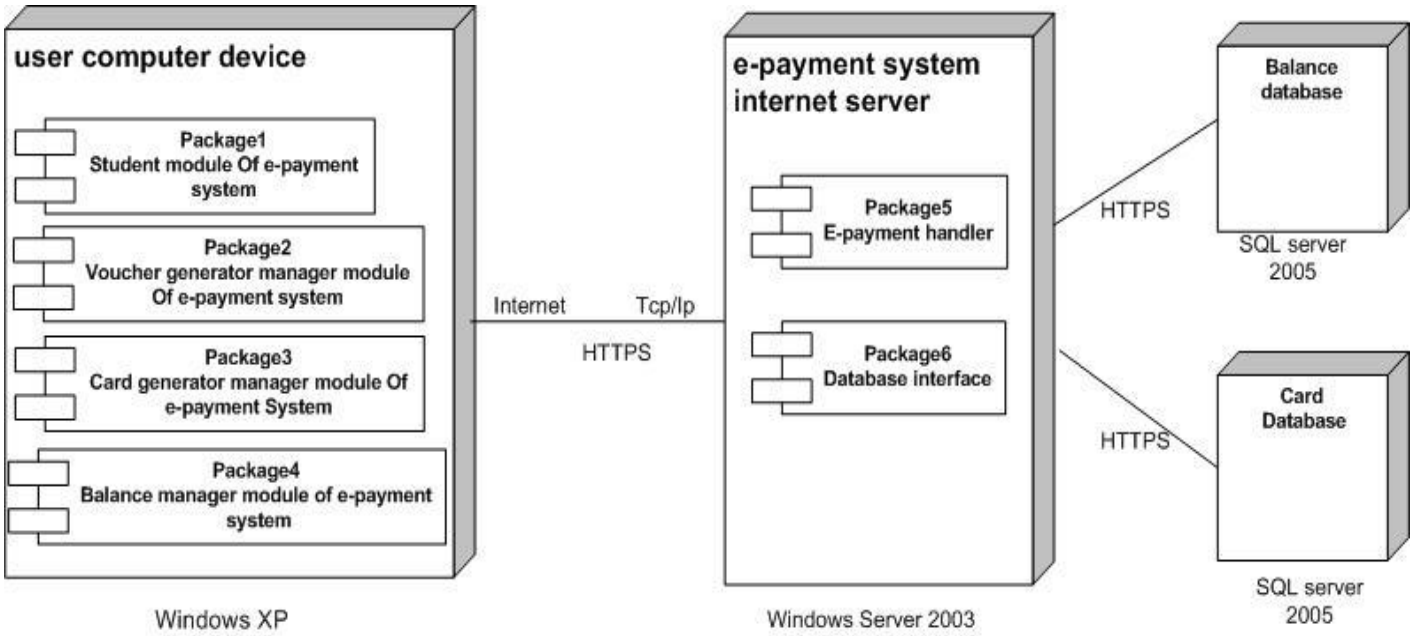


Figure 7. 1: Deployment diagram.

7.3 Establishment of development environment:

- **Hardware Environment:**

  For the system implementation the team is using the following hardware:

  - Desktop computers Pentium4

    3GHz, 256KB cash memory, RAM 512 MB, Hard disk drive 40GB

    Monitor17, Keyboard and mouse.
  - HP Color LaserJet 2605dn printer,(for print card)
  - white gloss paper- 150GSM [50 SHEETS] ,each card reqiuered one paper

- **Software Environment:**

  - Microsoft windows XP Professional.
  - Microsoft Office 2003 Professional Edition.
  - Microsoft Visio 2003
  - PhotoShop CS 8.
  - ASP.Net 2005.

- Internet explorer.
- Flash MX 2004.

7.4 Setting up the Required H/W and S/W:

7.4.1 Setting Hardware and Operating System:

The team chooses to install Microsoft Windows XP professional which is a powerful operating system; it supports many features needed in this project. Hardware requirements PC's and other supporting hardware tools as it is mentioned above.

7.4.2 Setting Software:

1. Photoshop CS 8:

   Adobe Photoshop is a tool for process image, the team used it to design the card for the interface also for designing the logo in the document, interface design.

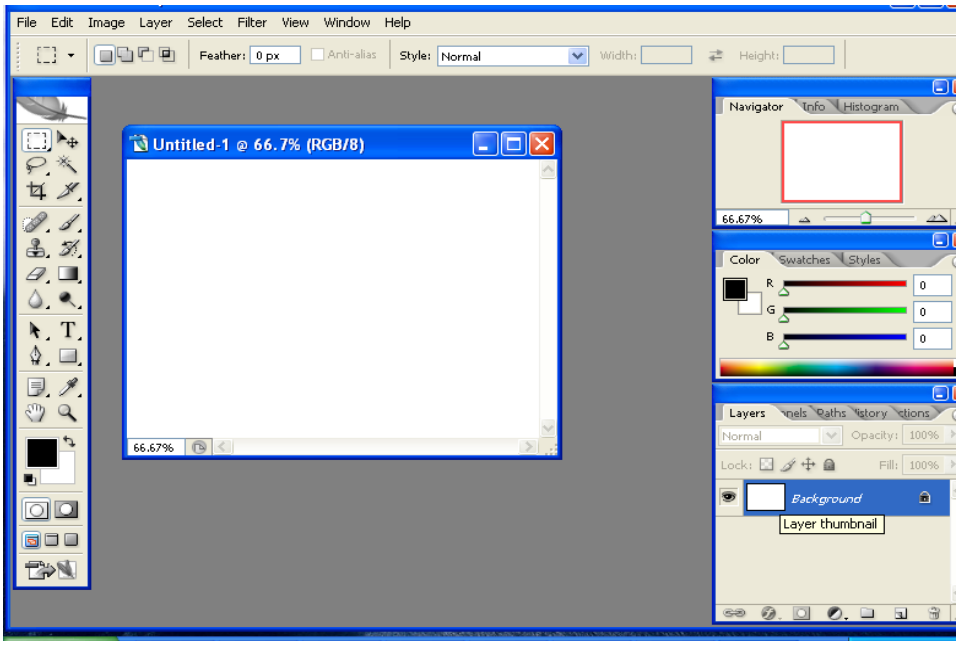


Figure 7. 2: Starting Photoshop Page.

2. Microsoft Office 2003

   Which contain Microsoft office word 2003, which is a word processor; we used it for writing the document of the project, also its contain Microsoft office Visio 2003 which we used to draw UML diagram.

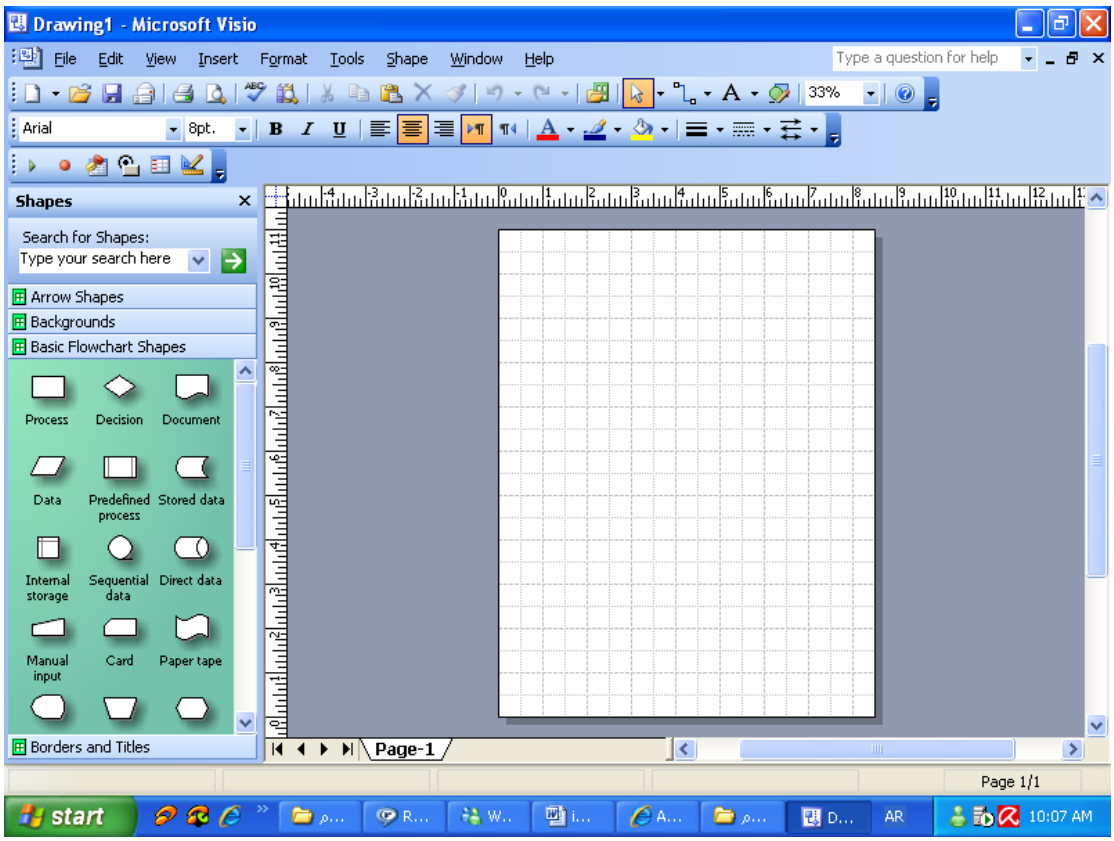


Figure 7. 3: Page for microsoft office visio 2003

3. Microsoft windows XP professional with IIS web server**.**

   We use this operating system because our system is built on Microsoft Visual Studio .NET 2005 programming and this language depends on this type of operating system

   When we want to install IIS (internet information services), we follow these steps:

- Open control panel.
- Select add /remove programs icon.
- Choose add/remove windows component icon.
- Check on IIS option.
- Click on details button.
- Check on options.
- Insert windows XP professional CD.
- Click next.
- After installed click finished.

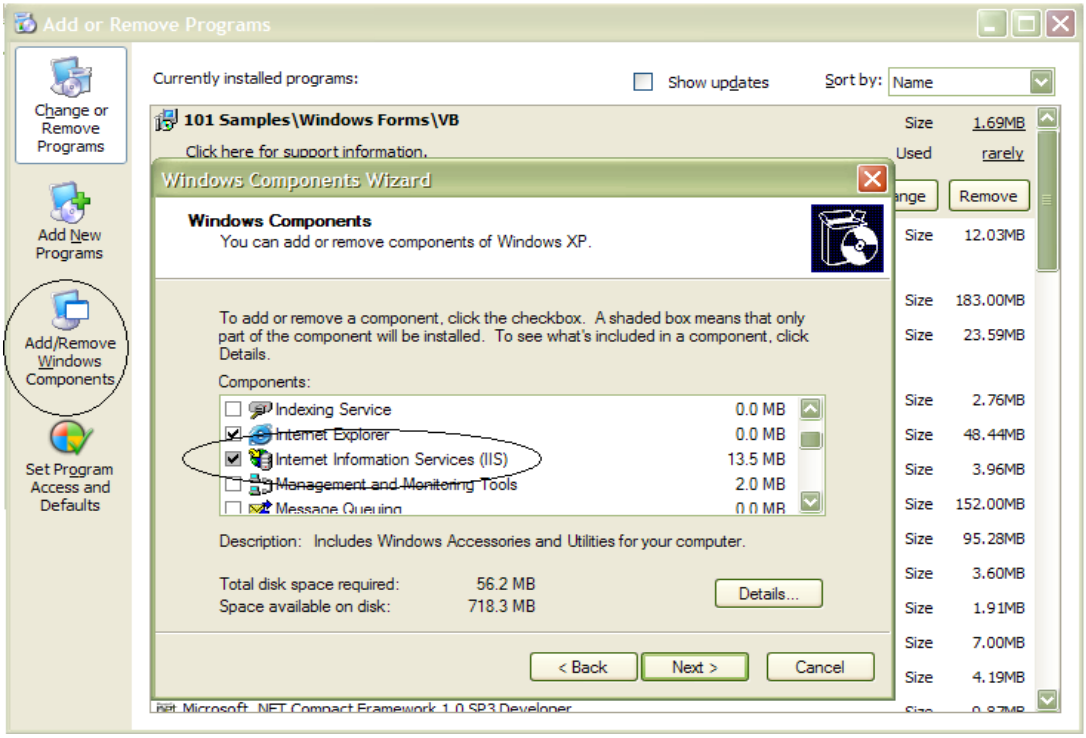


Figure 7. 4: Install Internet information service

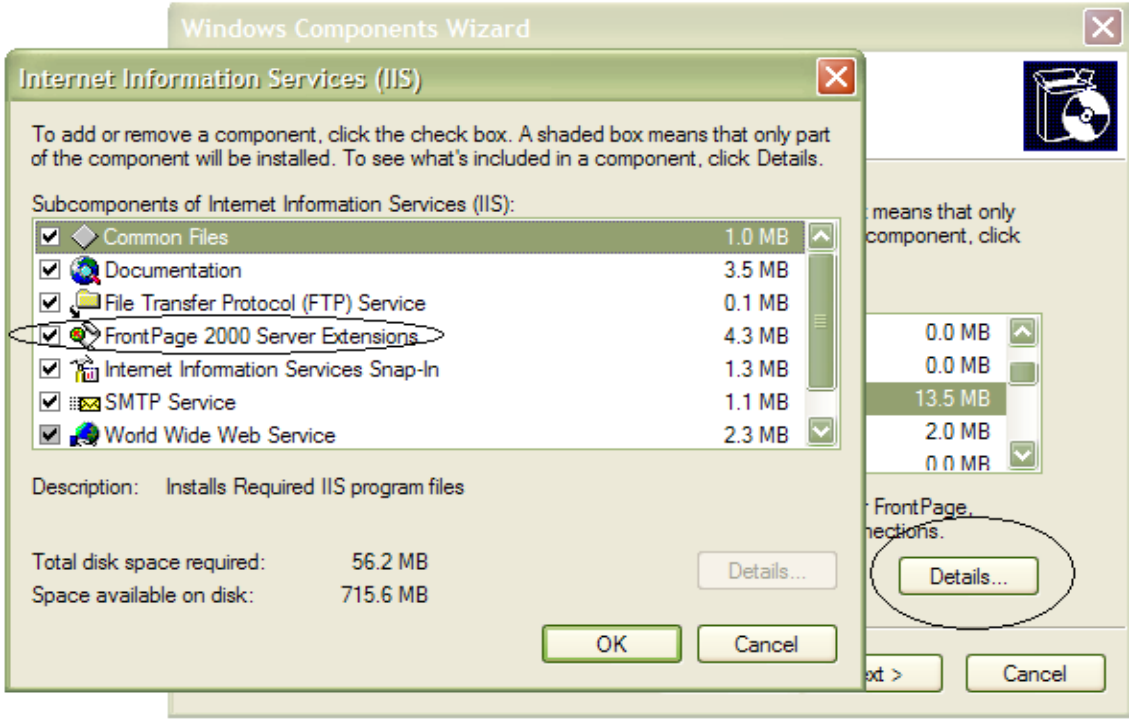


Figure 7. 5: Front page 2000 server extension

4. Microsoft Visual Studio .NET 2005.

   Its version of Microsoft Visual Basic programming language VB.NET that shares the common Language runtime and .NET framework class library with the other .NET Languages, We use this technology to create web applications, making complete error handling, and provide data access tools.

The Reasons of Using Visual Basic.Net 2005:

- Ease of use.
- Integrated development environment.
- Supports multiple languages within the project.
- Supports debugging, tracing and error handling.
- Large collection of built in controls.

- Provide suitable interface.
- Compatibility with windows environment.
- Compatibility with database.

Figure 7. 6: Create web application in visual studio 2005

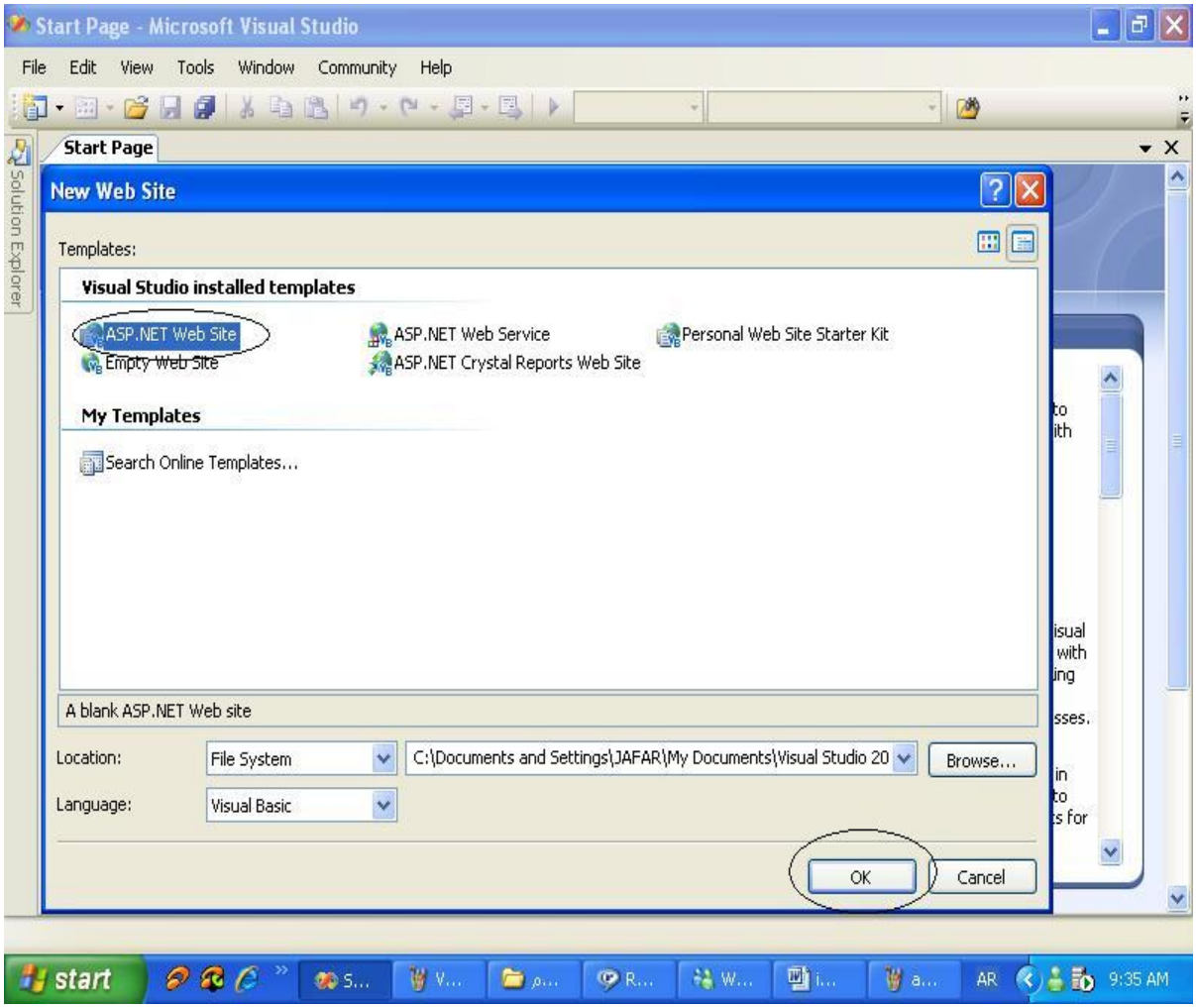


Figure 7. 7:Create new website

Create database:

This operation includes creation of database and tables using SQL server express.

SQL server express : is the freely-downloadable and distributable version of Microsoft's SQL Server relational database management system. It offers a database solution specifically targeted for embedded and smaller-scale applications

Create new database:

- First you must click on App_data from the solution explorer then right click and choose add new item.

- Second you must choose SQL database click okay, and give it a name then click add.

