CHAPTER 4
Data Collection, Analysis and Findings

4.1 Introduction

Data collection is the very next step after identifying the research methodology and the research strategy. Determining the methodology of collecting data depends on the type of data that the researcher wants. Therefore data collection can be a multiple technique, such as observation and interview. The researchers may prefer to use more than one technique for collecting data, which help them to get the range of perspectives (Biggam, 2008).

As mentioned in Chapter 3, there are two ways used for collecting data, namely interview and observation. Both methods are suitable for collecting data to get accurate and correct information about health care management system. Data should be collected specifically to provide reliable and valid base information to address the objective of this research.

On the other hand, analyzing data investigates and evaluates words and observations, which means using the interpretation to improve the understanding of the data collected. However, there is nothing call the best way for analyzing data because the analysis must come through steps and the results of the analysis depends on that steps (Powell and Renner, 2003):

i. The questions that needs to be answered.

ii. Who will use that answers.

iii. The resources of that answers.
4.2 Case study

Case study is a result of observation in this research and it is a method that enables one to learn and analyze a real situation and to develop a solution by applying theoretical concepts and experience. Moreover, through a case study, a researcher faces new problems might never experience before. So, because Health Care Management System is very complicates to understand by interview only, it is very important to include a case study to include every single point, the researcher might think not important.

4.2.1 Study 1 (UH) University Hospital

This case study is a result of observing the patient medication process in (UH) University Hospital, and the systems used in the UH for managing the patient’s information and the process of patient appointment confirmation.

Generally, regarding to the data collected through the interview (appendix a-6), UH is using several systems used for managing the patient’s information and other systems are used for managing different information related to UH. The systems, which used for managing the patient information, are four major systems (patient information system, pharmacy system, laboratory system, payment system) these systems are connected together through database server unit. The nurses are working with the patient information system to manage the patient information such as patient personal information, diagnosis reports, suggested treatments and appointments etc. If the patient has medicine or the doctor prescribed a medicine to the patient the information about prescribing the medicine it’s in other system (pharmacy system). This system is for managing the medicine information (product information, prescribing information). Likewise, if the patient has a laboratory test, all the information related to the laboratory test is managed by the laboratory system.
In addition; if the patient needs to pay for medication, treatment or anything else the payment information is managed by another system calls payment system this system to manage all the payment information in the hospital.

Through observing the process of work in UH the patient cannot see the doctor unless the patient has an appointment. So once the patient has completed the registration process and obtained the green card (patient card), patient has to check with the appointment staff for the appointment booking.

The appointment staffs, who are not necessarily a nurse, will check the doctor availability on another system called (doctor schedule) and give the patient the clinic number. Then, the patient has to go to the clinic, where will get the queue number to meet the doctor.

i. Doctor checks the basic diagnosis repot that comes from the nurse or from the external consultation clinic.

ii. If the patient needs a medicine, the doctor will write down the medicine prescription in the patient report.

iii. Then the nurse takes the report and key in the medication information in the pharmacy system (some doctors are keying in the medicine prescription in the system by themselves).

iv. The patient has to go by himself to the pharmacy and collect his medicine.

v. About the payment there are special staffs, the patient has to go to them and pay the payment and this staff has special system for them to manage the payments.
On the other hand, the process of managing the patient appointment, once the patient has received the treatment, the doctor will write in the green card (patient card) for the next appointment date, if the doctor needs to make another medical check up on the patient in the future. Then, to get an appointment, the patient has to show up at the appointment staff to book the next appointment. The patient is then given an appointment on a specific date. In the next time, when the patient comes to the hospital, patient has to see the appointment staff to confirm the appointment.

4.2.2 Study 2 (HUKM) Hospital of University Kebangsaan Malaysia

This case study is a result of observing the patient medication process in the Hospital of University Kebangsaan Malaysia (HUKM), and the systems used in HUKM for managing the patient’s information and the process of patient appointment confirmation.

Generally, HUKM is using the same method as in UH for managing the hospital information, they have a several systems for managing the patient’s information and other systems are used for managing HUKM information (appendix a-1, a-2 and a-3). The systems that used for managing the patient information are three major systems (patient information system, pharmacy system, and payment system), these systems are connected together through database server unit. The nurses are working with the patient information system to manage the patient information such as patient personal information, Patient diagnosis, patient treatments and patient appointments, etc. If the patient has medicine or the doctor prescribed medicine to the patient the information about prescribing the medicine it is in another system (pharmacy system), this system is for managing the medicine information (product information, prescribing information).
In addition, if the patient needs to pay for medication treatment or anything else, the payment information is managed by another system called payment system, this system to manage all the payment information in the hospital.

Through observing the process of work in HUKM the patient cannot see the doctor unless he books an appointment. So, once the patient has finished the basic treatment in the emergency hall or from any external clinic, the consultation report send direct to the doctor’s room, where there is a nurse or staff, whose main job is to manage appointments between the patient and the doctor. If the patient is paying his/her first visit, the appointment staff or the nurse will make the appointment based on the doctor’s availability (checking the doctor availability in different system called (doctor schedule). From next visit, the patient has to use the system to make appointment; otherwise he/she would not be allowed to see the doctor. This patient has to show the nurse the patient card; the nurse will then check the appointment date and confirms the appointment. Finally the nurse tells the patient to take a queue number and waits to meet the doctor, then the next steps in the doctor consultation room.

i. Doctor checks the basic diagnosis report that comes from the nurse or from the external consultation clinic.

ii. The doctor will write down the medicine prescription in the patient report.

iii. Then the nurse takes the report and key in the medicine information in the pharmacy system (some doctors are keying in the medicine prescription in the system by themselves).

iv. The patient has to go by himself to the pharmacy and collect his medicine.

v. About the payment, there are special staffs, the patient has to go to them and pay the payment and this staff has special system for them to manage the payments.
Once the patient has been treated, and if the doctor needs to make another check up in the future, the doctor will write on the green card (patient card) the next appointment date. Then, to get the appointment, the patient will show up at the appointment staff to book the next appointment. So, now the patient has a specific appointment date. In the next time, when the patient visits the hospital, patient has to see the appointment staff to confirm the appointment.

### 4.3 Data Capture

Based on both of the case studies in UH and HUKM, and the interview, both of the hospitals have the same structure for managing the patient information. In UH and HUKM the nurse has to look in more than one system for managing the patient information (personal information, medicine information and appointment information).

Although the appointment processes are clear for both hospitals, there have been cases where some patients with appointments did not come to the hospitals and other patients without appointments came to the hospital. To manage unscheduled appointments of such type, the nurse and the doctor should know how many patients with appointment and how many of them are coming. This is because in the normal process, the doctor has many things to do in the hospital (operations, conferences, critical care, etc) and needs to manage his time based on the confirmed number of appointed patients.

Actually, the nurse has a daily list of patients, who have appointments with the doctor, but nurse doesn't know how many of them would turn up to see the doctor. Based on this, the nurse manages the doctor time - how long time the doctor has to be in the clinic and how many patients the doctor has to see.
Consequently, in this research the data captured through the observation in both of the hospitals (Case study) and the data captured also through the interview (see appendix a-1 to a-10) summarized in the following:-

i. Both of the hospitals have more than one system for managing the patient information.

ii. The nurse has to work for more than one system to manage the patient information.

iii. For prescribing the patient medicine, the doctor or the nurse has to use another system called pharmacy system.

iv. For managing patient information, the nurse enters the patient information into the system, called Electronic Patient Record. If the staff needs information they have to see the nurse or access the system themselves using their own user name and password.

v. For managing the appointment time, after the patient is registered, the nurse gives the patient an appointment card. Then, the patient has to wait in the queue to meet the doctor. After the treatment and if the patient needs another appointment for instance after one week or two week, patient has to see the nurse again for booking. In the next visit, there is no need for the patient to register again and patient has only to go to the nurse to confirm the appointment. The nurse will then give him the appointment card.

vi. The coordination between the patient and the doctor is done through the nurse by specifying the appointment time and schedule.

vii. The nurse determines the patient appointment based on the doctor’s schedule through another system. If the patient needs another appointment, the nurse has to check the doctor schedule and the patient’s need for the appointment. After the nurse finds the suitable date.
viii. The patient is expected to arrive about 10 minutes before the appointment time because the patient needs to register and confirm the appointment.

ix. For appointment confirmation, the patient has to arrive earlier to the hospital, if the patient wants to see the doctor early, because the rule in the hospital is first come first reserve. If the patient does not have an appointment or has not confirmed the appointment, the patient will not get to meet the doctor.

x. Checking the doctor availability by the nurse through different system called (doctor schedule).

xi. For medicine prescribing, it is through different system.

xii. The consultation payment and the treatment fees it is in separate system for managing the payment only.

xiii. Managing the Products (medicines) it is through different system for the pharmacy.

xiv. For appointment confirmation procedure, the patient has to inform the nurse that wants to meet the doctor and has an appointment. The nurse will then check the appointment in the system and confirms the appointment for patient. If there arises, any additional information, the patient has to see the nurse again. On the other hand, the doctors usually never use the system.