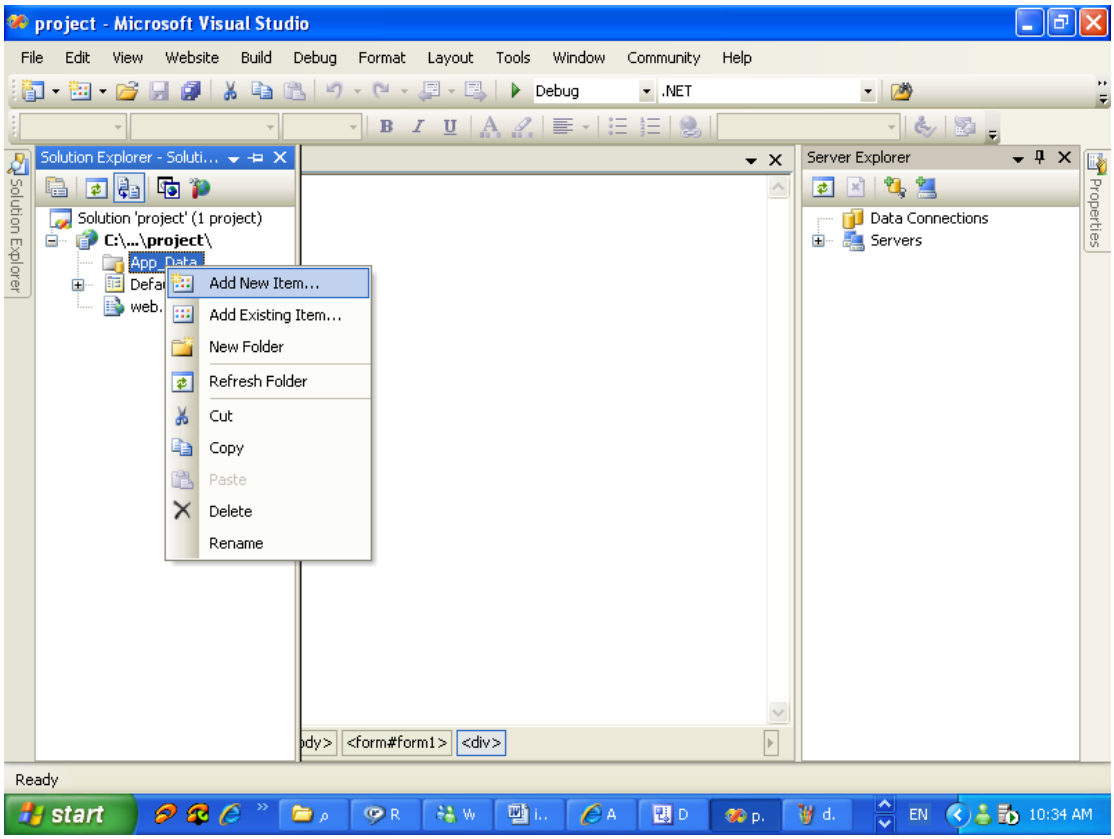


Figure 7. 8: Add SQl database

Create table:

To create table using SQl server express you must do the following:

- First click on table choice from server explorer window.

- Second right click with mouse and choose add new table.

- Third create the table with attribute and data type then click save to save the table.

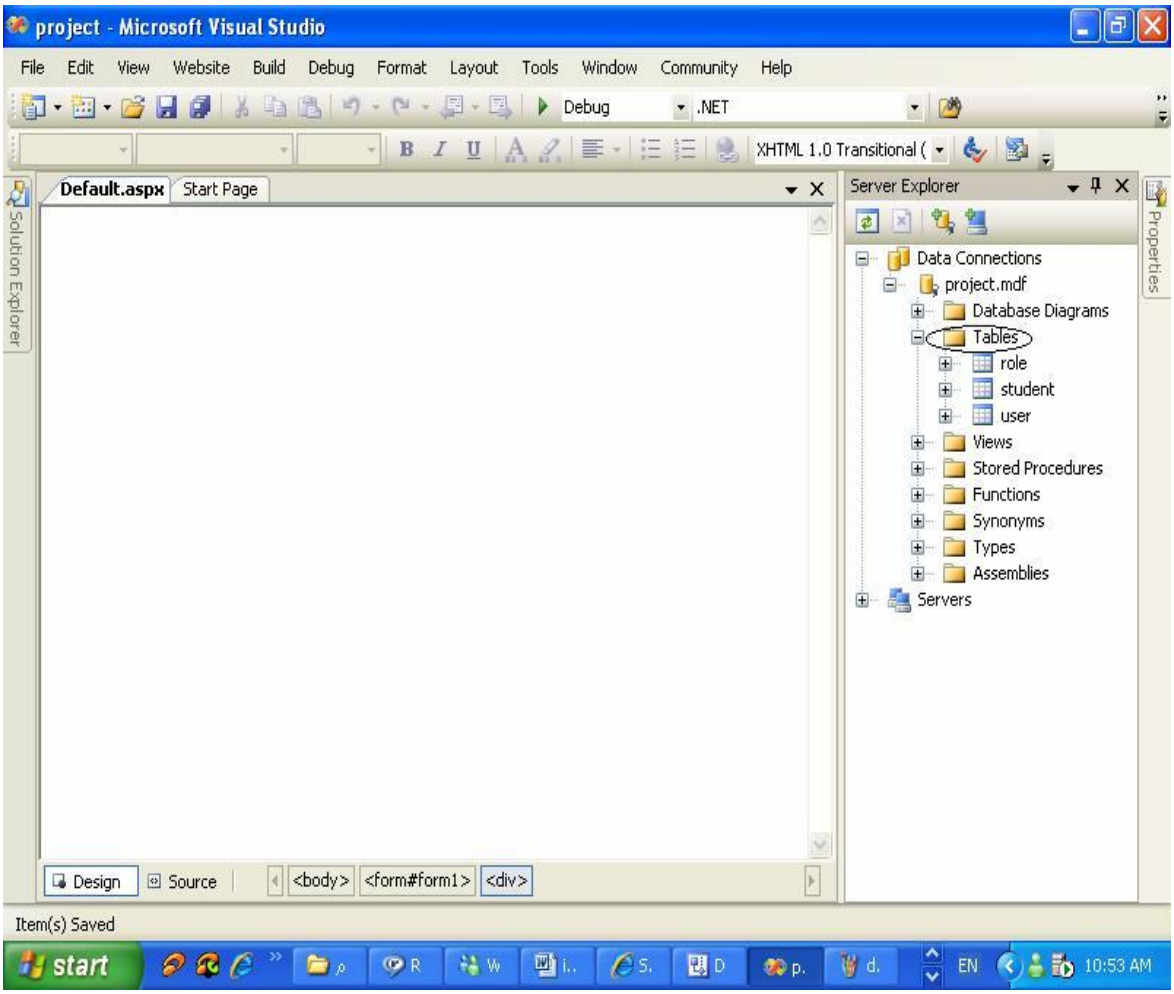


Figure 7. 9: Create table with SQL server express

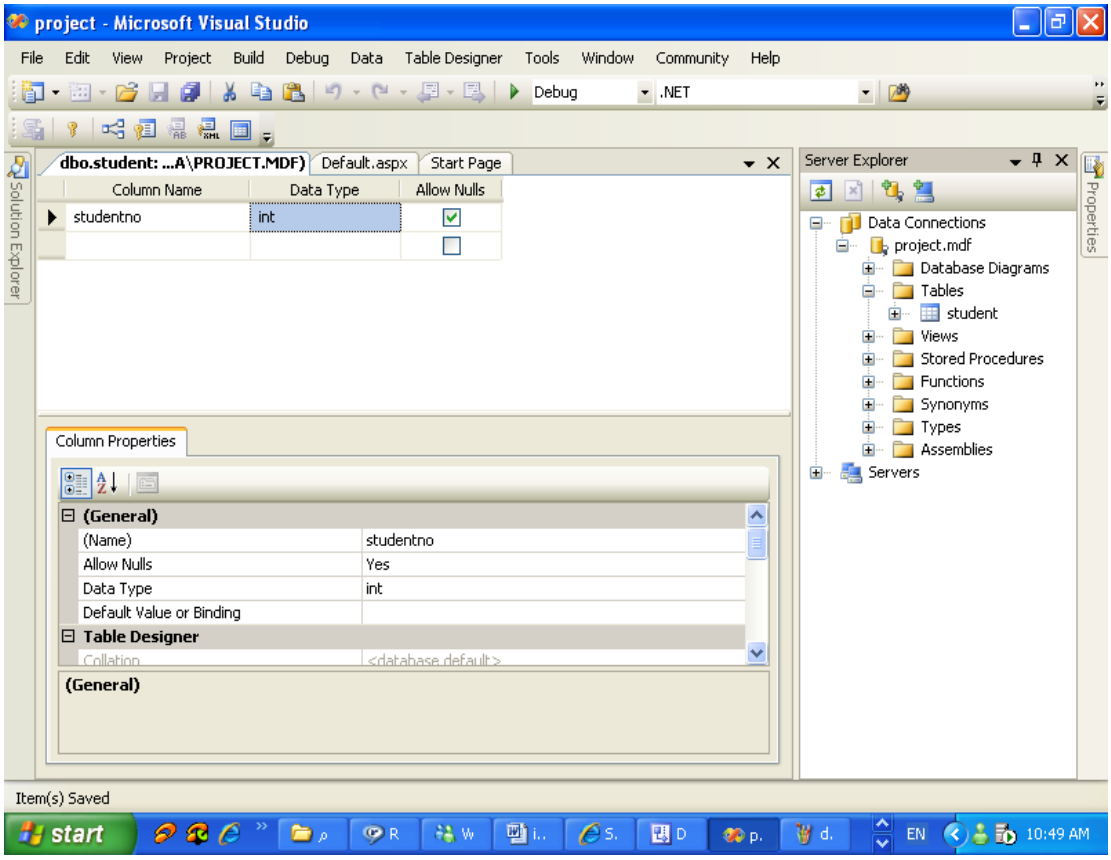


Figure 7. 10: Create the table student with attribute and data type

7.5 Operating the system:

There are many steps should be taken before the system operates:

- Setting up the required programs needed to operate the system .
- Setting up the .NET framework.
- Creating the database connection.

To execute the system from the development environment we follow these steps:

1. Go to start menu and select Microsoft Visual Studio.NET 2005.
2. Then will appear two choices, open link of existing project or new link to create new project. Select open existing project.
3. Then select project that name is "project".

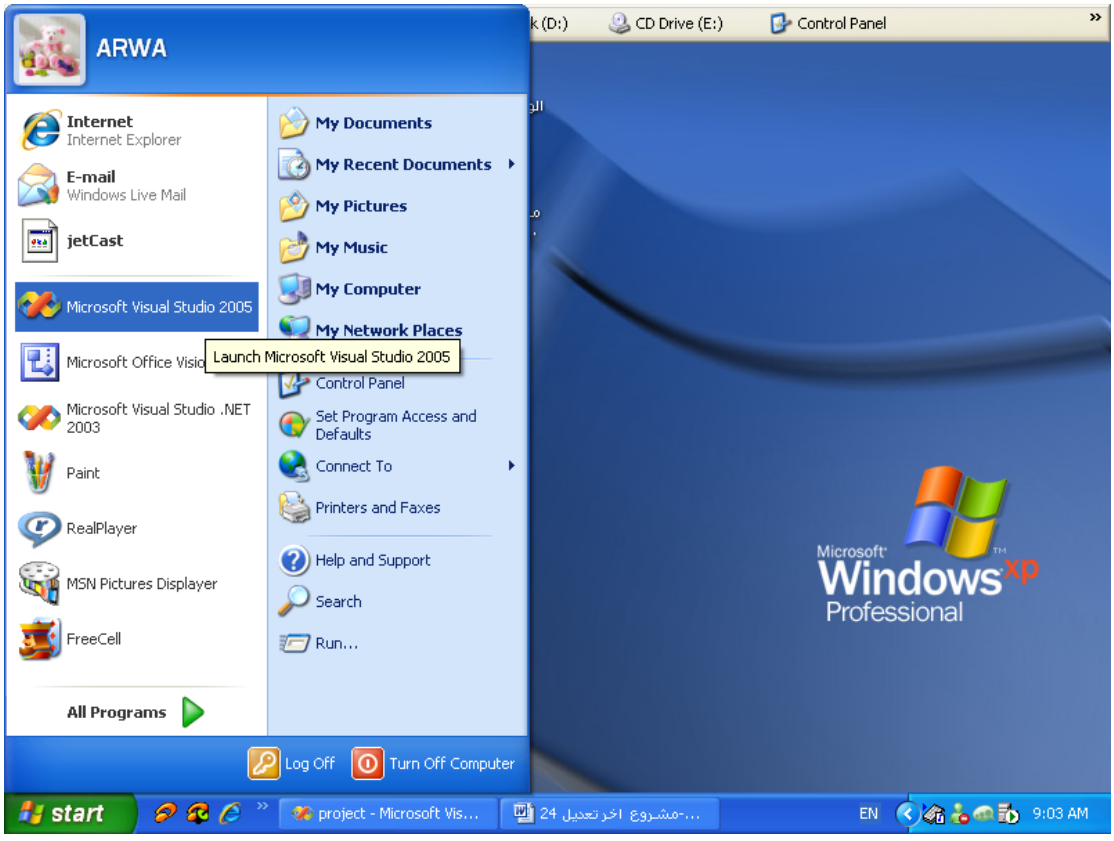


Figure 7. 11: Select Microsoft Visual Studio.NET 2005

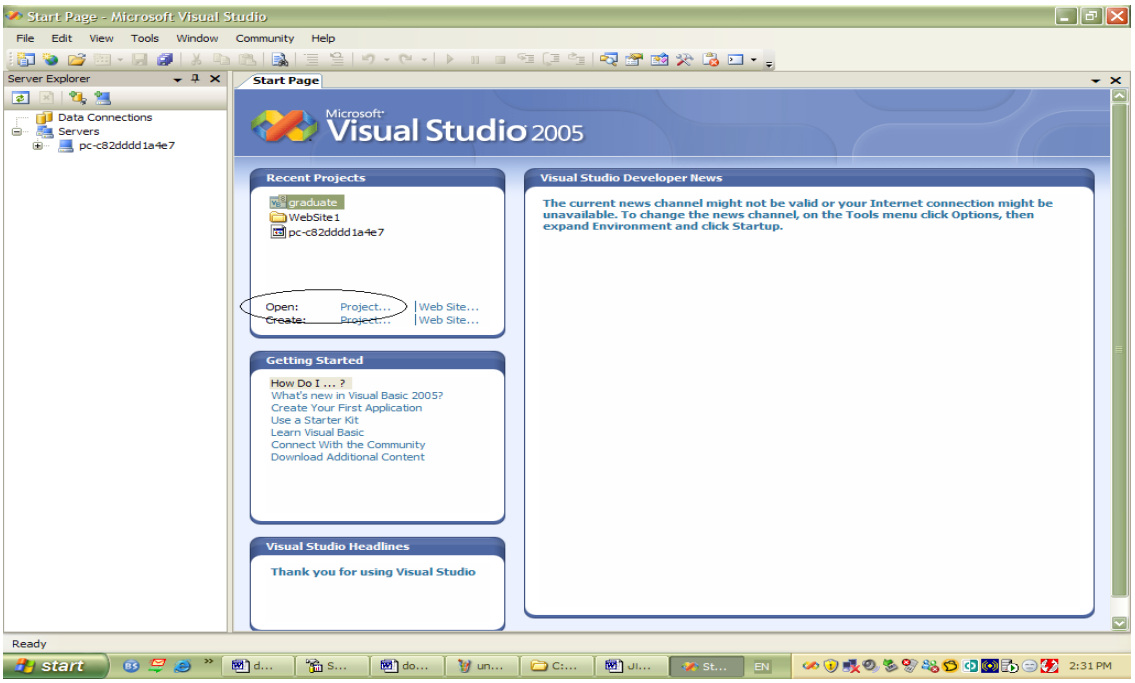


Figure 7. 12: Select open project

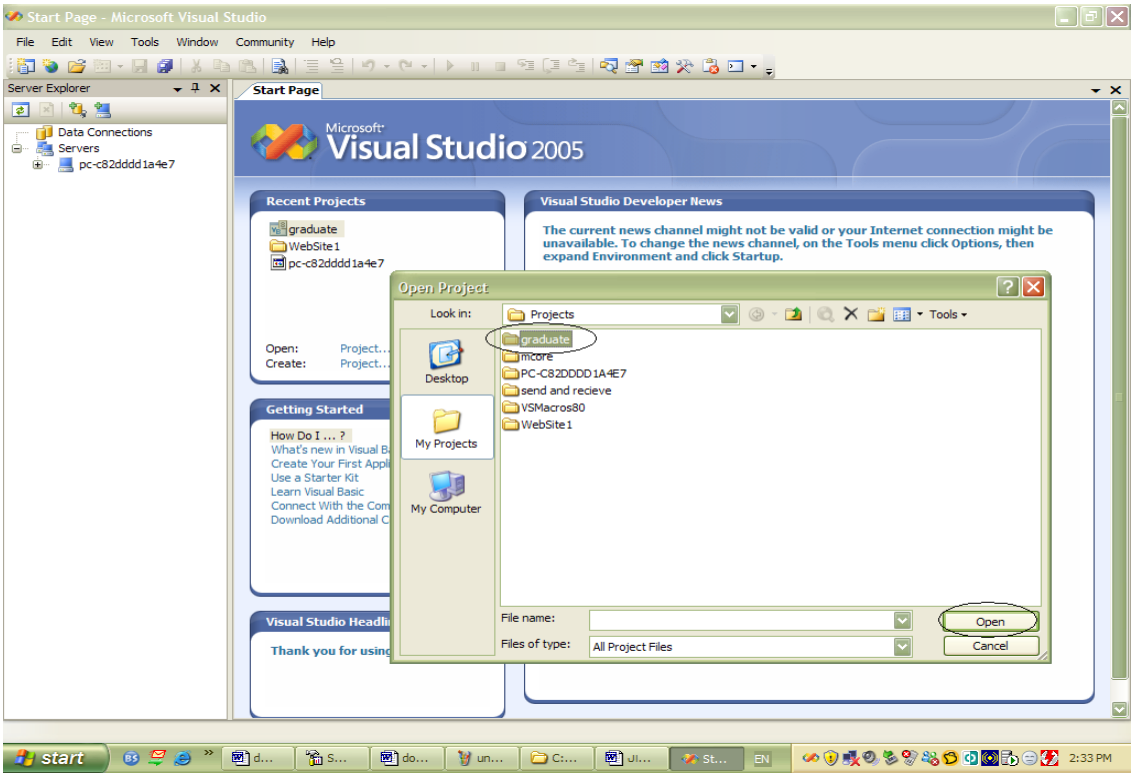


Figure 7. 13: Select project

7.5 E-payment system network diagram:

The diagram below illustrates the basic network diagram for e-payment system.

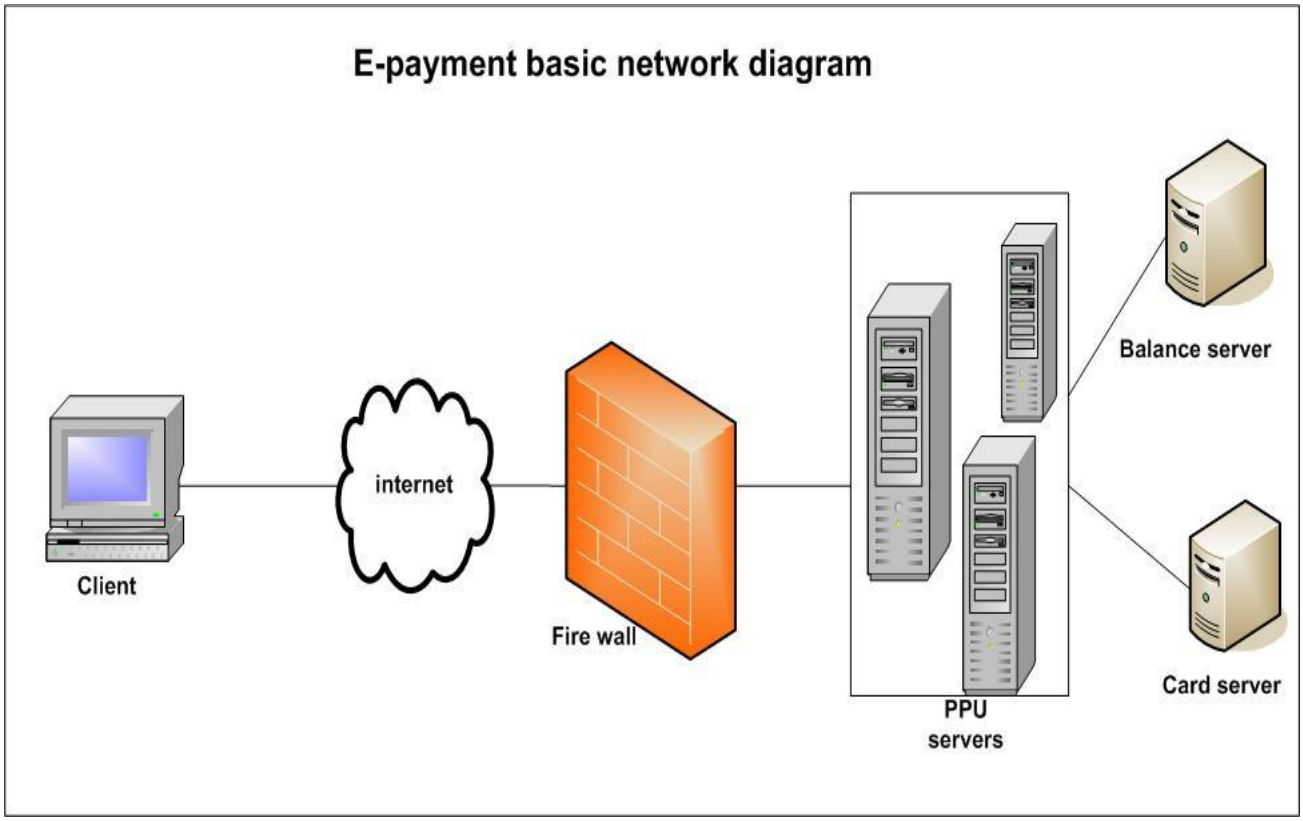


Figure 7. 14: E-payment system basic network diagram.

Chapter Eight 8

System Testing

- Introduction.
- Unit testing.
- Subsystem testing .
- Integration testing .
- Snapshots .

8.1 Introduction:

System testing is the most important step we must do before deliver the system ,to ensure it worked as we exactly expected , and to ensure that it meet all requirements that we specified before.

In e-payment project, system testing is considered to be very important in checking the efficiency and the effectiveness of the system. It should be taken into consideration that any error may affect the whole system and consequently any other related errors may appear.

The testing process includes four levels:

- Unit testing.
- Subsystem testing.
- Integration Testing.
- System testing.

8.2 Unit testing:

Unit testing is one of the testing types that depend on separating or dividing the system into components that each one of them will be tested separately to ensure that each one is meet its requirement, where it was testing process through (Black Box Testing).

The project team starts with testing each unit of the system separately in order to ensure that it meets the specifications and works properly , the team test the different managers and student login and changing there password .

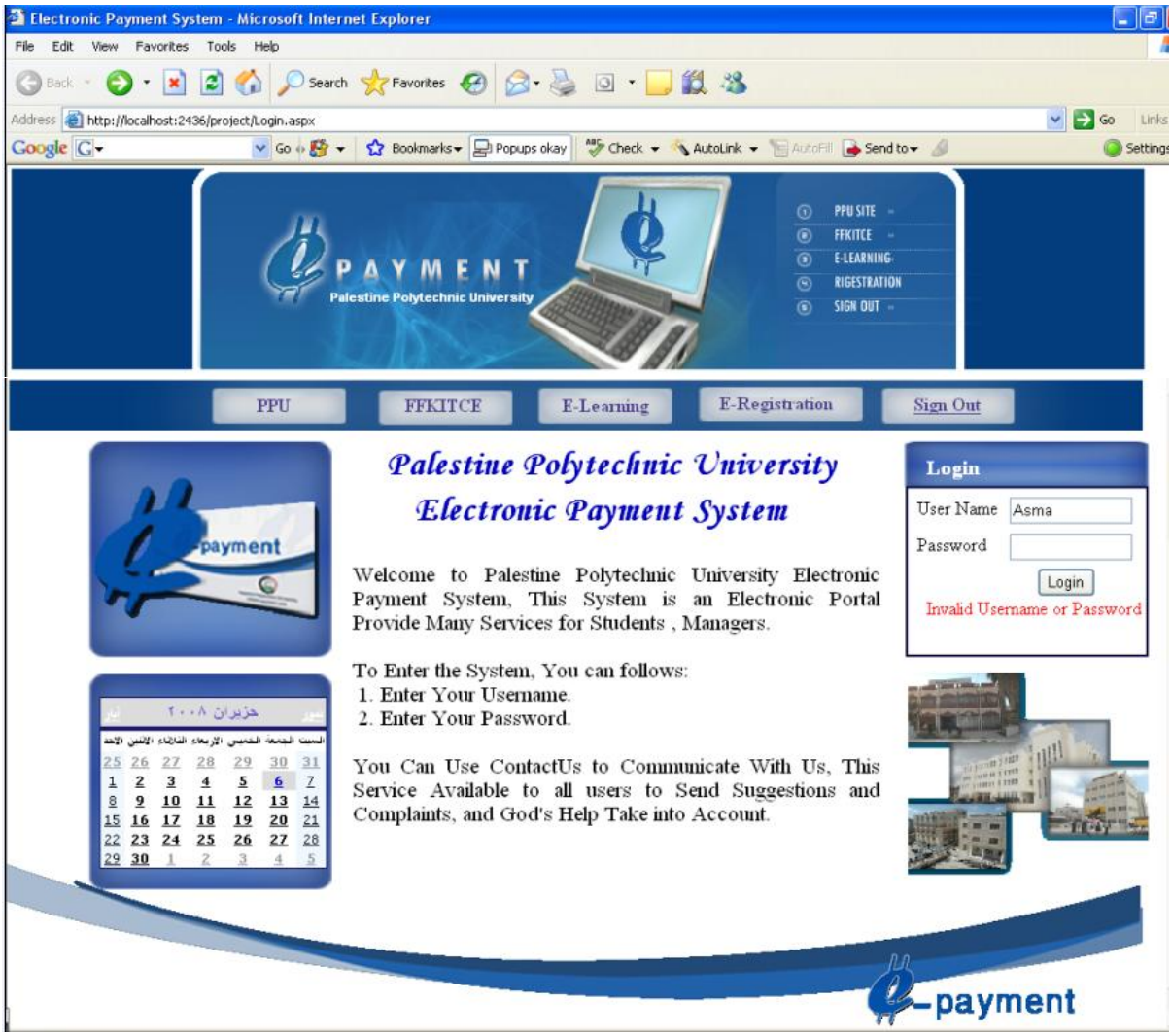


Figure 8. 1: login with valid user name and password

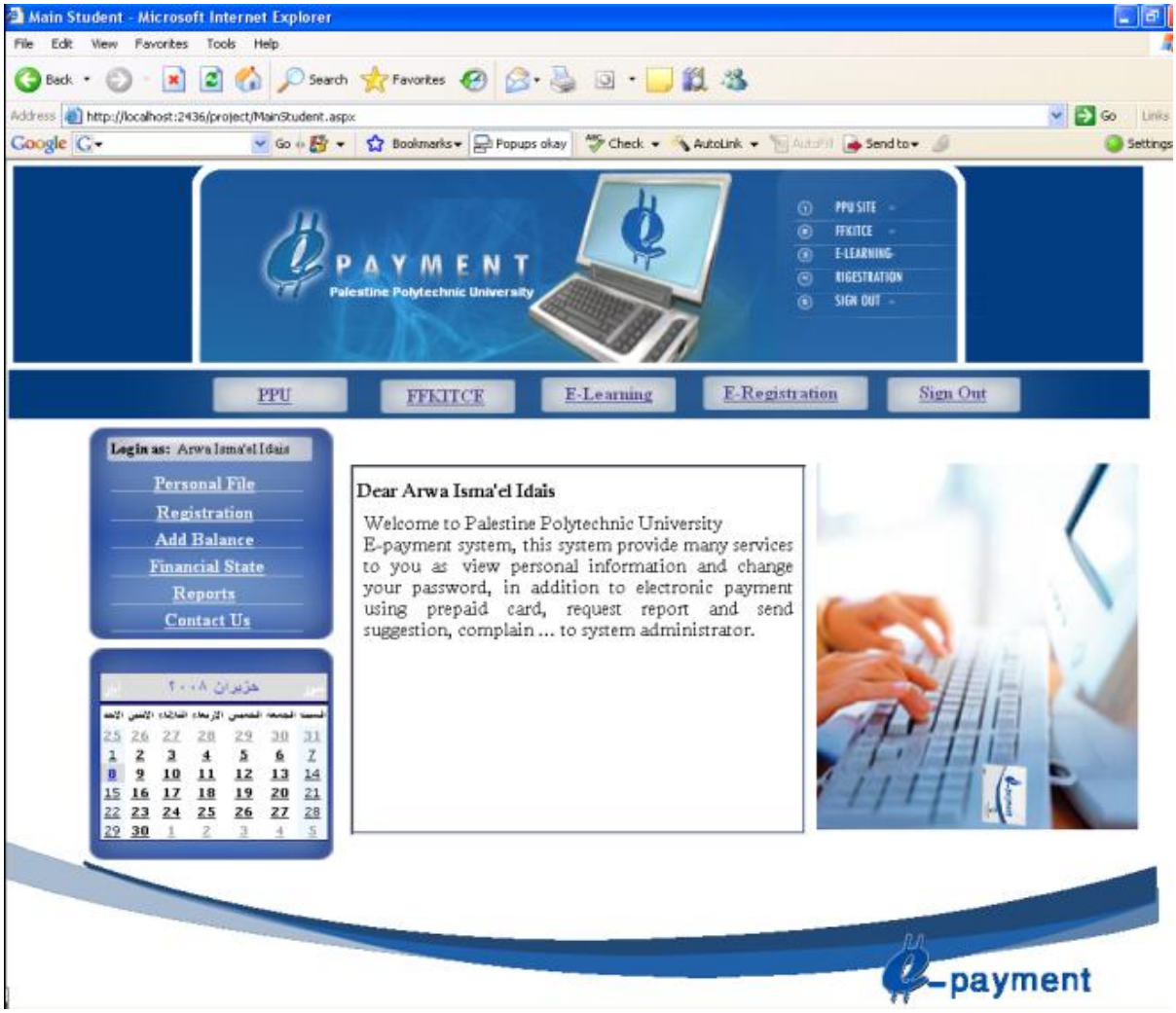


Figure 8. 2:Login with invalid username and password

Example for unit testing:

- Login testing:

  - Case one: Figure 8.1 we test login by enter user name and password in right way .
  - Case two :Figure 8.2 we test login by enter incorrect user name and password

As we will see, first we will use valid inputs and another time we will use invalid inputs, and we will see the result at each time, as the below tables which explains the testing process for managers and student login.

Unit testing process	Input value	Expected Result	Actual result
Valid username and password	Type: balance manager. User name :Asma Password:123456	True data	Balance manager page load
Wrong length for password	Type: balance manager. User name :Asma Password: 1234.	Password must be at least 6 digits.	Password must be at least 6 digits.
Invalid username or password	Type: student. User name :040170 Password: 234567	Error message appear" invalid username or password"	Error message appear" invalid username or password"

Table 8. 1: User login testing unit

- Change password testing :

Unit testing process	Old password	New password	Confirm new password	Expected result	Actual result
Valid old password, new password , and its confirm	123456	234567	234567	Password updated successfully	Password updated successfully

Wrong in password confirmation	2681985	234567	234566	Error message appear" password mismatch"	Error message appear" password mismatch"
new password and confirmation length	123456	1234	1234	Error message appear " password must be at least 6 digit"	Error message appear" password must be at least 6 digit"

Table 8. 2 : Student change password testing unit

- Example of unit testing (Change password):

The following two Figure represent testing for change password , once with invalid conformation and other figure show valid change of password.

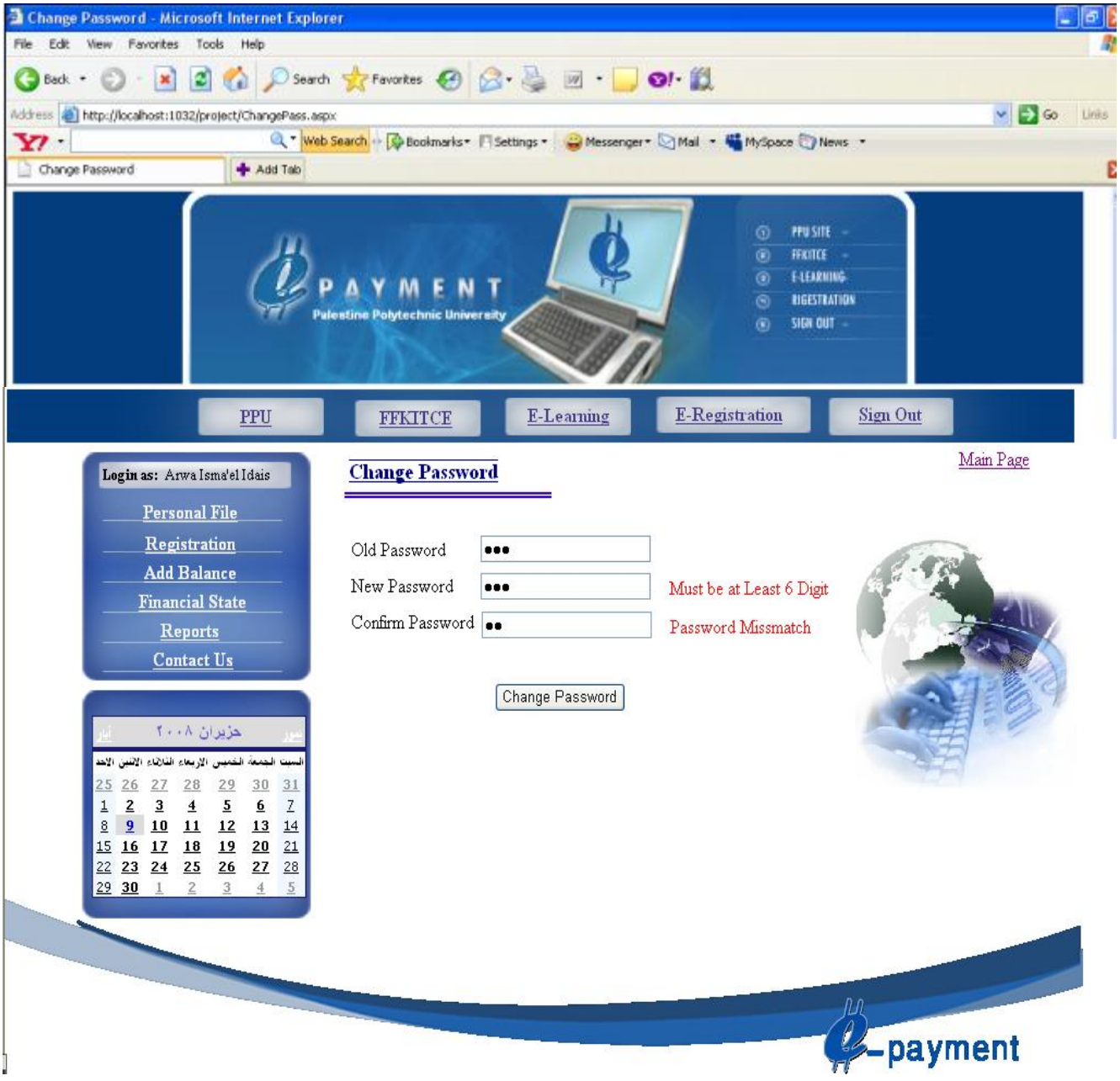


Figure 8. 3: change password with invalid confirmation or length.

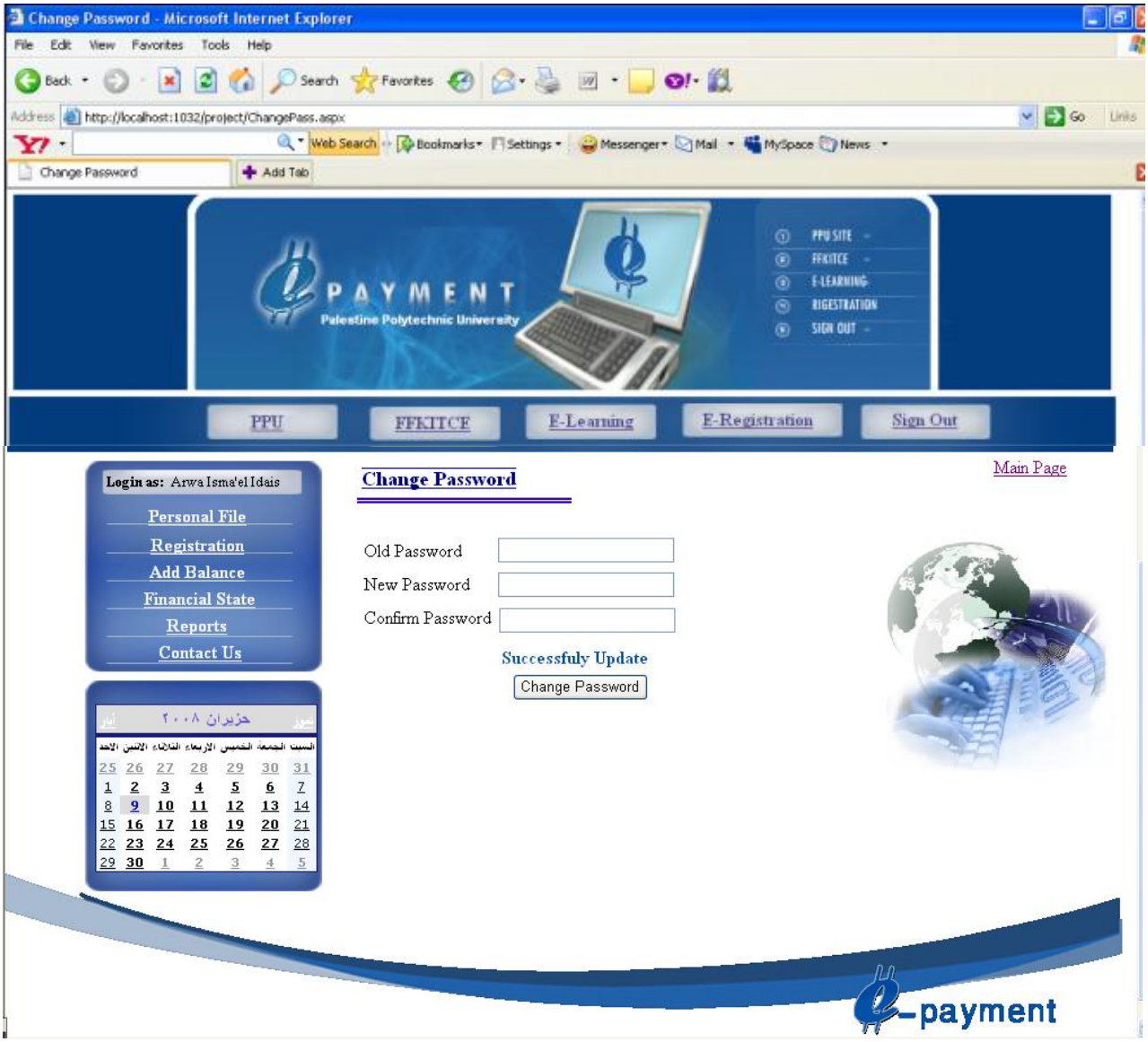


Figure 8. 4:Change password successfully

- After testing each system unit the team notices that each separated unit works properly.

8.3 Sub-system testing:

Is another testing type that depends on testing the related system components, so it can be tested without other system components.

1. student sub system :

   Here we tested the student functions that operate through the student page to ensure they meet their specification, and also we tested the interface how it appears and how the data layout.

2. card generator manager subsystem:

   Here we tested the card generator manager functions that operate through the card generator manager page to ensure they meet their specification.

3. Voucher generator manager subsystem:

   Here we tested the Voucher generator manager functions that operate through the voucher manager page to ensure they meet their specification.

4. balance manager :

   Here we tested the Balance manager functions that operate through the balance manager page to ensure they meet their specification.

- Example for student subsystem testing:

The following screens represent subsystem testing for student page where we test add balance and registration.

If the student login to the page with correct username and password the system forward him to main student page then student select add balance.