4.4 Data Analysis

In this research, the general analytical strategy is presenting analysis the current system construction in (UH and HUKM) based on the data collected through the interview and observation. After that, presenting analysis of the patient registration process and the appointment process in (UH and HUKM), and then representing the results in flow chart diagram to find out the difference between them. The reason for using this strategy for analyzing the collected data is because of the purpose of collected data is supporting the finding from the literature review.
Therefore, the open questions that have been answered from the interviewee and the data collected from the observation organized in themes (Table 4.1):

i. The system construction.

ii. Current system use.

iii. Patient registration process.

iv. Patient appointment process.

v. Appointment confirmation process.

Those themes help to analyze the respondent's answers (appendix a and observation i.e. case study). In Table 4.1, if the number is 1 means that the answers and the observation data from the respondents in both hospitals are same and if the number is 2 mean that the answers and the observation data from the respondents in both hospitals are not same.

<table>
<thead>
<tr>
<th></th>
<th>UH Nurse</th>
<th>UH Patient</th>
<th>HUKM Nurse</th>
<th>HUKM Doctor</th>
<th>HUKM Patient</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>System construction</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Interview and observation</td>
</tr>
<tr>
<td>Current system use</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Interview</td>
</tr>
<tr>
<td>Patient registration</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>Interview and observation</td>
</tr>
<tr>
<td>process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient appointment</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Interview and observation</td>
</tr>
<tr>
<td>process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment confirmation</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Interview and observation</td>
</tr>
</tbody>
</table>

Based on the (Table 4.1) those hospitals are using more than one system for managing patient information, such as patient registration, patient consultation, patient medication, and the medication payment, and setting the appointment and confirm the appointment. All those systems are separated systems (appendix a) and connected through server database (Figure 4.1).
In addition, some of those systems are used to manage information related to the hospital (see Figure 4.2) such as (pharmacy hospital for managing the products and doctors schedule for managing doctor status, etc). Hence, the user needs to use more than one system to find or to manage different information such as (medicines prescription, it should be through the pharmacy system and the doctor status for patient appointment, it should be through doctor schedule system, etc). The following is the steps that the user has to follow to manage the patient medical information:

i. Doctor checks the basic diagnosis report that comes from the nurse or external consultation clinic.

ii. The doctor writes down the medicine prescription in the patient report.

iii. Then the nurse takes the report and key in the medicine information in the pharmacy system (some doctors are keying in the medicine prescription in the system by themselves).

iv. The patient has to go to the pharmacy and collect the medicine by himself.

v. About the payment there is a special staff they are using payment system to manage the patient payment.
On the other hand, the analysis of patient appointment and appointment confirmation process in both of the hospital (UH and HUKM) are the following:

### 4.4.1 University Hospital (UH)

Based on the data, that have been collected about patient appointment process, (interview and observation) from UH (senior nurse (appendix a-6) and three patients (appendix a-7, a-8, a-9 Patient 1, 2, 3)), the patient has to follow specific procedure and steps based on the patient categorize such as; new patient, existing patient has an appointment and existing patient does not have appointment. For each category there is a different procedure and steps the patient has to follow to get the treatment, (see Figure 4.3 and appendix a).

These steps can be organized into two steps, firstly the registration step and secondly is the appointment step. Therefore, referring to the senior nurse and the patients (appendix a-7, a-8, a-9 Patient 1, 2, and 3) in UH, these steps presented in (Figure 4.3) and summarized as the following:
1) First time, patient without appointment

   i. Patient arrives.

   ii. Get queue number, to see the nurse for basic medical check up.

      - If the patient came from external medical consultation, the nurse follows the consultation report and send patient to the clinic or doctor that’s mentioned in the report.

      - If not, the nurse will specify the clinic or the doctor based on the basic medical check up and patient case.

   iii. Then, patient should see the registration counter,

   iv. Then, patient goes to the clinic,

   v. Get queue number.

   vi. Patient meets the doctor,

   vii. Doctor treats the patient.

   viii. Doctor prescribes the medicine.

   ix. If the doctor wants to see the patient again for medication purpose, doctor will write down behind the patient card the next appointment date.

   x. The patient, who has next appointment, should see the nurse for reservation purpose.

   xi. Nurse books the next appointment date for patient.