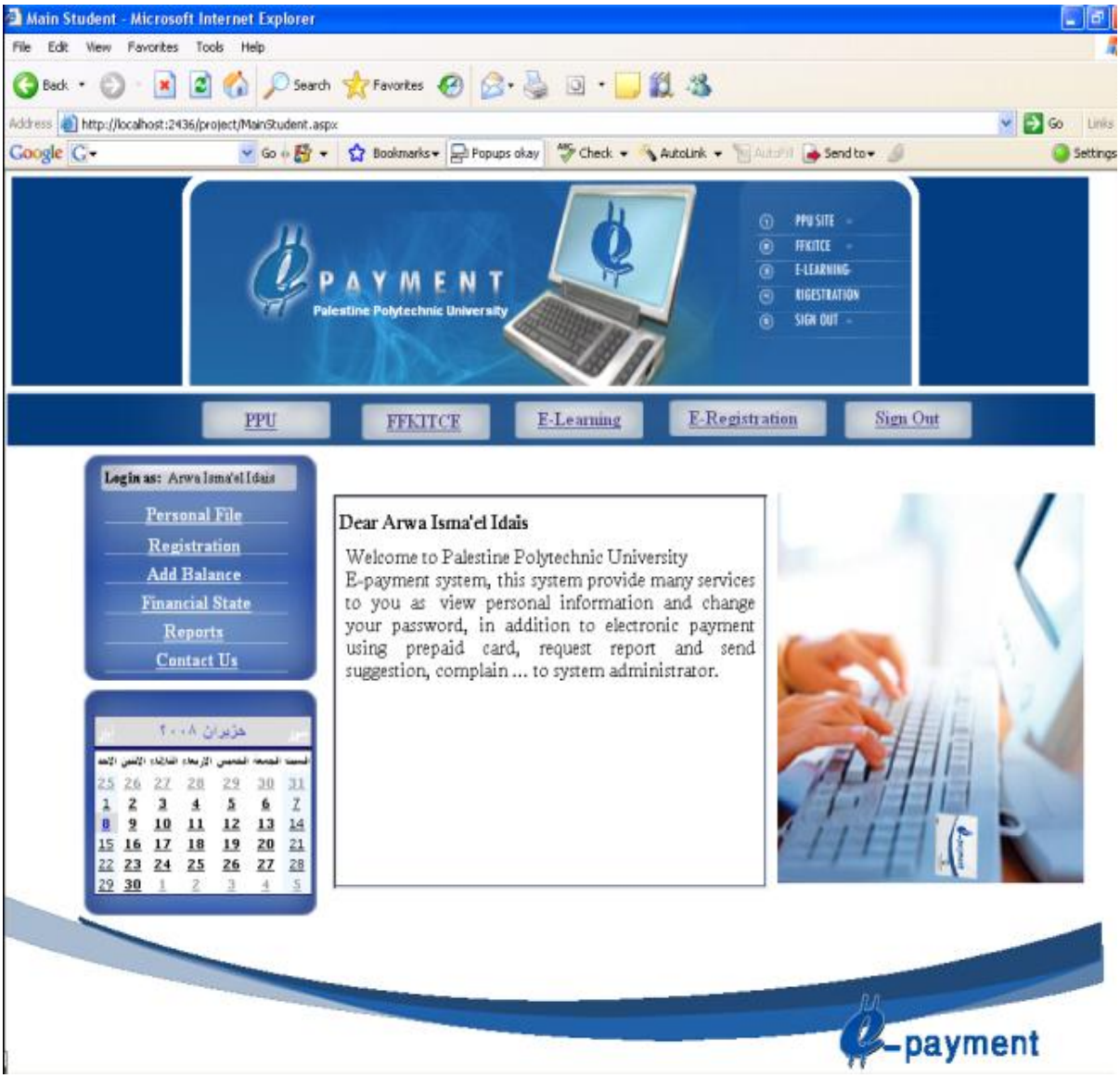


Figure 8. 5:main student screen

The team test add balance screen by enter the card number, and the result was as expected the system send response number to the student then the student enter the second response number and click add balance, the system add balance to the student as it was expected so every thing is okay here , and message appear to the student that card added successfully .

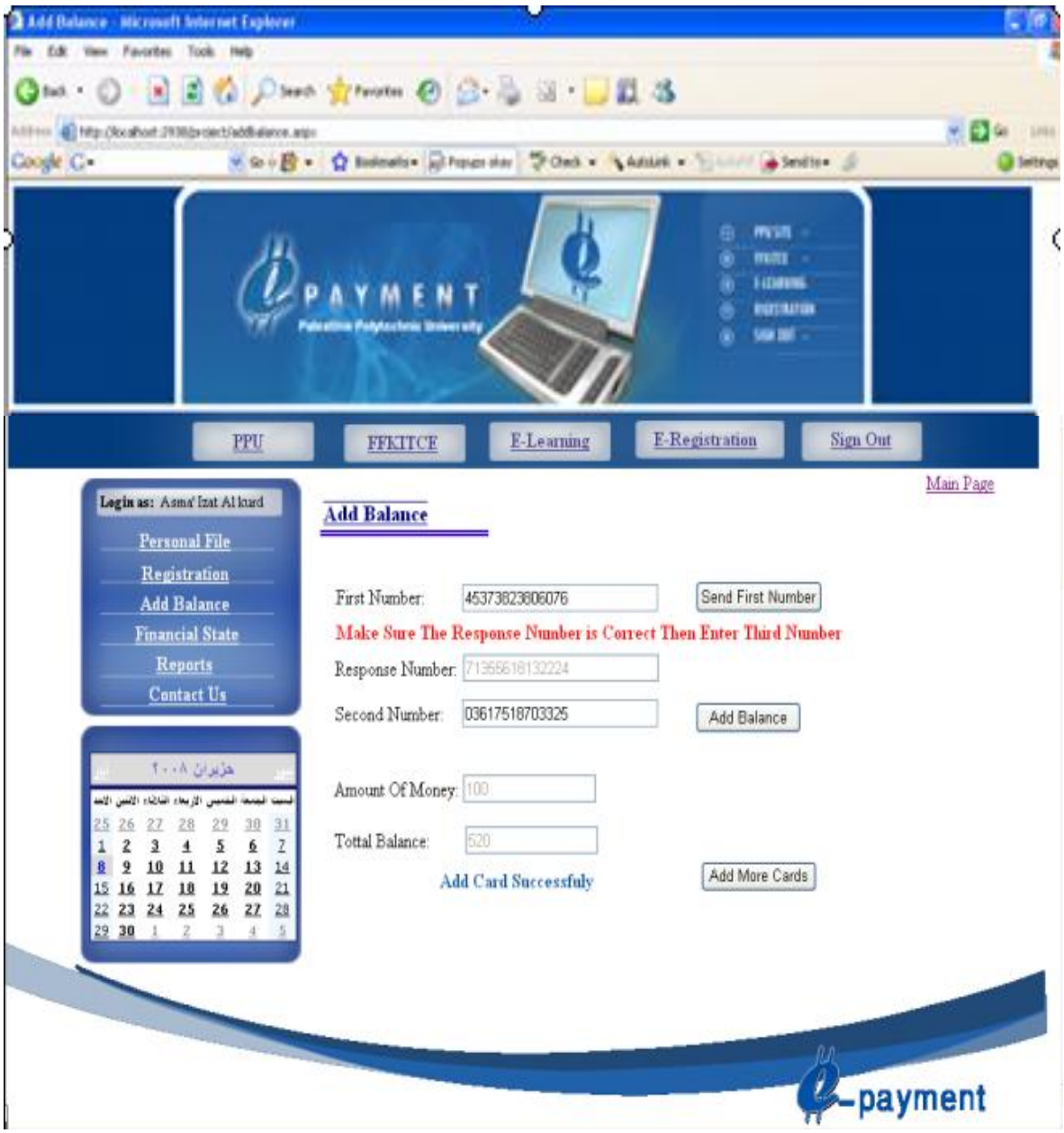


Figure 8. 6: Add balance screen

Then the team complete subsystem testing by test registration screen ،by enter number of hours the student want to register and then the system return the required fees as expected .

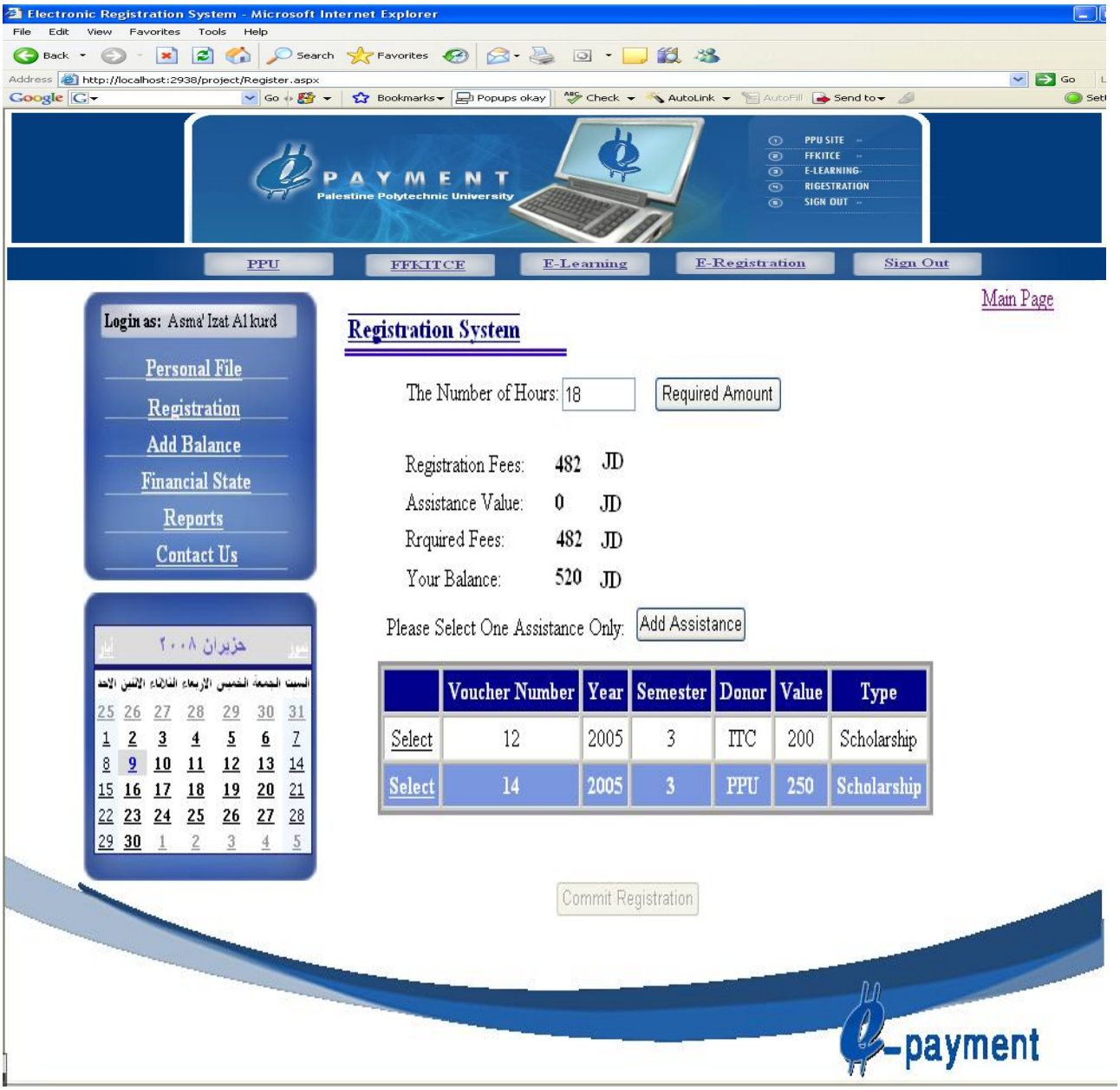


Figure 8. 7:Registration of 18 hours .

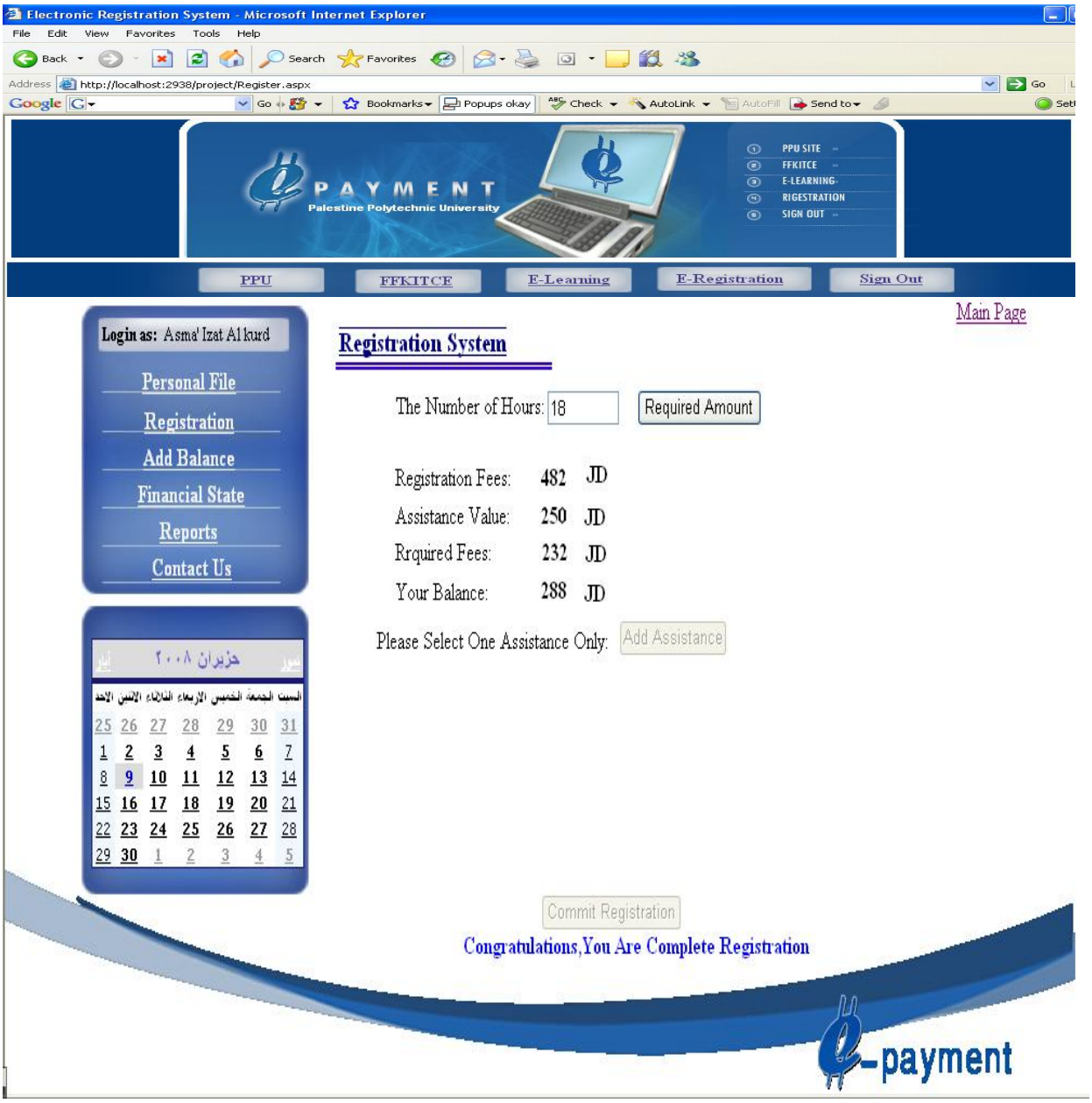


Figure 8. 8: complete e registration

8.4 Integration testing:

At this testing type we tested all modules as a whole system to ensure that the system meet its requirement and specification and operate as we expected.

8.5 System testing:

At this testing type we tested all the system to ensure that the system meet its requirement and specification and operate as we expected.

8.6 Snapshots:

In this section the project team displays some of the snapshots of the card generator manger forms, balance manager, voucher manager forms and student forms.

8.6.1 Some of user pages:

- This Snapshot describes the invalid login of the e-payment system.

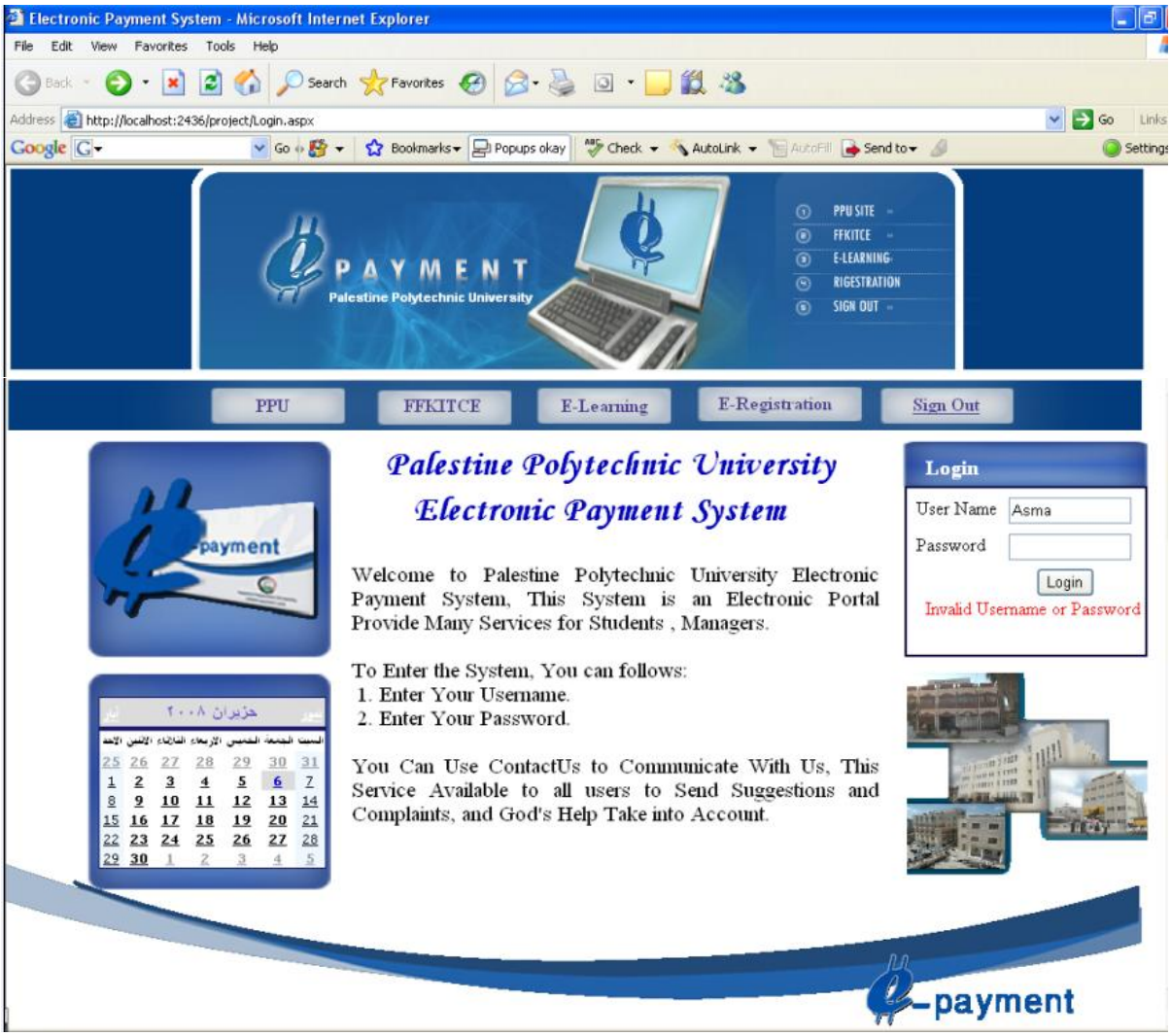


Figure 8. 9:Invalid login

- Snapshot for view personal information.