2) Second time, patient with appointment.

   i. Patient arrives.

   ii. Get queue number to see the nurse.

   iii. Show the nurse the patient card,

   iv. Nurse look in the system to check the patient appointment,

   v. Then, confirm the patient appointment based on the doctor availability.
vi. Patient get queue number to meet the doctor.

vii. Then, patient meets the doctor and got the treatment.

viii. Doctor prescribes the medicine.

ix. If the doctor wants to see the patient again for medication purpose, the doctor will write down again behind the patient card, the next appointment date.

x. The patient, who has next appointment, should see the nurse for reservation purpose.

xi. Nurse books the next appointment for patient.
Figure 4.3 Patient flow steps (Chart) in UH
4.4.2 Hospital of University Kebangsaan Malaysia (HUKM)

In HUKM the patient procedures to meet the doctor and getting the treatment is more complicated than UH, but the steps are very similar. Based on the data, that have been collected through (interview and observation) about patient appointment process from HUKM ((nurse (appendix a-2, a-3) and patients (appendix a-4, a-5)) the patient in HUKM has to follow specific procedure and steps.

Initially, before starting to explain the steps, the patient in HUKM can be categorize into three categories same as UH, which is new patient, existing patient has an appointment and existing patient does not have appointment, and each categories of patient has to follow different procedure, (Figure 4.4) representing that in flow chart.

1) First time, patient without appointment:- which means, its the first time to come to HUKM and below what the patient should follow:-

a) Patient arrives to the emergency hall.
   i. See the registration staff,
   ii. Then, the registration staff sends patient to the nurse for basic medical check up,
   iii. Then, the patient sends to the emergency hall to wait for the doctor.
   iv. Patient gets the treatment.
      - If the patient needs especial doctor, the emergency doctor should send the patient back to the nurse with the patient case report and the patient medication needed
      - Then the nurse can send the patient with the report to the special doctor.
b) Patient arrives at the clinic or doctor directly. But here the patient should have a patient report from external clinic.

i. Patient arrived to the hospital with the report form external clinic.

ii. Patient asks the nurse for registration purpose.

iii. Nurse registers the patient and getting all the information needed from the report.

iv. Patient got the queue number and wait for doctor.

v. Doctor treats the patient.
   - If the doctor needs to see the patient again the doctor writes the next appointment in the patient card.
   - The patient, who has next appointment, should see the nurse for reservation purpose.
   - Nurse books the next appointment date for patient.

2) Second time, patient with appointment: Patient might arrive to the hospital and it's not the first time, it might the second time or above. In this case, this patient categorized into two types:

a) Second time and patient has appointment.

   This patient have seen the doctor in the previous visit and got the appointment. So the patient comes to meet the doctor for that’s appointment.

i. Patient arrived (not to the emergency hall).

ii. Patient sees the nurse and presents the patient card.

iii. Nurse gets the patient card from the patient and checks the appointment in the system.

iv. Nurse checks the doctor availability.
v. Then, confirms the appointment.

vi. Patient gets the queue number and sees the doctor.

vii. Doctor treats the patient.

- If the doctor needs to see the patient again, doctor will write down the next appointment in the patient card.
- If the patient has next appointment, patient should see the nurse for reservation purpose.

b) Second time and patient does not have appointment.

Some patient comes to the hospital and don’t have appointment, in this case the patient should go to the emergency hall and follow the steps, except the registration step because this patient information already in the system.
Start

Patient Arrival to the Hospital

You Must arrive to the Emergency Hall

Are you coming from external Clinic?

No

Are you existing patient?

No

Do you have an appointment?

No

Register

See the Nurse to get the basic medical check up

See the Nurse or staff set the appointment

Get queue number to see the doctor in the emergency

Meet Emergency Doctor

Do you need to meet specific doctor?

Yes

See the Nurse to get the appointment

No

See the Nurse

Show the nurse your patient card

Nurse check the appointment information & Doctor availability

Does the doctor available?

Yes

Confirm the appointment

Get queue number

See Doctor

Need another appointment

Yes

No

End

Are you existing patient?

Yes

Do you have an appointment?

Yes

See Doctor

End

Figure 4.4 Patient flow steps (Chart) in HUKM
4.5 Findings

After the analyzing process for the current system in (UH and HUKM) is completed, and based on the analysis part in the literature review in this research, several points are appeared to reflect the necessity of developing such this system. Based on the analysis results for both systems the findings are:

i. The nurse has to work through different system to manage the patient information.

ii. If the nurse looks for different information about patient, the nurse has to look at different system.

iii. It is time consuming procedure for the nurse.

iv. It is more time consuming for the doctor.

v. It is not easy for the new user to be a familiar with the system.

vi. The new user, need long time training to understand the system.

vii. It is not easy for the admin to do the maintenance.

viii. It is not easy to add a new module to the system to support another service in the hospital.

ix. If the network is down or network failure everything will stop and the user needs to work manually.

Based on the analysis part and the finding, below is the new module (Figure 4.5) for developing an integrated system to manage the health care information:

i. Easy to use.

ii. No need for the user to look in different system to find patient information.

iii. The system has friendly interface, so the user can easily find the wanted information.

iv. The user can be familiar very fast with the system.
v. The health care management can use the system for managing all the health care information.

vi. The way of developing the system, allowing the admin to extend unlimited modules needs, based on the user requirements or the healthcare service requirements.

vii. If the network is failure, the users still can work as long as if they have internet connection.

![Diagram of the system](image)

Figure 4.5 The new integrated module

According to UH and HUKM case study and data collected (Appendix a-1 to a-10) through the interview and observation, the patient has to go through steps to get the treatment (registration step and the appointment step), those steps in different hospital for getting the treatment are same and the different is the manner for following the steps. Therefore, based on the analysis part, the finding of the current system presented in the following module (Figure 4.6)
The current module aspects summarized in the following:

i. Nurse has to hold all the patient information.

ii. Usually, there is long patients queue; they are queuing to confirm their appointment.

iii. For reducing the nurse working load the management determined special staff for managing the appointments and one of their staff for confirming the appointment.

iv. Usually, the doctor doesn’t know, how many patients have confirmed their appointments.

v. The patient waits long time in queue.

vi. If there is no special staff for the appointment, the nurse has to do this work, which carry over work load for her.

vii. The patient and the nurse need to spend at least ten minutes in confirming the appointment.

viii. For each appointment show on, the patient has to present the patient card to the nurse to confirm the appointment.

ix. The management cannot keep tracking for the confirmed appointment.

x. Only the nurse or the special staff has the authority to confirm the patient appointment.
Based on the analysis part and the finding, below is the new module, below (Figure 4.7) is the new module for reducing the nurse working load and giving the patient the opportunity to use the system to confirm appointment.

![Diagram](Figure 4.7 The new module for managing the patient appointment)

Moreover; the aspects of the new model are summarized in the following:

i. It is not necessary for the nurse to hold all the patient information.

ii. There is not queue any more for patient to confirm the appointment.

iii. It is not necessary from the management to determined special staff for confirming the appointment.

iv. The doctor can know how many patients are confirmed their appointment, which will help him to manage his time.

v. There is no hustle for the patient any more.

vi. If there is no special staff for the appointment, the patient can confirm the appointment by him self.

vii. The patient and the nurse need very shot time for confirming the appointment and booking the patient appointment.

viii. It is not necessary to confirm the patient for the nurse about their appointments.
ix. The management can keep tracking for the confirmed appointment and give powerful reports for all the system movement.

x. The patient has the opportunity to use the system and do some thing by them self.

xi. The conformation process reduced.

4.6 System Testing

The developed system has been tested in two types of testing carried out; to make sure the system is working successfully according to the specifications to achieve the research objectives. First test it has been done by developer (researcher) and the second test it is done by the system users.

The first testing is very important before the system released, which is testing the system interface, buttons, menus, functions, charts, reports and system validation. So, based on the first testing all these are working properly and testing two proved that.

The second testing is very important to get the user feed back. So, the system should be tested in the real live environment, to check the extent of the system efficient. Therefore, the integrated health care management system is ready to use by the system user (Admin, Doctor, Nurse and Patient).