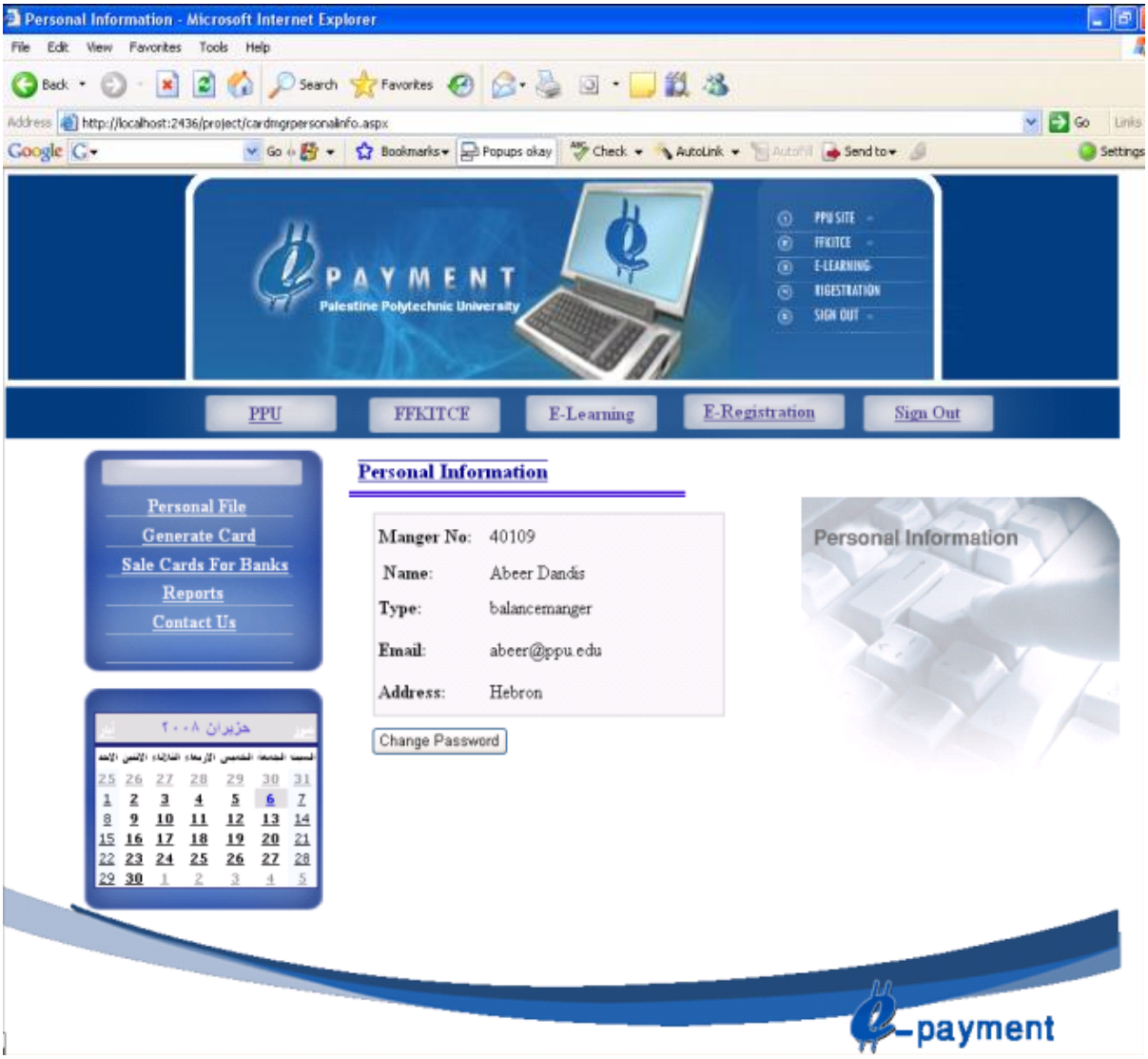


Figure 8. 10:View personal profile

- Snapshot for contact us.

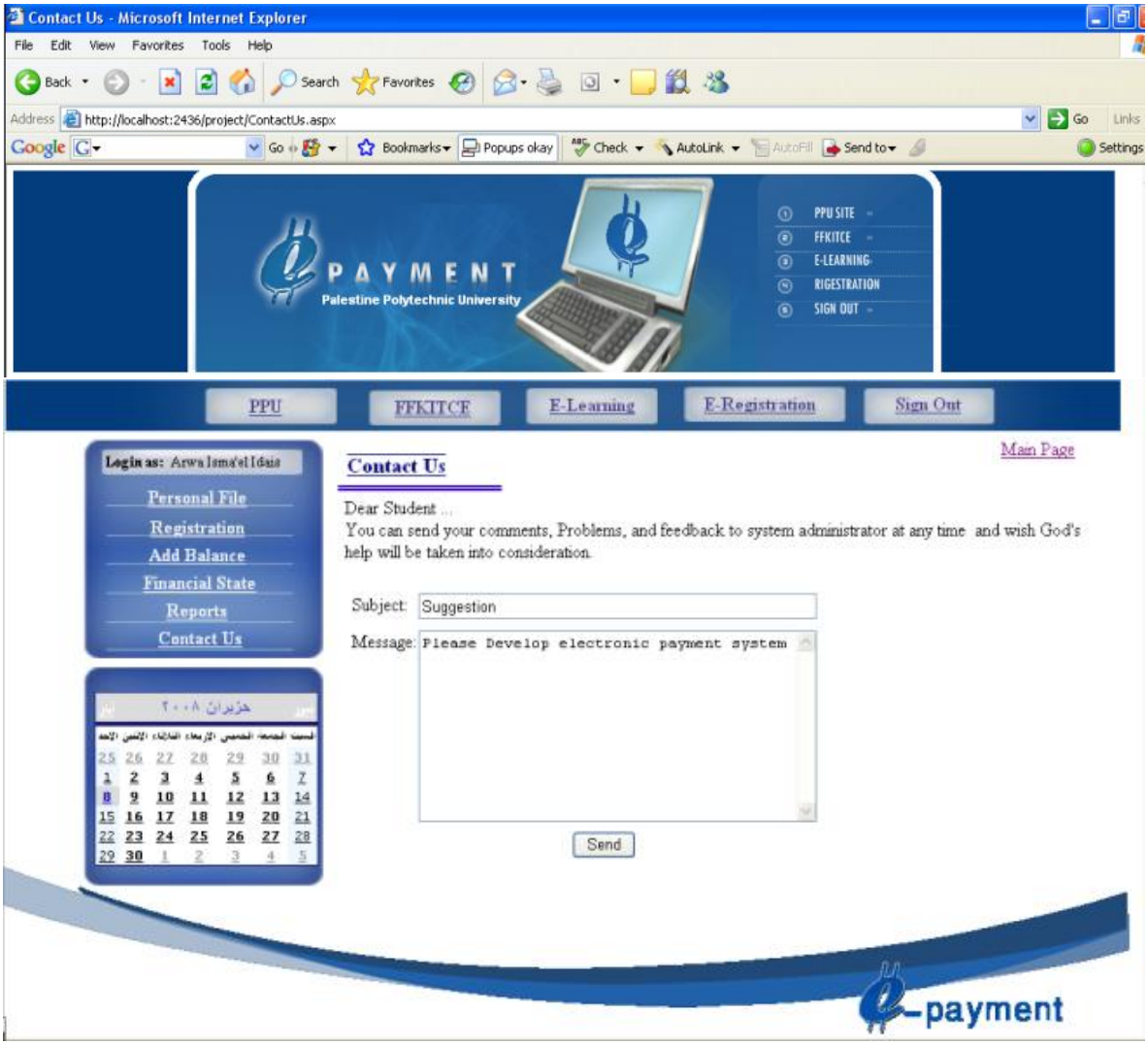


Figure 8. 11:Contact us .

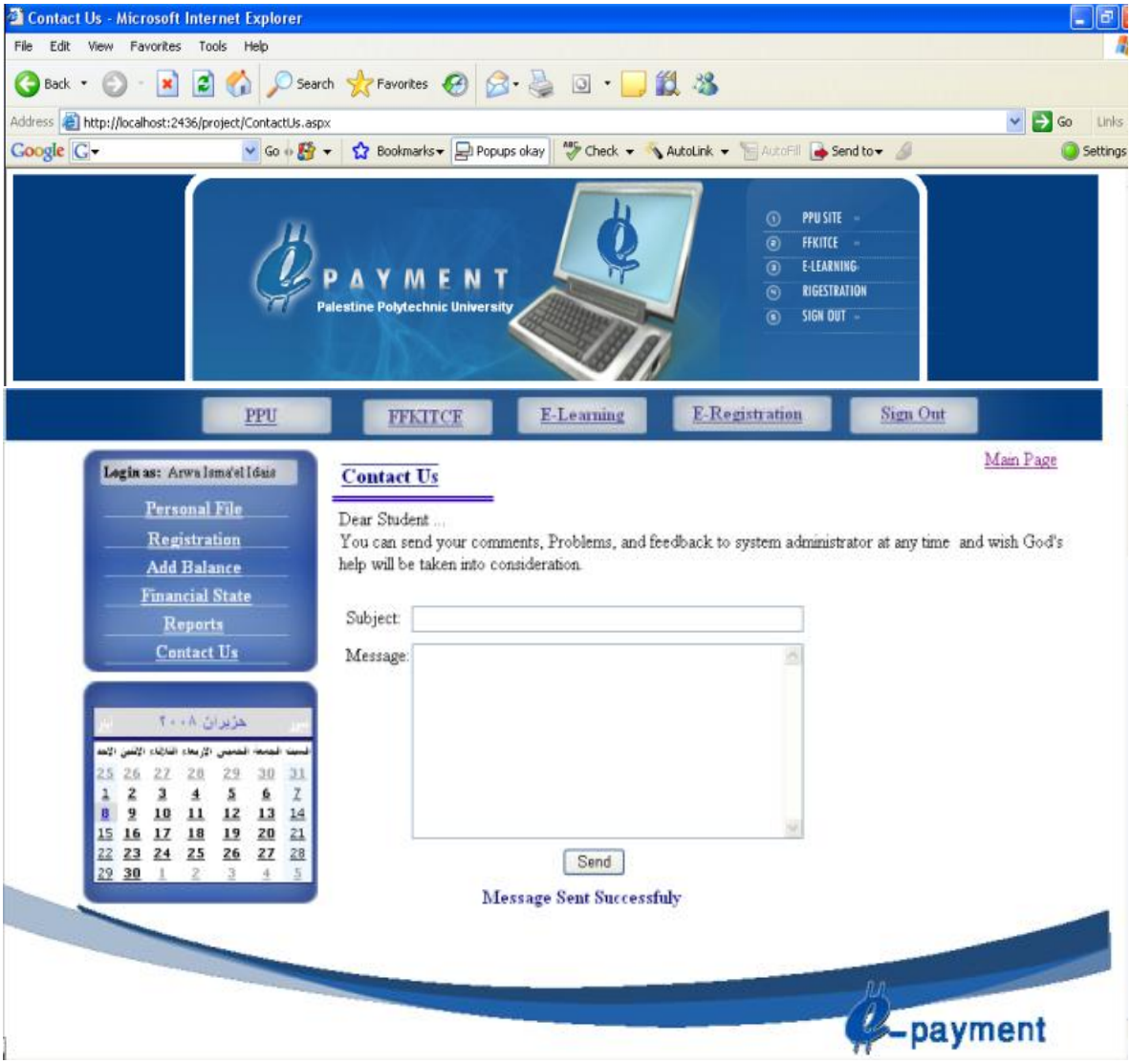


Figure 8. 12: contact us with message sent sucessfuly .

8.6.2 Students snapshots.

- Snapshot for student report.

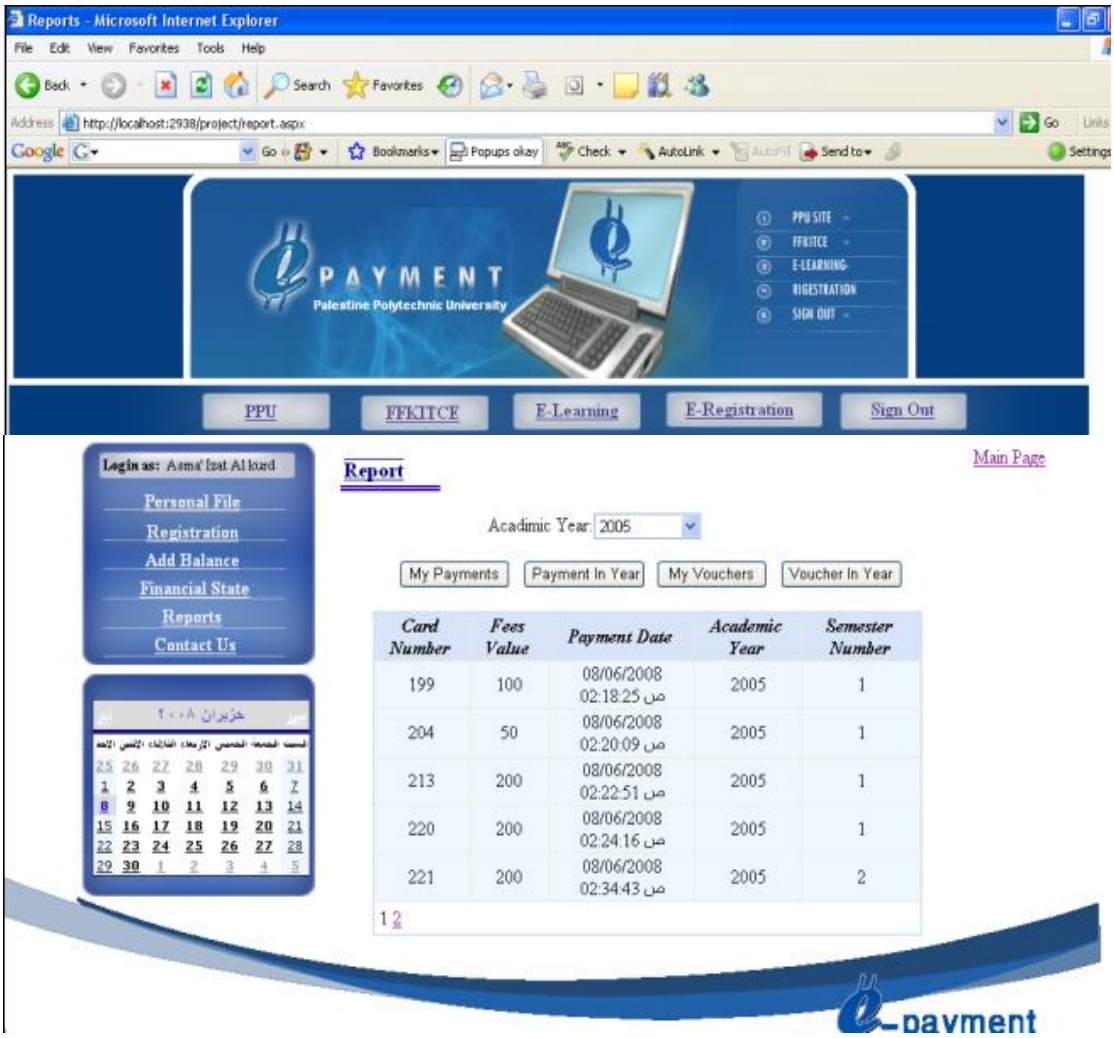


Figure 8. 13:student report .

8.6.3 Balance manager snapshots.

- Snapshot for edit settings.

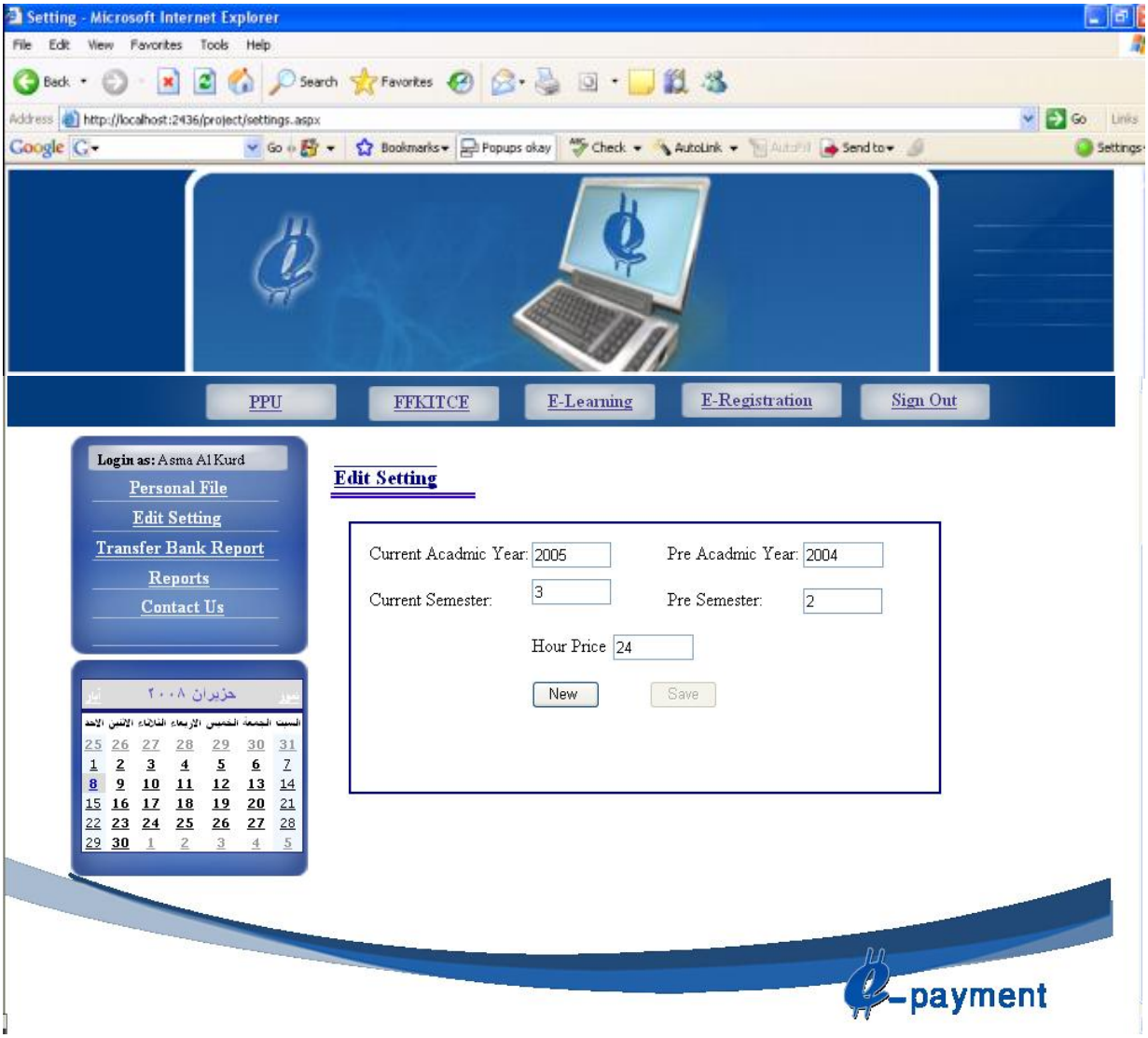


Figure 8. 14:Balance manager edit settings .

8.6.4 card generator manager snapshots :

- Snapshot for generate card.

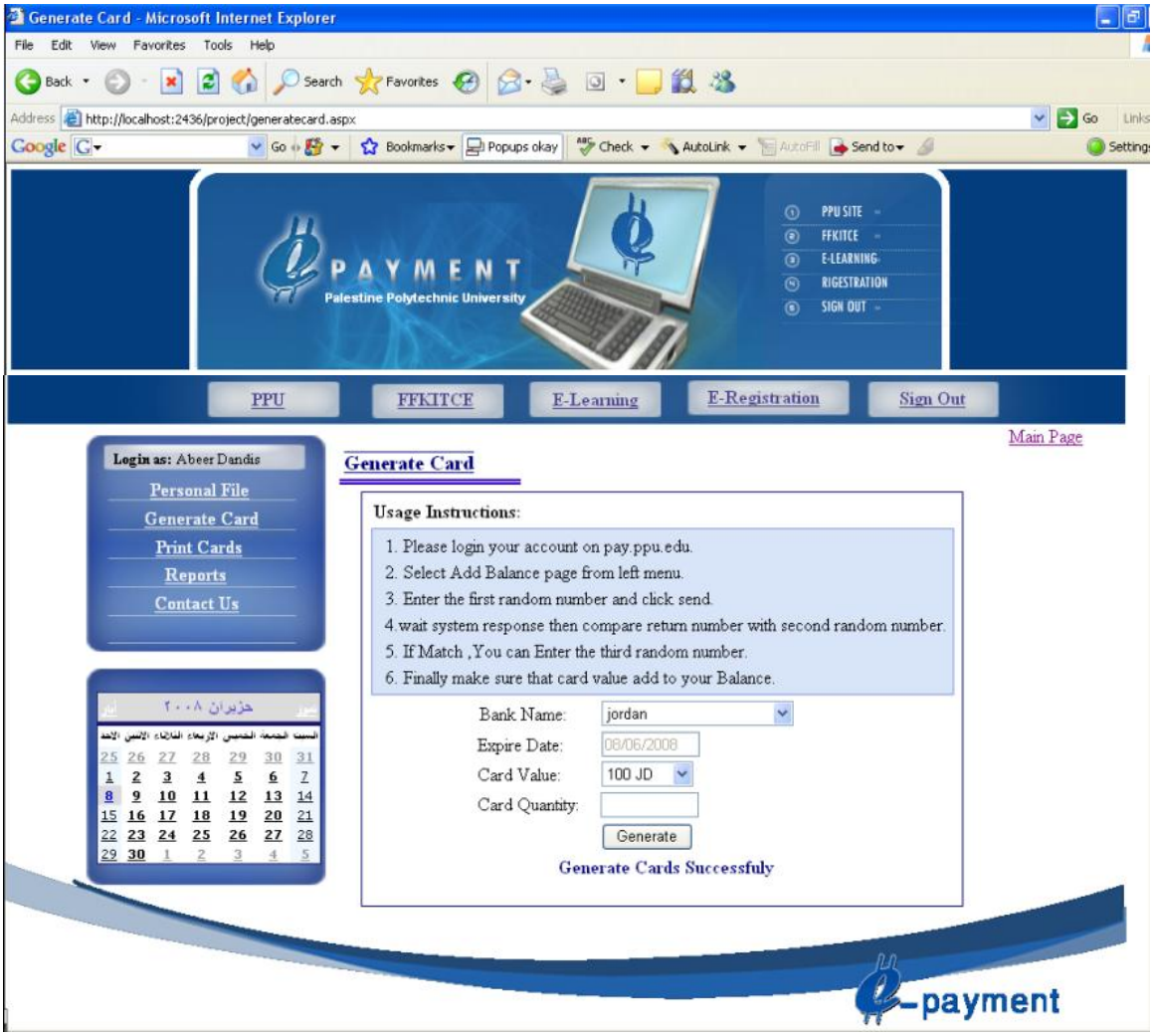


Figure 8. 15: Crad generator manager generate cards

8.6.5 Voucher manager Snapshots:

- Snapshot for generate voucher :

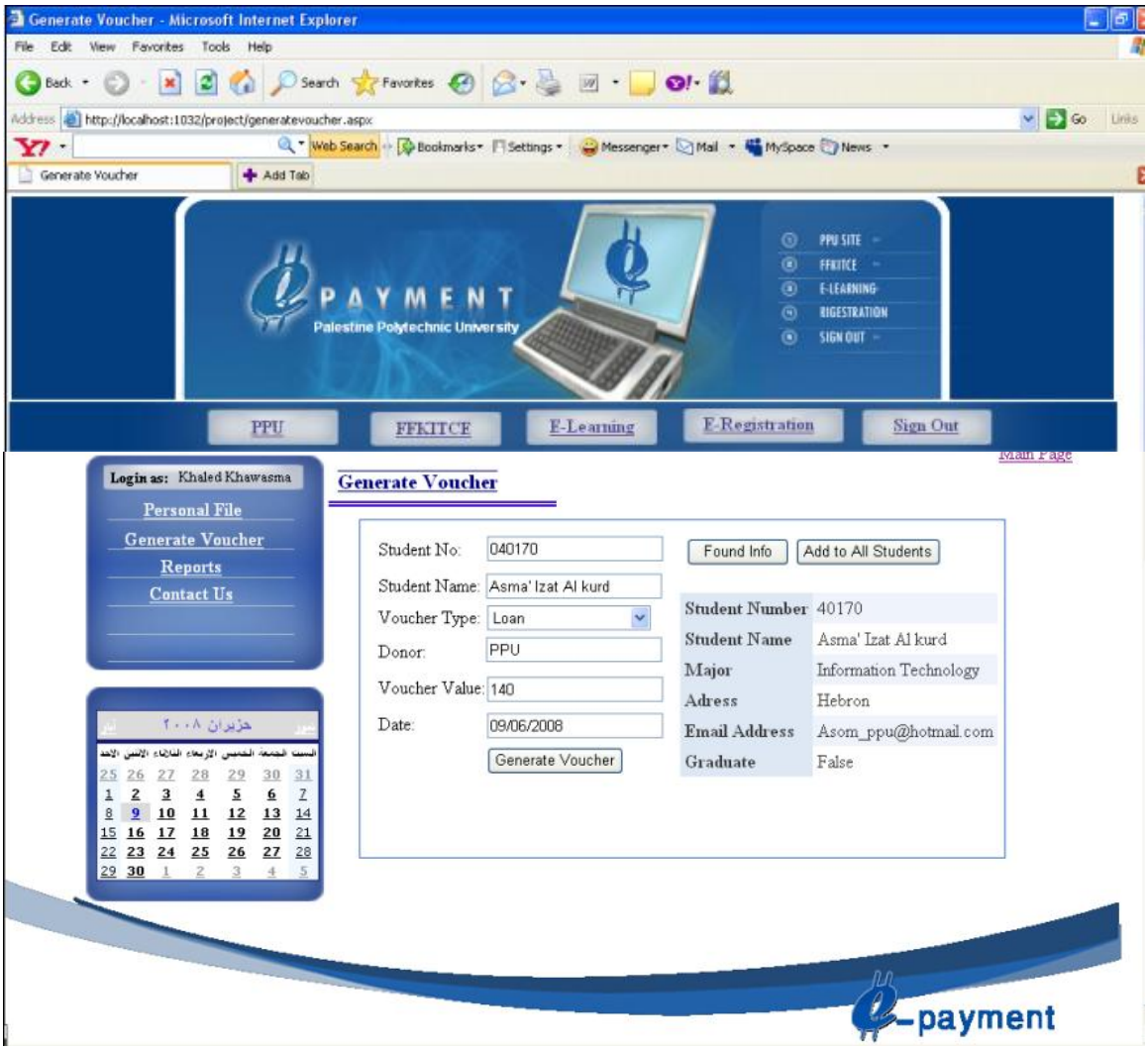


Figure 8. 16:Voucher genrator manager generate voucher.

Chapter Nine

9

System maintenance

- Introduction.
- Maintenance plan.
- Migration.

9.1 Introduction:

Maintenance of the system represents a final stage of the project life cycle, it is a process of returning to the beginning of SDLC and repeating development steps focusing on system change until the change is implemented, also at this Stage we can move the system to work in the real environment.

At this chapter we will describe the process that the system administrator used to maintain the system after running it.
In this chapter we will describe:

- Maintenance plan.
- Migration.

Also we will talk about the system maintenance which includes:

- IIS maintenance.

9.2 Maintenance plan:

When you run the system in the work environment there is a real probability of occurrence of some errors and problems that must be avoided, as is known, the user does not have the capacity to solve problems that may be encountered on the job for that it was necessary to develop a plan for maintenance of the system contains the procedures to be followed to prevent such problems or to help solve. So in this section we will show plan to maintains the system, which includes:

- Backup:

  Any modifications to the system must be stored constantly in fear of the occurrence of any defect causing loss, so we should keep these data by take a backup for it periodically, backup must be done for the total system and database

which is the most important part in the system that includes tables, stored procedures, views and data of the system.

- Upgrade system:
  - By getting newer copies of software, such as SQL server 2005 we improve performance of the system.
  - Make changes on the system to increase its effectiveness.

9.2.1 Internet Information System maintenance(IIS):

IIS is the important element of the operation and the publishing of web pages that have been designed, and through it we can also control some of the characteristics of protection and security for Internet pages.

You must ensure that the IIS effectively work, and to make sure settings. The following figure illustrates this element:

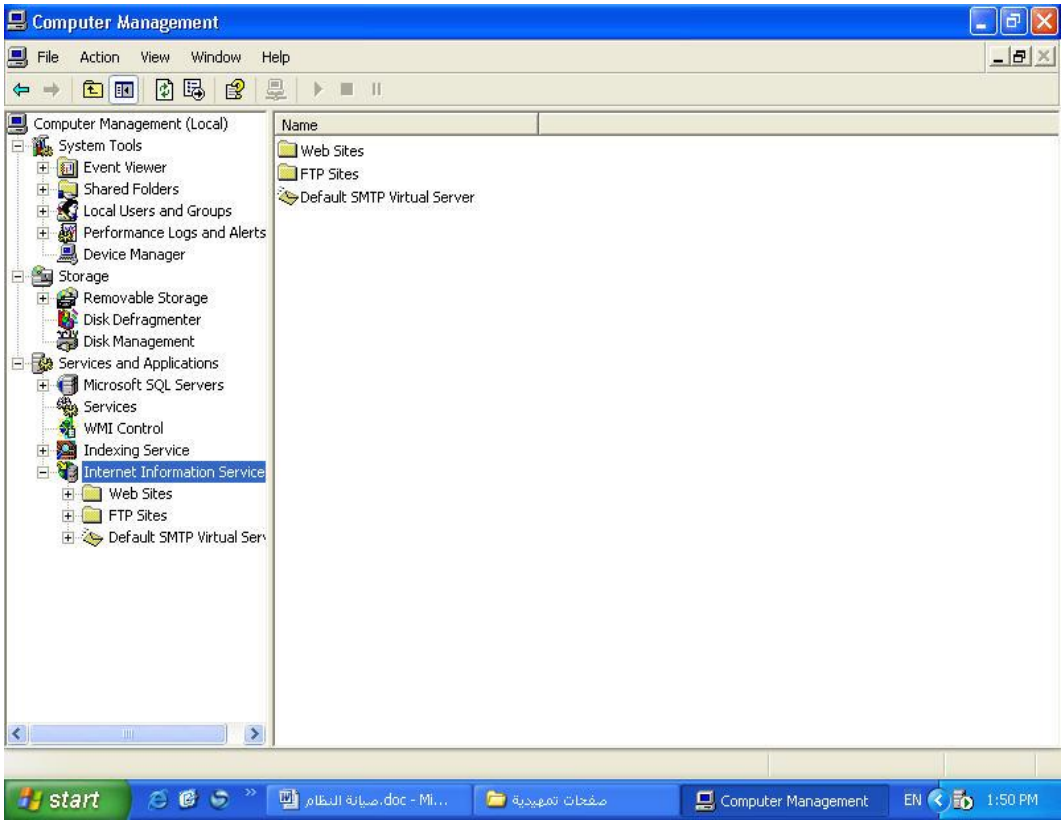


Figure 9.1:Accesses Internet information services .

9.3 Migration:

The deployment of the system must be preceded by certain steps, to work effectively and efficiently within its environment. So the system environment should be established correctly, configured and decision of operating on the new system with considering all constrains and risks of migration.

Migration should be passing these steps:

1. Establishment of the production environment:

The system must have the minimal requirement to running it. Which described in chapter three (feasibility study), and chapter seven (implementation) which clarify needed configuration, so the company must have all elements required.

2. Deciding to deploy the new system:

    - Decision making to deploy the new system is taken by the management of the company that decided to work on our system, after answering these questions:
        - ✓ Does the new system cover all the functional requirement of the company?
        - ✓ Does the company have the minimal requirement to operate the new system?
        - ✓ What are steps that should follow to operate the system?

3. Running the system:
    a. After the completeness of the system it can be running.

Chapter Ten 10

Conclusions & Recommendations

- Introduction.
- Conclusions.
- Recommendations.

10.1 Introduction:

This chapter includes the team conclusions, Skills, and Recommendations. These are mentioned as the following:

10.2 Conclusions:

- Develop e-payment system to be used in Palestine polytechnic university which saves student time and effort to pay tuition electronically by using card with different values instead of the old way that was used in the university.

- Applying E-payment system for student tuition payments at Palestine polytechnic university will reduce staff cost since e-payment reduce number of employees who was required to check bank voucher, money paid, to verify voucher number and the fees required.

- Applying E-payment system for student tuition payments at Palestine polytechnic university guarantee the university right to get the complete fees from student, since the policy of e-payment system, no student can complete his registration process until paid total required fees.

- E-payment approves its efficiency as an alternative payment method of the existing payment techniques.

- It's an important to provide student, balance manager, card generator manager, voucher manager (all users) with clear guidelines about how to use e-payment system.

- Building effective e-payment projects needs more efforts and long time to be completed; this is one of the project risks the team members face while building the project.

- E-payment system must be more secure rather than other systems which required additional effort to achieve security, but the team tries to achieve some of security mechanism.

10.3 Skills:

- We have learned how to work as a team.
- Using and dealing with software programs such as: Visual Basic.Net 2005, SQL server express ,Microsoft office Visio 2003 .
- Searching, gathering and documenting information processes.

10.4 Recommendation:

- The team recommends to the university to apply our project electronic payment for student tuitions along with the electronic registration process to make all registration process occur electronically.

- The team recommends to the registration unit at Palestine polytechnic university to add Xml web service in their site, this enable student to pay electronically from registration page.

- Developing our system to include all payment process such as paid fees for review marks, fees for graduation ceremony, clearance fees ,not only the tuition payment .

- Developing our system to be mobile application instead of web application, so the student can enter the card numbers using SMS.

- The team recommends to the university to support the students with more requirements and encouragements to motivate them in building such systems in effective way.

- The team recommends applying strong security mechanism such as using encryption techniques to encrypt the password and three random numbers.

- The team recommends using strong algorithm to generate random numbers which make the possibility of knowing the number by hackers and crackers difficult or impossible.

- The team recommends implementing general e-payment system to be used in Palestine since the analysis and design being done by the team member.

- The team recommends to change the port number for card generator manager when he want to put the URL address ,by made this change only the card generator manager know the right address to view the main page of card generator manager .

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Appendix A(Questionnaire)

University Graduates Union
(PPU) Palestine Polytechnic University
جامعة بوليتكنك فلسطين
كلية العلوم الإدارية ونظم المعلومات

FRIEND OF FAWZI KAWASH IT
(FFKITCE) CENTER OF EXCELLENCE
مركز أصدقاء فوزي كعوش للتميز بتكنولوجيا
المعلومات

استبيان حول
مشروع نظام الدفع الإلكتروني في فلسطين

عزيزي القارئ/ عزيزتي القارئة:

يقوم فريق البحث بإجراء دراسة لمعرفة توجه الأفراد وميولهم نحو استخدام نظام دفع الكتروني في تسهيل عمليات الدفع التي يقوم فيها الفرد مقابل الحصول على خدمة أو سلعة معينة بدل من الدفع النقدي، حيث يعتبر الدفع الإلكتروني أحد مقومات التجارة الإلكترونية وهو عنصر هام يسهم في نجاح عمليات التبادل التجاري المختلفة، وسيقوم فريق البحث بتحليل كامل لنظام الدفع الإلكتروني في فلسطين وتطبيق جزء من النظام على نظام التسجيل الإلكتروني في جامعة بوليتكنك فلسطين، ومن هذا المنطلق قام فريق البحث بإعداد هذه الإستبانة كمتطلب لمشروع تخرج لتخصص تكنولوجيا المعلومات في كلية العلوم الإدارية ونظم المعلومات في جامعة بوليتكنك فلسطين.

ويشير الفريق إلى أن المعلومات الواردة في هذه الإستبانة لن تستخدم إلا لأغراض البحث العلمي فقط، لذا نرجو منكم التعاون معنا في تعبئة هذه الإستبانة بصدق وأمانة ونشكر لكم حسن تعاونكم معنا.

فريق البحث : **أروى إسماعيل ادعيس، أسماء عزات الكرد، عبير إبراهيم دنديس.**
مشرف المشروع: الدكتور المهندس رضوان طهبوب.
مشرف مساعد : المهندس هاني صلاح.

القسم الأول : عام:

1. **الجنس:** ☐ ذكر ☐ أنثى
2. **المهنة :** ☐ طالب ☐ إداري
3. **هل لديك جهاز حاسوب ؟** ☐ نعم ☐ لا
4. **هل تتعامل مع شبكة الإنترنت ؟** ☐ نعم ☐ لا
5. **اذا كان لديك جهاز حاسوب وكنت تستخدم شبكة الإنترنت، ما مدى مهارتك في الاستخدام ؟**

☐ ممتازة ☐ متوسطة ☐ جيدة

القسم الثاني : استخدام نظام الدفع الإلكتروني:

1. **هل سمعت بمفهوم التجارة الإلكترونية ؟** ☐ نعم ☐ لا
2. **ما هي طرق الدفع التي استخدمتها في فلسطين ؟**

☐ نقدا ☐ شيكات ☐ فيزا كارد ☐ بطاقات مسبقة الدفع (غير جوال) ☐ بطاقات جوال ☐ الصراف الآلي

3. **هل تواجه مشاكل في طرق الدفع التقليدية (نقدي, شيكات) ؟** ☐ نعم ☐ لا
4. **هل سمعت بمفهوم الدفع الإلكتروني ؟** ☐ نعم ☐ لا
5. **هل ترغب باستخدام طرق الدفع الإلكتروني بدل من الطرق التقليدية ؟** ☐ نعم ☐ لا
6. **هل تعتقد أن الدفع الإلكتروني يغني عن الطريقة التقليدية في الدفع (نقدي، شيكات) ؟** ☐ نعم ☐ لا

7. **في حال تطوير نظام دفع الكتروني آمن في فلسطين، هل تتعامل معه؟** ☐ نعم ☐ لا

8. **لو طبق الدفع الإلكتروني، ما هي الطرق التي تفضل استخدامها في عمليات الدفع :** _____

9. **هل لديك مخاوف من استخدام نظام دفع الكتروني ؟** ☐ نعم ☐ لا

إذا كانت الإجابة نعم: اذكر بعض هذه المخاوف :_____

10. **هل ستتعامل مع شراء بعض الخدمات البسيطة (باسعاراقل من 100 شيكل) من خلال موقع الكتروني يستخدم طريقة الدفع المسبقة** : ☐ نعم ☐ لا

11. **هل تعتقد أن الدفع الإلكتروني يوفر الوقت والجهد المطلوب في البيع والشراء؟** ☐نعم ☐ لا

12. **هل ترى في نظام الدفع الإلكتروني ضمان لحقوق البائع في تحصيل أمواله؟** ☐ نعم ☐ لا

13. **هل ترى في نظام الدفع الإلكتروني ضمان لحقوق المشتري في الحصول على الخدمة؟**☐ نعم ☐ لا

القسم الثالث: خاص بالطلاب:

1. **الكلية:**

☐ الهندسة والتكنولوجيا☐ العلوم التطبيقية ☐ العلوم الإدارية ونظم المعلومات ☐ المهن التطبيقية

2. **المستوى الدراسي:**

☐ سنة أولى ☐ سنة ثانية ☐ سنة ثالثة ☐ سنة رابعة (أو أكثر)

3. **ما رأيك بنظام بألية الدفع الحاليه المستخدمه في نظام التسجيل ؟**

☐ ملائم ☐ غير ملائم

4. **هل ترغب في استخدام نظام دفع وادارة الأقساط الجامعية بطريقة إلكترونية *(أمنة)* إلى جانب التسجيل الإلكتروني؟**

☐ نعم ☐ لا

5. **هل لديك الثقة في استخدام نظام دفع وادارة الأقساط الجامعية بطريقة إلكترونية *(أمنة)* إلى جانب التسجيل الإلكتروني؟**

☐ نعم ☐ لا

6. **ما هي طريقة الدفع التي تفضلها ؟**

☐ بطاقات مسبقة الدفع ☐ بطاقات الإئتمان ☐ الصراف الآلي ☐ ايداع في حساب بنكي

7. **هل تعتقد أن استخدام نظام دفع وادارة الأقساط الجامعية بطريقة إلكترونية يتغلب على مشكلة الإنتظار في الطابور ؟**

☐ نعم ☐ لا

8. **ما هي اقتراحاتك لنظام دفع الكتروني إلى جانب التسجيل الإلكتروني؟**

شاكرين لكم حسن تعاونكم

Appendix B (Security).