The second testing was in two public hospitals, (UH and HUKM), after getting the approval from the hospital management, system testing was by two nurses from UH staff and five patients in the hospital. In addition, another two nurses form HUKM staff and five patients in the hospital. During the system testing there was system user instruction to guide patient on how to use the system:
i. Enter the patient number (Medical registration number).

ii. Enter the password (NRIC number or the password number).

iii. Click on button (all) to view all the appointments that you have.

iv. Click on button (new) to view all the new appointments that you have.

v. Click on button (cancel) to view all the canceled appointments that you have.

vi. Click on button (close) to view all the closed appointments that you have.

vii. Click on button (postponed) to view all the postponed appointments that you have.

viii. Click on button (confirm) to view all the confirmed appointments that you have.

ix. Press on button (reset) to reset the page.

x. To confirm today appointment press on view today appointment button.
   - Press on button (view) for the appointment that you want to confirm.
   - Press on button (confirm) to confirm your appointment.
   - If your process is successes this message will appear "Congratulation your appointment has been confirmed".
   - If your process is not successes this message will appear "appointment ID number …… has been canceled or closed. If you wish to set a new appointment, please contact the nurse".
1) University Hospital (UH)

The testing method was by timer; to count how long time the user needs to use the health care management system successfully. Table 4.2 presents how long time the nurse in UH needs to create patient profile and setting the appointment for new patient and existing patient.

Table 4.2 UH Nurse, use system for creating patient profile and setting appointment

<table>
<thead>
<tr>
<th>Nurse 1</th>
<th>Start use system</th>
<th>Finished use system</th>
<th>duration</th>
<th>Create Pat First time come</th>
<th>Second time</th>
<th>Purpose for using system</th>
</tr>
</thead>
<tbody>
<tr>
<td>First time use system</td>
<td>11:10:00 am</td>
<td>11:13:50 am</td>
<td>00:03:50</td>
<td>✓</td>
<td></td>
<td>Create Pat and set app</td>
</tr>
<tr>
<td>First time use system</td>
<td>11:15:00 am</td>
<td>11:15:50 am</td>
<td>00:00:50</td>
<td>✓</td>
<td>✓</td>
<td>Set app for existing Pat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nurse 2</th>
<th>Start use system</th>
<th>Finished use system</th>
<th>duration</th>
<th>Create Pat First time come</th>
<th>Second time</th>
<th>Purpose for using system</th>
</tr>
</thead>
<tbody>
<tr>
<td>second time use system</td>
<td>12:00:00 pm</td>
<td>12:03:00 pm</td>
<td>00:03:00</td>
<td>✓</td>
<td></td>
<td>Create Pat and set app</td>
</tr>
<tr>
<td>second time use system</td>
<td>12:30:00 pm</td>
<td>12:30:30 pm</td>
<td>00:00:30</td>
<td>✓</td>
<td></td>
<td>Set app for existing Pat</td>
</tr>
</tbody>
</table>

Once the nurse has finished creating the patient profile and setting the appointment, the patient in UH allowed using the system to confirm their own appointment by themselves (Table 4.3).

Table 4.3 UH Patients use system to confirm the appointment

<table>
<thead>
<tr>
<th>Patient 1</th>
<th>Arrival Time</th>
<th>Starting use sys</th>
<th>Finished use sys</th>
<th>duration</th>
<th>First time User sys</th>
<th>Second time</th>
<th>Purpose for using system</th>
<th>Created by</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:12:00 am</td>
<td>11:14:00 am</td>
<td>11:14:50 am</td>
<td>50 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:17:00 am</td>
<td>11:17:30 am</td>
<td>11:17:30 am</td>
<td>30 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient 2</th>
<th>Arrival Time</th>
<th>Starting use sys</th>
<th>Finished use sys</th>
<th>duration</th>
<th>First time User sys</th>
<th>Second time</th>
<th>Purpose for using system</th>
<th>Created by</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:15:00 am</td>
<td>11:20:00 am</td>
<td>11:21:00 am</td>
<td>1 minute</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:30:00 am</td>
<td>11:30:50 am</td>
<td>11:30:50 am</td>
<td>50 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient 3</th>
<th>Arrival Time</th>
<th>Starting use sys</th>
<th>Finished use sys</th>
<th>duration</th>
<th>First time User sys</th>
<th>Second time</th>
<th>Purpose for using system</th>
<th>Created by</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:55:00 pm</td>
<td>12:05:00 pm</td>
<td>12:06:00 pm</td>
<td>1 minute</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:32:00 pm</td>
<td>12:32:45 pm</td>
<td>12:32:45 pm</td>
<td>45 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient 4</th>
<th>Arrival Time</th>
<th>Starting use sys</th>
<th>Finished use sys</th>
<th>duration</th>
<th>First time User sys</th>
<th>Second time</th>
<th>Purpose for using system</th>
<th>Created by</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:35:00 pm</td>
<td>12:40:00 pm</td>
<td>12:40:55 pm</td>
<td>55 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:45:00 pm</td>
<td>12:45:40 pm</td>
<td>12:45:40 pm</td>
<td>40 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient 5</th>
<th>Arrival Time</th>
<th>Starting use sys</th>
<th>Finished use sys</th>
<th>duration</th>
<th>First time User sys</th>
<th>Second time</th>
<th>Purpose for using system</th>
<th>Created by</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:40:00 pm</td>
<td>12:50:00 pm</td>
<td>12:50:50 pm</td>
<td>50 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:52:00 pm</td>
<td>12:52:45 pm</td>
<td>12:52:45 pm</td>
<td>45 sec</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For doing the process of creating patient profile and setting the appointment in UH (Table 4.2), if it is the first time for the nurse to use the system, the nurse needs 00:03:50, but once the nurse got familiar to use the system, the nurse needs 00:03:00. In addition, for setting the appointment only, the nurse needs 00:00:50, if it is first time, but once the nurse got familiar, the nurse needs 00:00:30. Moreover, for doing the process of confirming the appointment (Table 4.3), if it is the first time for patient to use the system, the patient needs between 00:01:00 to 00:00:50 second, but once the patient got familiar to use the system, the patient needs between 00:00:50 to 00:00:30 second.