Introduction:

Security is considered one of the most important thing that designer must take into account when designing any system, but as known our system electronic payment must achieve high level of security to be trusted by user , because the system deal with sensitive ,accurate information and data.

The team decided to apply SSL (Secure Sockets Layer) protocol on the web site, so here we will clarify what is SSL in detailed.

What is SSL?

SSL are cryptographic protocols that provide secure communications on the Internet for such things as web browsing, e-mail, Internet faxing, instant messaging and other data transfers, SSL uses a program layer located between the Internet's Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers.

SSL protocol developed by Netscape for transmitting private documents via the Internet. Both Netscape Navigator and Internet Explorer support SSL and many Web sites use the protocol to obtain confidential user information, such as credit card numbers. By convention, URLs that require an SSL connection start with https: instead of http.

Security problem without SSL

Without SSL, your computer-to-computer communications suffer from the same security problems from which your telephone communications suffer:

- **Who are you talking to**?

In a phone conversation, how can you be sure that the person who picks up the phone at the other end is really the person you are trying to call (especially if you have never spoken to them before)? What if someone else is answering your call recipient's phone? There really is no way to be sure that you have reached the right person.

- **Eavesdropping?**

  It is very easy to tap phone lines: the police and spies do this all the time to gather information. It is not easy to detect if your lines are tapped. The same applies with communications over the Internet, how can you be sure that your communications are not being "tapped" and recorded?

The solution for two previous security problems is to use SSL by using it you are achieved the following points.

1. Knowing for sure that you are connecting to the right computers.
2. Knowing that your data is safe from prying eyes during transmitting.

How SSL works?

SSL relies on the concept of "public key encryption" In public key encryption; each person has two keys a **public key** and a **private key.** Anything encrypted with the user's public key can only be decrypted with the private key and vice versa. The public key is made public when it is distributed it widely. The private key is never distributed; it is always kept secret.

When a Web browser points to a secured domain, a Secure Sockets Layer **handshake** authenticates the server (Web site) and the client (Web browser). So an SSL exchange is initiated with an SSL handshake where the client and the server exchange information with

each other regarding the encryption information indicated by the SSL certificate, once this handshake is completed both the client and the server know exactly how to encrypt the information in a way that the other end will understand and be able to decrypt.

From that point on, anyone listening to (or snooping on) the data transfer between the client and the server will only see this encrypted information. They would then have to spend a long time decrypting it before they could make any sense out of it.

An SSL Certificate consists of a public key and a private key, SSL Certificate is issued by a trusted authority, the Certificate Authority (CA). When the SSL handshake occurs, the browser requires authentication from the server. A customer sees the organization name when they click certain SSL trust marks (such as the VeriSign Secured™ Seal) or use a browser that supports Extended Validation. If the information does not match or the certificate has expired, the browser displays an error message or warning.

When you need SSL?

Almost any Internet service can be protected with SSL. Common ones include Webmail and other secure web sites such as banking sites and corporate sites.

You need SSL if...

- You have an online store or accept online orders and credit cards.
- Your business partners log in to confidential information on an extranet.
- You process sensitive data such as address, birth date, license, or ID numbers.
- You need to comply with privacy and security requirements.

- ❖ You value privacy and expect others to trust you.

What is HTTPS ?

Another protocol for transmitting data securely over the World Wide Web is Secure HTTP (S-HTTP). Whereas SSL creates a secure connection between a client and a server, over which any amount of data can be sent securely, S-HTTP is designed to transmit individual messages securely. SSL and S-HTTP, therefore, can be seen as complementary rather than competing technologies.

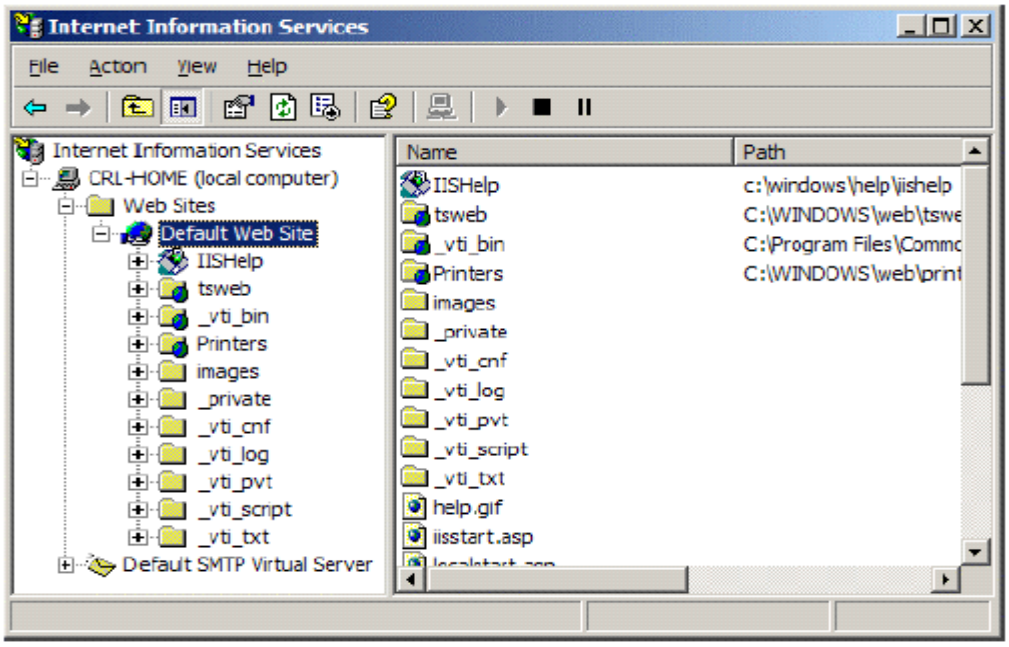
The team implements SSl on the e-payment website by use windows server 2003 operating system , to achieve high level of security and to configure your website to operate under Https protocol, so we follow number of steps to implement the SSL as following:

1- **First you must install certificate services as follow:**

   a. From control panel double-click add/remove programs icon.
   b. Select add/remove windows component.
   c. Select certificate services.
   d. Windows wizard will appear follow the wizard and fill the information that required, certificate name, organization name (e.g. PPU), organization unit, country, city ... .
   e. Click finish Button

2- **The second step is creating the certificate signing request (CSR) as follow:**

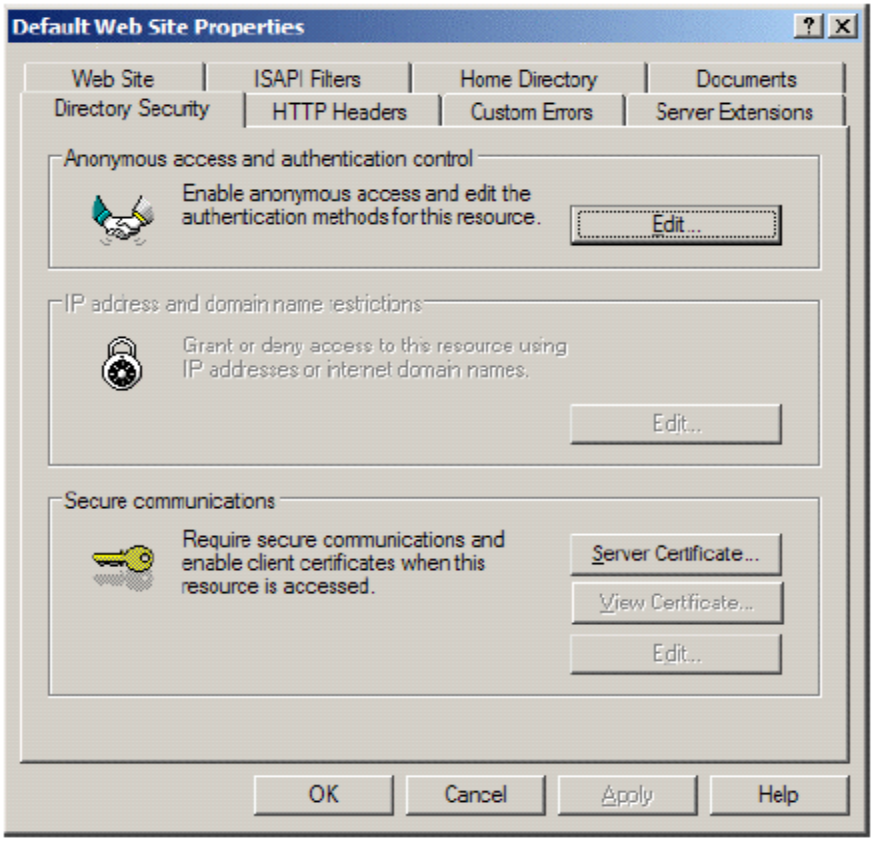
   a. From administrator tools select internet information manager.



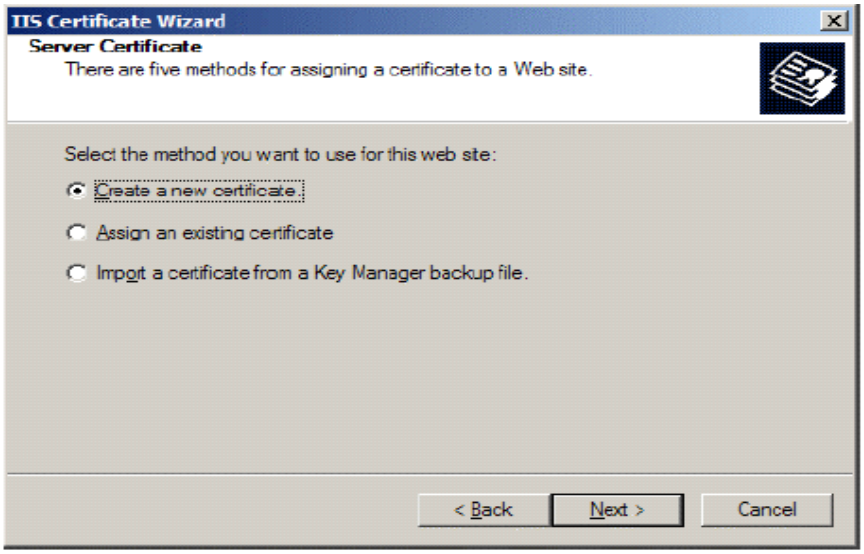
b. From internet service manager Snap-in right-click your web site that you want to configure it under https protocol.

c. Menu will appear, select properties.

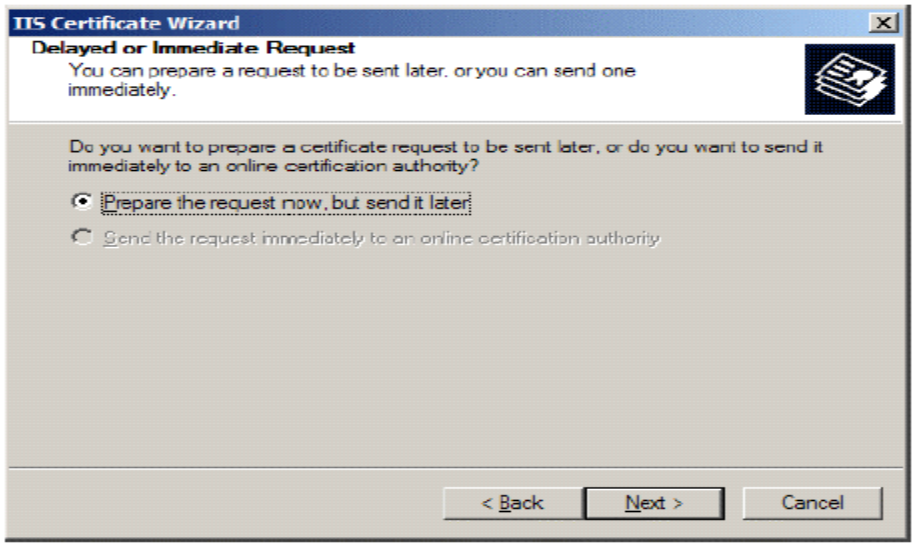
d. From properties window select directory security tab.



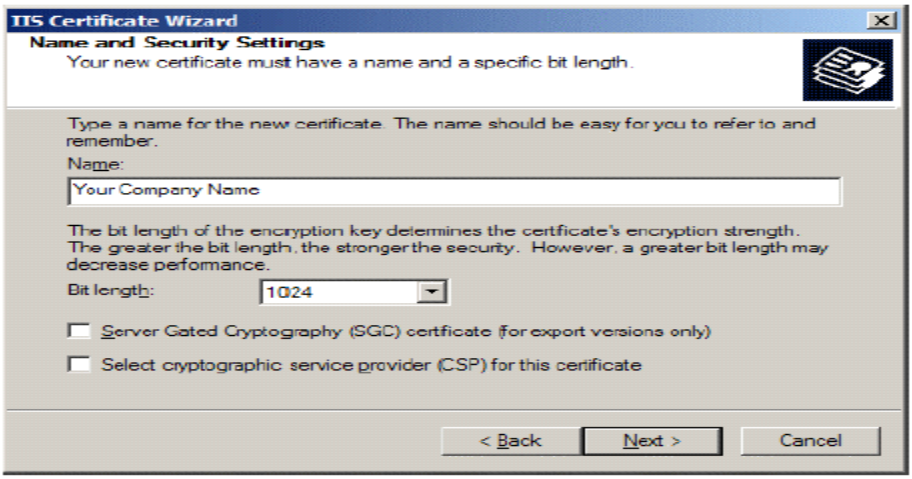
e. Click server certificate wizard will appear.



f. Select create a new certificate then click next.



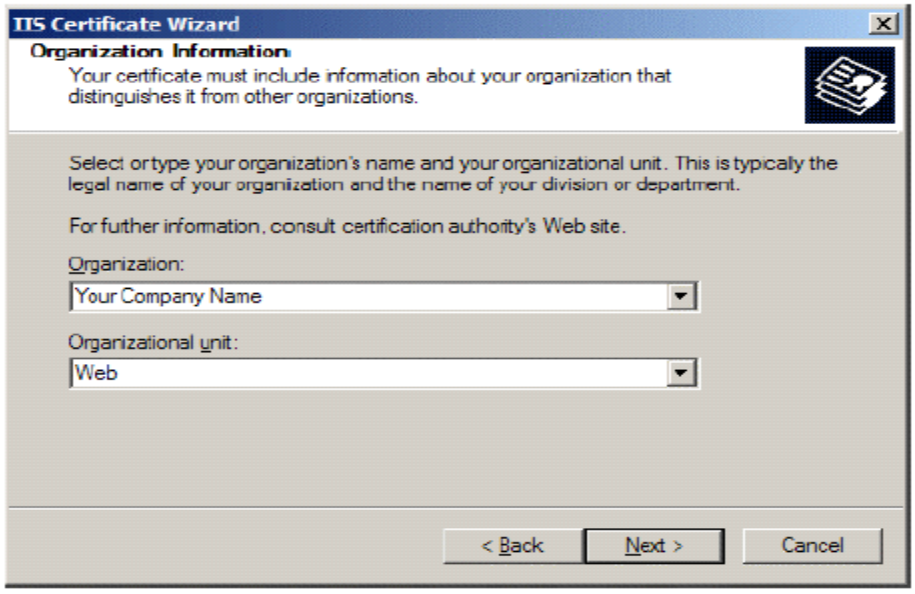
g. Select Prepare the request now, but send it later and click **Next**.



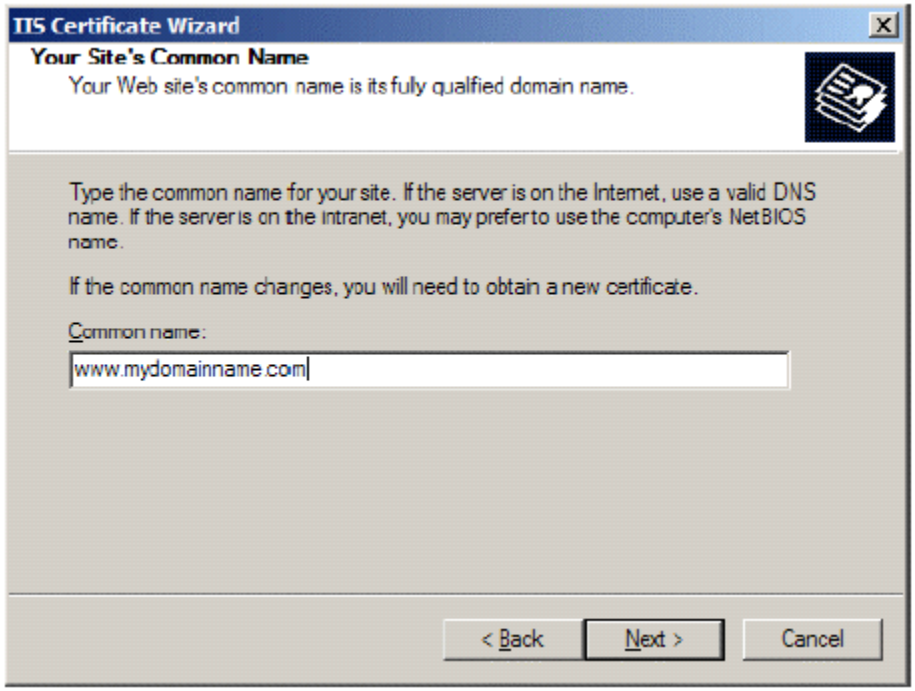
h. Provide a name for the certificate.

i. Choose bit length as 512.

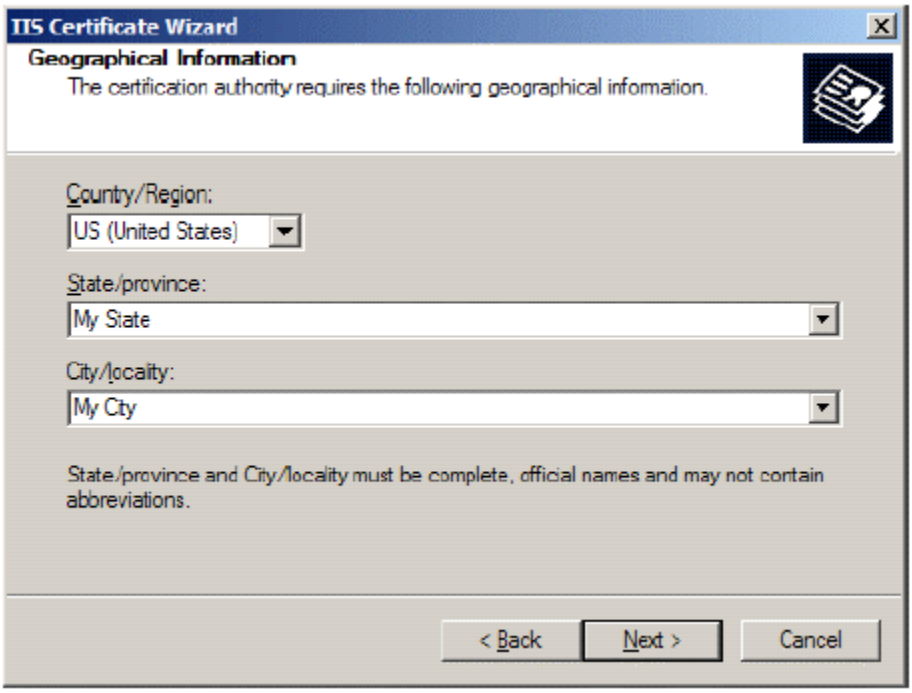
j. Enter Organization and Organization Unit, these are your company name and department respectively. Click **Next**.



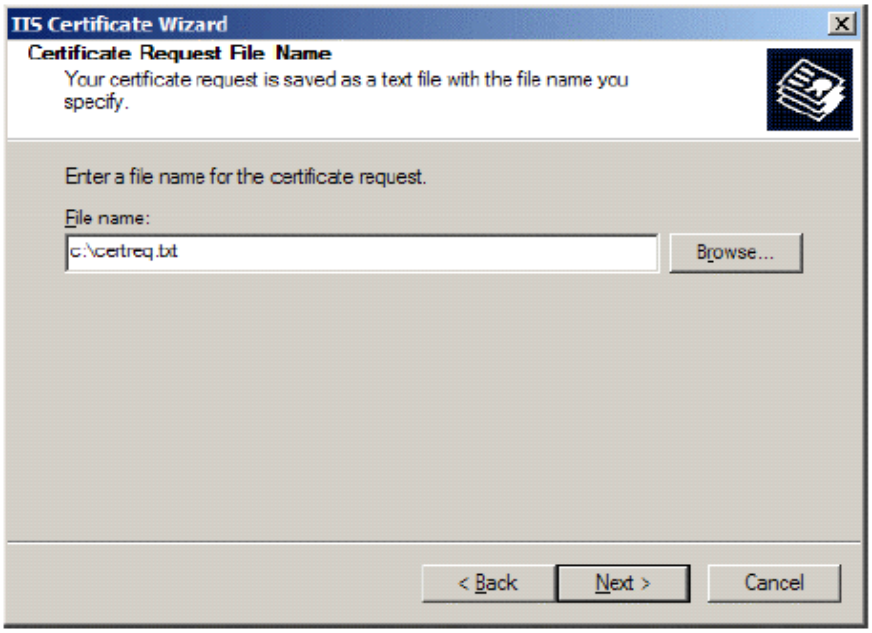
k. in the common name enter your server NetBIOS name if you operate in the intranet else entre FQNDN (Fully Qualified Domain Name). Click **Next**.



l. Enter your Country, State and City. Click **Next**.



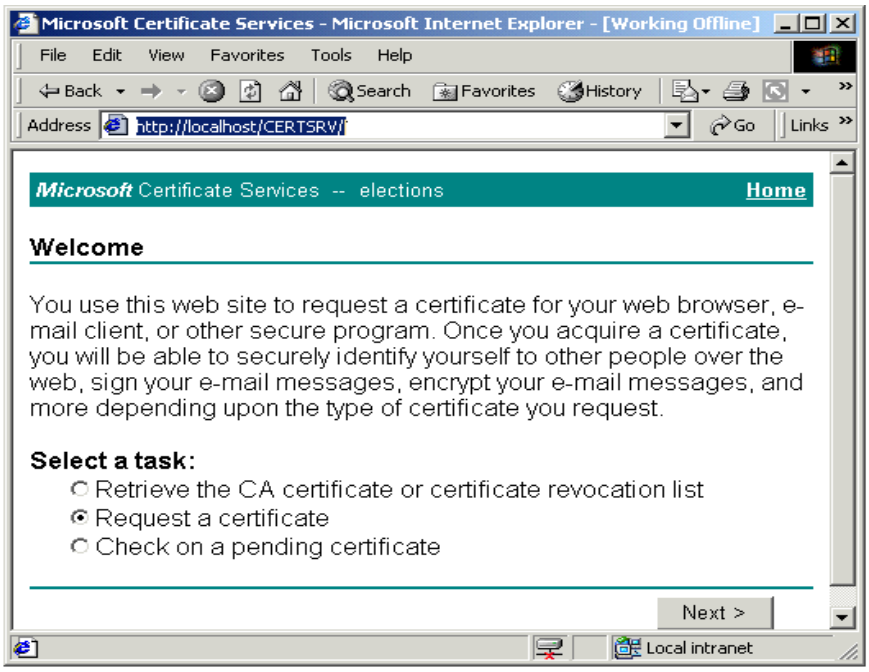
m. Enter a filename and location to save your CSR. You will need this CSR to enroll for your Certificate. Click **Next**.



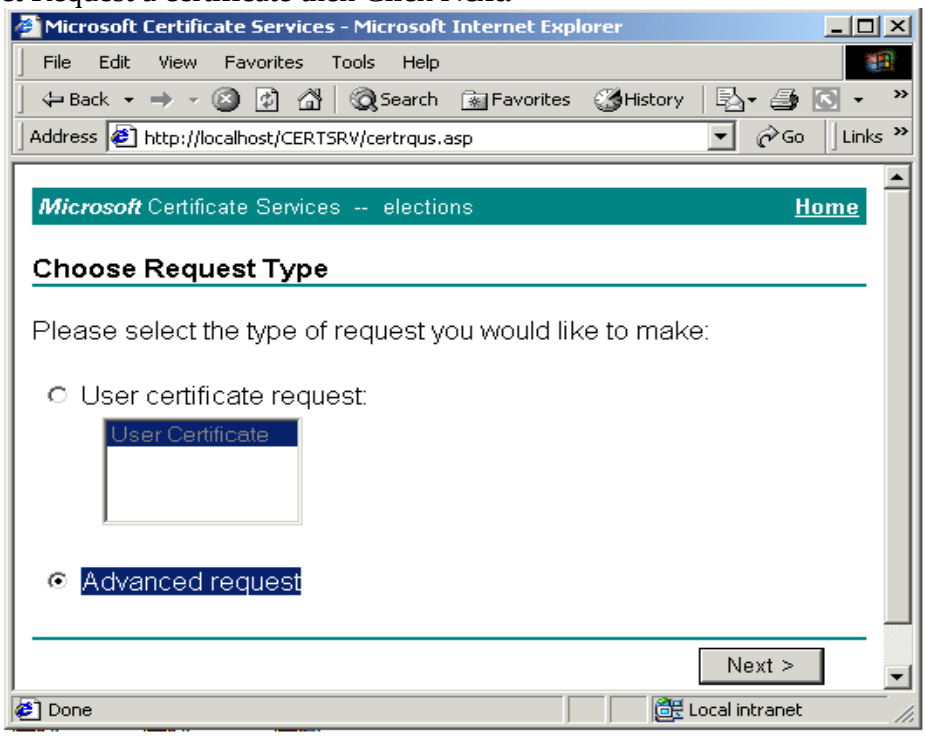
n. Check the details you have entered. Correct any mistake then Click **Next** when you finish. Then click **Finish.**

3- Applying your CSR.

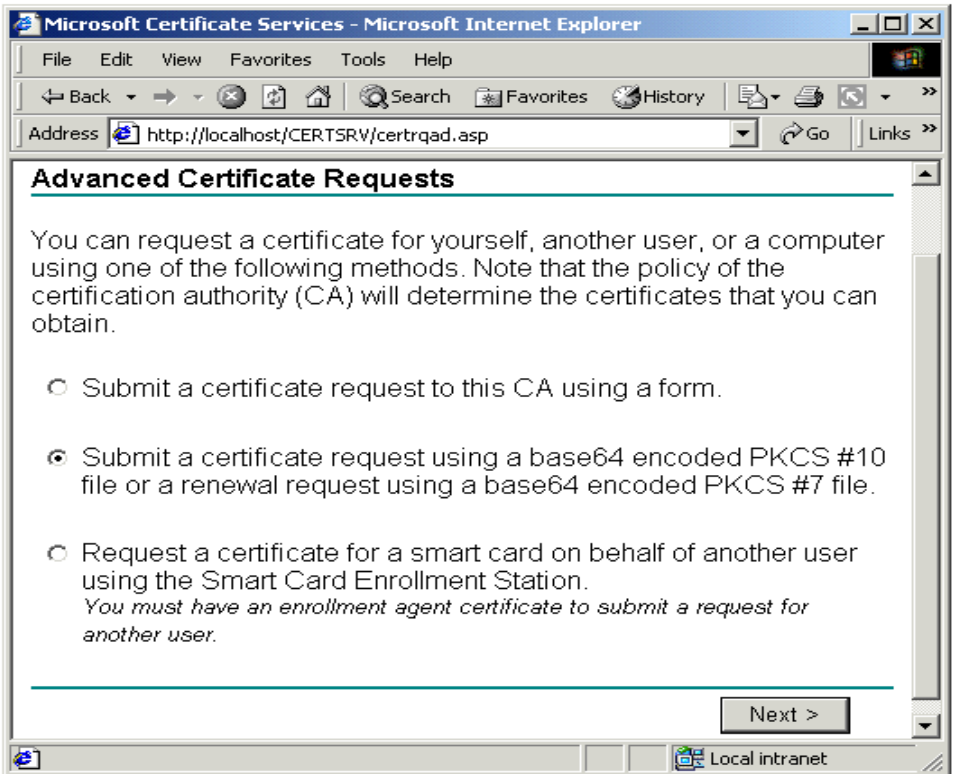
a. Run the internet explorer and enter the following in URL: //localhost/CERTSRV the following page will appear.



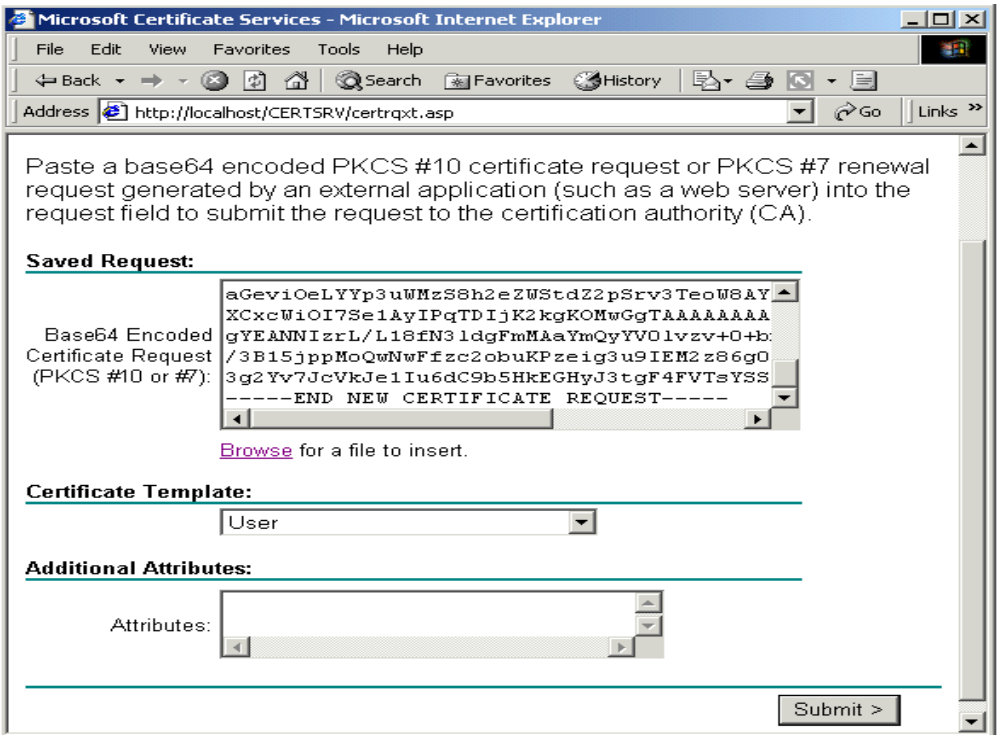
b. Select Request a certificate then Click **Next.**



c. Select Advanced request then Click **Next**.



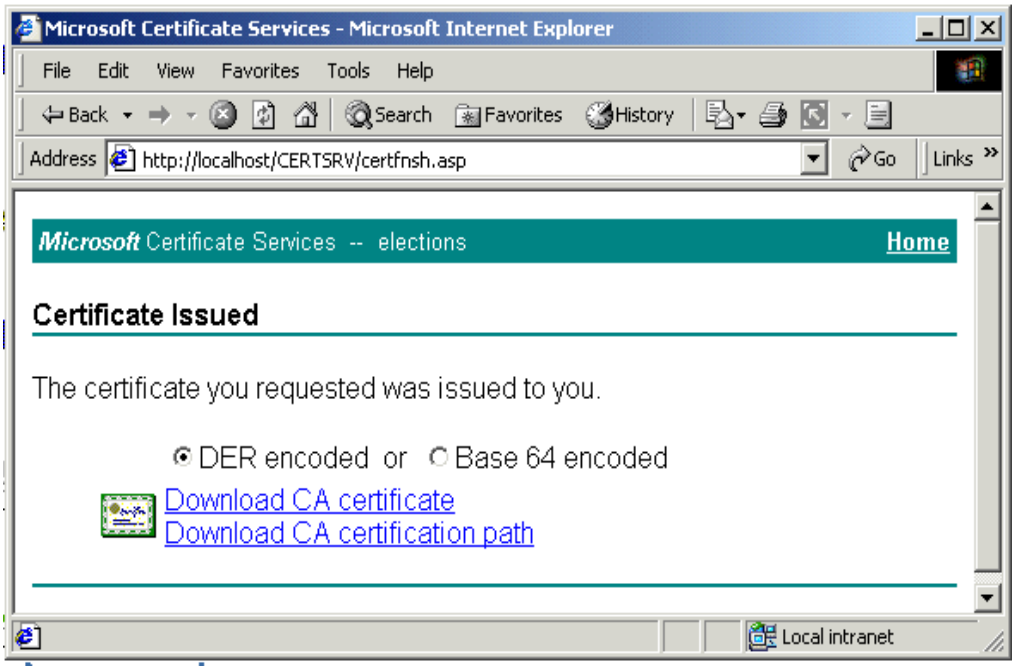
d. Select Submit a certificate request using a base64 encoded PKCS #10 file or a renewal request using a base64 encoded PKCS #7 file. Then Click **Next**.



e. Open the CSR file and copy paste its contents into the application form. Be sure to copy the CSR text in its entirety into the application form,
including the:

-----BEGIN CERTIFICATE REQUEST----- and -----END CERTIFICATE REQUEST-----

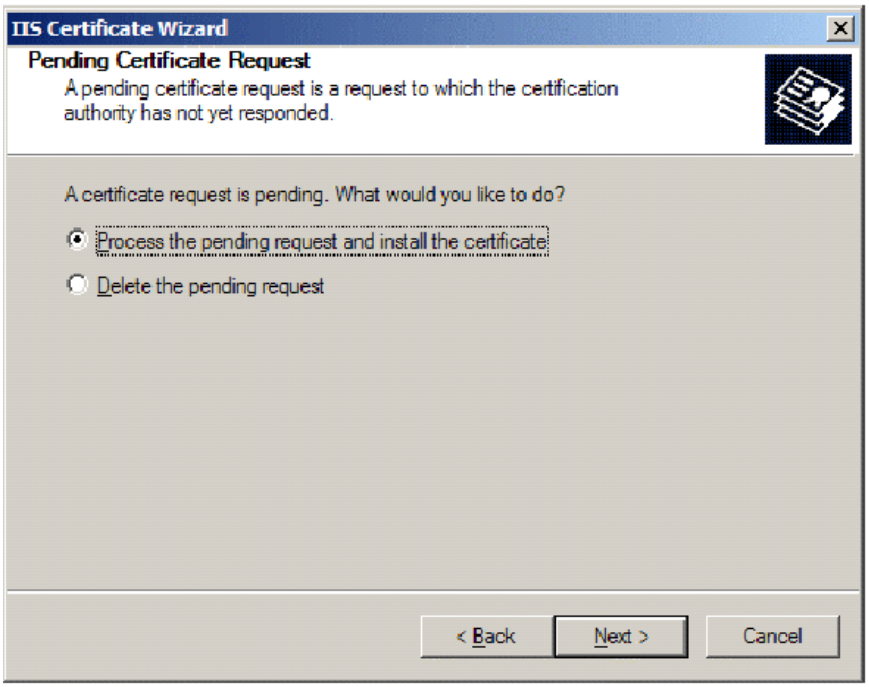
f. Click **Submit.**



g. Click DOWNLOAD CA CERTIFICATE, Be sure where you download it because you will need it.

4- Process the Certificate:

a. from administrator tools select internet information manager.
b. From internet service manager Snap-in right-click the web site
c. Menu will appear, select properties.
d. From properties window select directory security tab.
e. Click server certificate wizard will appear

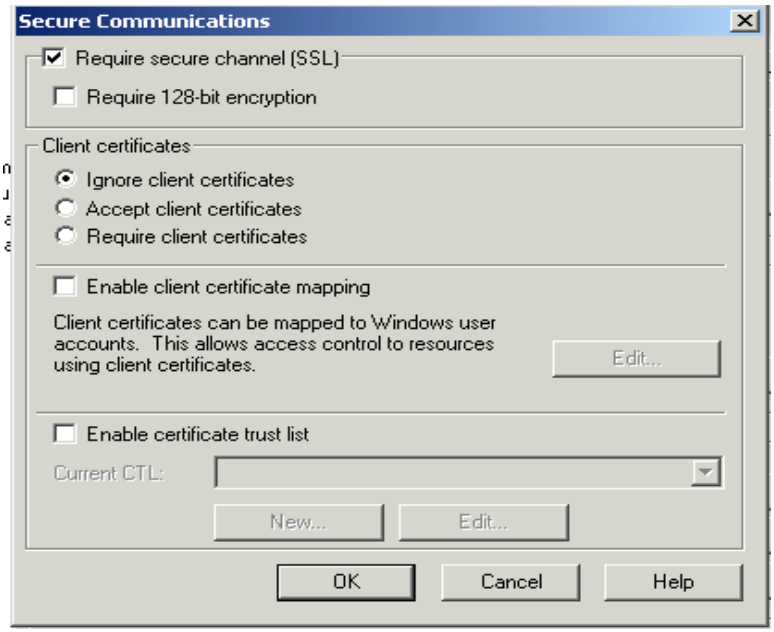


f. Select Process the pending request and install the certificate.

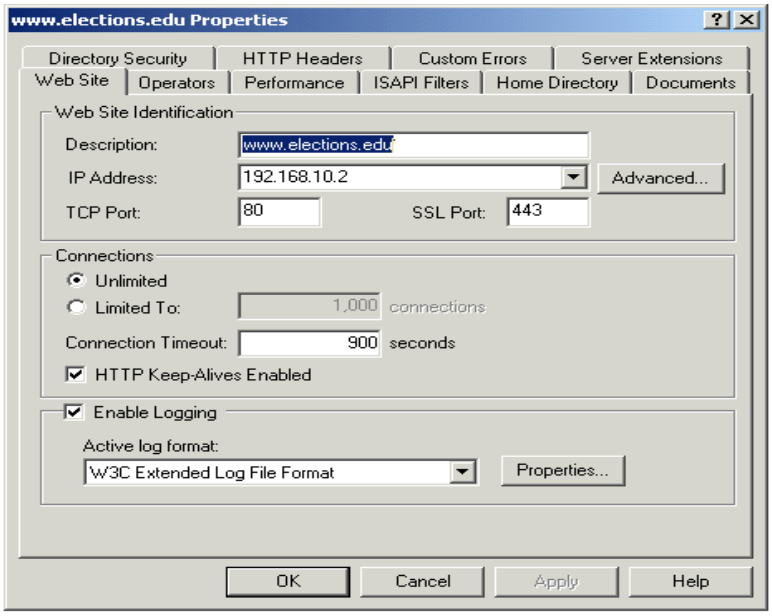
g. Browse the file of certificate from where you saved it (.cer)

h. Then click finish.

i. Return to directory security tab click edit.



j. Choose Require Secure channel (SSL), Click **OK**.



k. From the properties window select web site tag, click advance and enter SSL port number which is 443, Click **Apply**.

Encryption:

encryption is the process of transforming information (referred to as plaintext) using an algorithm (called cipher) to make it unreadable to anyone except those possessing special knowledge, usually referred to as a key. The result of the process is encrypted information (in cryptography, referred to as ciphertext).

- Types of Encrypting Data:

1. **Symmetric Encryption**: is an Encryption algorithm where the same key is used for both Encryption and Decryption. The key must be kept secret, and is shared by the message sender and recipient.

2. **Asymmetric Encryption (Public Key Encryption)**: is an encryption algorithms that use different keys for encrypting and decrypting information are most often called public-key algorithms but are sometimes also called asymmetric key algorithms. Public key encryption requires the use of both a private key (a key that is known only to its owner) and a public key (a key that is available to and known to other entities on the network).

Hashing: is the transformation of a string of characters into a usually shorter fixed-length value or key that represents the original string. Hashing is used to index and retrieve items in a database because it is faster to find the item using the shorter hashed key than to find it using the original value. It is also used in many encryption algorithms.

A hash function that works well for database storage and retrieval might not work as for cryptographic or error-checking purposes. There are several well-known hash functions used in cryptography. These include the message-digest hash functions MD2, MD4, and MD5, used for hashing digital signatures into a shorter value called a message-digest.

The team implements encryption technique on password and important data in the system ,to make it difficult or impossible to known by anyone who tries to detect it, by use asp.net 2005 built in hash encryption function