2) Hospital of University Kebangsaan Malaysia (HUKM)

Table 4.4 presents the duration of the nurse in HUKM needs to create patient profile and setting the appointment for new patient and existing patient. 

Table 4.4 HUKM nurse, use system for creating patient profile and setting appointment

<table>
<thead>
<tr>
<th>Nurse 1</th>
<th>Starting use system</th>
<th>Finished use system</th>
<th>duration</th>
<th>Create Pat First time come</th>
<th>Second time</th>
<th>Purpose for using system</th>
</tr>
</thead>
<tbody>
<tr>
<td>First time use system</td>
<td>03:10:00 pm</td>
<td>03:13:30 pm</td>
<td>00:03:30</td>
<td>✓</td>
<td></td>
<td>Create Pat and set app</td>
</tr>
<tr>
<td>Nurse 1</td>
<td>03:20:00 pm</td>
<td>03:21:00 pm</td>
<td>1 minute</td>
<td>✓</td>
<td></td>
<td>Set app for existing Pat</td>
</tr>
<tr>
<td>Second time use system</td>
<td>03:45:00 pm</td>
<td>03:48:00 pm</td>
<td>00:03:00</td>
<td>✓</td>
<td></td>
<td>Create Pat and set app</td>
</tr>
<tr>
<td>Nurse 2</td>
<td>04:04:00 pm</td>
<td>04:04:30 pm</td>
<td>00:00:30</td>
<td>✓</td>
<td></td>
<td>Set app for existing Pat</td>
</tr>
</tbody>
</table>

Once the nurse has finished creating the patient profile and setting the appointment, the patient in HUKM allowed using the system to confirm their own appointment by themselves (Table 4.5).
Table 4.5 HUKM Patients use system to confirm the appointment

<table>
<thead>
<tr>
<th>Patient</th>
<th>Arrival Time</th>
<th>Starting use system</th>
<th>Finished use system</th>
<th>Duration</th>
<th>First time Use system</th>
<th>Second time</th>
<th>Purpose for using sys</th>
<th>Created by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>03:15:00 pm</td>
<td>03:15:00 pm</td>
<td>03:15:50 pm</td>
<td>50 sec</td>
<td>✓</td>
<td></td>
<td>Confirm app</td>
<td>Nurse 1</td>
</tr>
<tr>
<td>2</td>
<td>03:16:00 pm</td>
<td>03:16:40 pm</td>
<td>03:16:50 pm</td>
<td>40 sec</td>
<td>✓</td>
<td>✓</td>
<td>Confirm app</td>
<td>Nurse 1</td>
</tr>
<tr>
<td>3</td>
<td>03:25:00 pm</td>
<td>03:25:53 pm</td>
<td>03:26:40 pm</td>
<td>53 sec</td>
<td>✓</td>
<td></td>
<td>Confirm app</td>
<td>Nurse 2</td>
</tr>
<tr>
<td>4</td>
<td>03:49:00 pm</td>
<td>03:49:49 pm</td>
<td>03:49:53 pm</td>
<td>34 sec</td>
<td>✓</td>
<td></td>
<td>Confirm app</td>
<td>Nurse 2</td>
</tr>
<tr>
<td>5</td>
<td>04:13:00 pm</td>
<td>04:14:00 pm</td>
<td>04:14:46 pm</td>
<td>45 sec</td>
<td>✓</td>
<td></td>
<td>Confirm app</td>
<td>Nurse 2</td>
</tr>
</tbody>
</table>

For doing the process of creating patient profile and setting the appointment in HUKM (Table 4.4), if is it the first time the nurse use the system, the nurse needs 00:03:30, but once the nurse got familiar to use the system, the nurse needs 00:03:00. In addition, for setting the appointment only, if is it first time the nurse needs 00:01:00, but once the nurse got familiar, the nurse needs 00:00:30. Moreover, for doing the process of confirming the appointment (Table 4.5), if is it the first time the patient use the system, the patient needs between 00:00:49 to 00:01:00 second, but once the patient got familiar to use the system, the patient needs between 00:00:30 to 00:00:45 second.

Based on the tables of system testing, the results have proves and reflected the efficiency of the developed system by clarifying, how much this system can save nurse and patient time. On other word, where the nurse needs minutes to create patient profile and setting the appointment, the patient needs seconds to confirm their appointment. In addition, the result from the tables are reflecting how much this system is easy to use because the system is presenting all the needed information in a friendly interface, which helps the user for doing their tasks in short time.
4.7 Feed back

During the system second testing, the users (doctor, nurses, and patients) add some perspectives that can make the system more efficient. Referring to the appendix (B-1 to B-15) the following is summary of the feedback outcome from the user in UH and HUKM during the system testing.

a) Nurses in UH and HUKM

According to appendix (B-2, B-3, B-9, and B-10) below is the feedback summary:

i. The System should support all the patient information (personal information, medical information, appointment information).

ii. Within the appointment, include the patient consultation, which means the doctor and nurse can observe the patient medication based on the appointment.

iii. The nurse and doctor can have report about the patients with different criteria.

iv. Within the nurse part, its better if the system can support the nurse schedule task based on the priority, because it helps for managing patients based on their cases.

v. In the patient interface, no need to give the patient more details because it may confuse them, especially most of the patient here are not knowledgeable about using computer.

vi. The patient part should include many details about patient information.

vii. The medication part should be includes in the system.

viii. Saving the process of the patient consultation between the doctor and the patient and the nurse.
b) Doctor in HUKM

According to (appendix b-1) below is the feedback summary:

This system is for managing the patient appointment and allowing patients to confirm their appointment by themselves, but the system should be able to support more functions related to the patient health, such as:-

i. The system should include all the process that can help to support managing the patient information and patient appointment.

ii. Managing the patient medication thought the patient appointment.

iii. Managing the patient consultation through the patient appointment.

iv. The system should be flexible for adding or removing any of the system functions.

v. The nurse and the doctor can manage all the patient information such as personal information, medical information and/or appointment information through this system and no need for them to look into another system to retrieve any information related to the patient.

C) Patient

According to the feedback appendix (see appendix B-4, 5, 6, 7, 8, 11, 12, 13, 14, and 15) the patients are suggesting to use system online

4.8 Conclusion

This chapter has presented the collected data analysis and the findings. In this research, two methods have been used for collecting data – interview (see appendix a-1 to a-10) and observation (2 case studies). Through the interview the data collected proved, both of hospitals are using same structure for managing the patient information. Furthermore observing (2 case studies) the work process in both hospitals provides a comprehensive and deeply details about the systems use their.
Analyzing the collected data it is the next important step, the analysis process consists of several steps starting from organizing the collected data and finished by finding and results. In this research collected data was about the current health care system used in UH and HUKM. Moreover, the current system use for managing the patient appointment and appointment confirmation in both of the hospitals.

Therefore, based on the collected data, the users have to use different systems to find or to manage different information, which means user interface is difficult to use because the users need to look at different user interface to get different information. In addition the system used based on the local network (intranet), which is risk if the network is down. So developing an integrated health care management system come to provide easy user interface and trustable network because it’s developed based on the internet explorer. In addition the patients have the opportunity to use the system online and confirm their appointment by themselves.

4.9 Summary

This chapter adopted to present the collected data form both hospitals (UH and HUKM) by interview (see appendix a-1 to a-10) that presented in the appendix as groups and subnets, and then the observation (see case studies) in both hospitals (UH and HUKM) that presents a deeply details about system used, and then is data capture, which presents the captured data from the interview and the observation (case study).

Moreover, this chapter presents the analysis and the finding, which used as guide line to produce the new system framework and system modules. After that testing the system with sample user in both hospital to get a real feed back, which help to improve the developed system. The next chapter is discussing the system design and system interface.