# The Characterisation of a Web based Medical Insurance Management System to Overcome Workflow Restrictions

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**Summary**
Purpose In the triangular relationship between medical insurance, insurers and insurance provides the efficient interaction between these components is of paramount importance. Currently existing systems satisfy their users needs to variable degree, however they have certain drawbacks. In this study we demonstrate the development of a novel system that aims to overcome these drawbacks and a post-development survey to measure the degree to which was achieved. Approach A novel medical insurance claim processing system was developed according to the requirements of actual users as determined by focus group discussions with 10 system users. Second, the system was implemented in real life claim processing. Finally, 43 users of the system participated in a survey to assess to which degree there requirements were met by the new system and whether they perceived it to be advantageous compared to previously used systems. Findings Participants of the survey found the system to be easy to grasp and use, interfaces easy to understand, and found that its use reduces workload and increases accuracy, and facilitates carrying out the required tasks compared to traditional systems as demonstrated by the results of the survey. Originality The system developed in this study takes into consideration the unmet needs of users of the current traditional systems and aims to offer a more efficient and user-friendly way to process claims. This was achieved by following a meticulous design process to address a number of novel functionalities that lead to a number of improved features to satisfy users' needs.
*Keywords:*
*Medical insurance, Claim Processing, Web-based, User experience, Medical approvals.*

## 1. Introduction

In the field of medical insurance, insurers, medical institutions, and insurance providers form a triangular relationship. Medical insurance systems aim to streamline the interaction between these components [1].

The collection of claims data from different providers needs a standardized process to unify data [2], translate the date using a common nomenclature and to assure valid data [3].

Traditionally, medical insurance systems have been operated manually [4]. This has been associated with a number of drawbacks, such as employee dissatisfaction due to delays in processing as well as lapses in communicating the status of the claims [5]. To overcome these issues, web-based systems were introduced to provide the user with a better overview of the claim life cycle. These systems consists of a website and a web based Medical Insurance System. Submitting claims, processing claims, approving claims, auto generating mails and producing reports are some of the features of the system [5]. In the current medical insurance claims process, there are problems of low efficiency and complex services. When a patient applies for medical insurance claims, he/she must go to the hospital to apply for a diagnosis certificate and receipt and then send the relevant application documents to the insurance company. The patient will not receive compensation until the company completes the verification with the patient's hospital [6] For insurance service providers, insurance costs are high, especially management costs. A significant amount of energy is spent on contract signing and management, maintenance of the database, payment, and collection of funds, claim inspection, data review, etc. [6; 7]

Improving current systems requires developing a unique platform to serve online collaboration features, enabling the three user groups which is the healthcare providers, insurance carriers and their registered clients to communicate and delivering their services in a more efficient manner as this will eventually accelerates the tedious and time consuming insurance-related processes. This project is realized to overcome the difficulties in insurance verification process, which are currently being done manually. The current approach is impractical for emergency cases where timely events turn out to be the real deal in determining a patient's live. Thus, by taking advantage of the Internet, a collaboration platform can be developed to allow faster processing of medical and insurance related documents.

Novel developed Systems enable computer-assisted posting and processing of insurance claims. Medical providers prepare, post and receive health insurance claims. This process is important for running a medical practice. The developed information system performs data receipt, formatting, editing and processing; enables modern technologies and improves functionality of the former more limited options [8].

## 2. Material and methods

### 2.1 Study type and population

This study involved the analysis of current systems implemented for insurance management in Jordan to identify areas with potential for improvement via interviews with a focus group, design and implementation of a novel web-based medical insurance system followed by a survey of a cohort of 43 users of the system including insurance clients, to assess the degree to which it fulfils its purposes.

### 2.2 Study objectives

This research aims to propose a novel medical insurance claim processing system that overcomes the drawbacks of existing systems and to assess the degree to which users are satisfied with its features [9].

### 2.3 Study design

The study involved a number of steps in the following sequence:

First, a focus group discussion was conducted to identify weaknesses of the currently existing systems. A novel medical insurance claim processing system was developed according to the requirements of actual users as determined by focus group discussions. Second, the system was implemented in real life claim processing. Finally, the users of the system participated in a survey to assess to which degree there requirements were met by the new system and whether they perceived it to be advantageous compared to previously used systems.

### 2.4 System development and features

### 2.4.1 System development

The system was implemented as a web based medical insurance management system allowing users to accomplish tasks related to the claim process as well as accessing information about their insurance. The E-insurance system was designed according to the requirements determined by examining the user needs based on focus group discussion outcomes as well as existing literature in this field, and study of similar information systems. The system was designed to run on an easy to use web interface provided by HTML and PHP with MySQL Database. JavaScript was used for interactivity and animation among other technologies. It was designed using a programming language called MySQL [10]. MySQL is a relational database management system (RDBMS) that runs as a server providing multi-user access to a number of databases.

MySQL is a popular choice of database for use in web applications, and is a central component of the widely used in WAMP server.

### 2.4.2 System functionalities

Figure 1 shows the main interface the dashboard of the system.



Fig. 1 Dashboard of the system

### 2.4.2.1 Control of Information and Data Entry

This includes the following:
• Defining and updating medical diagnoses
• Defining and updating medical procedures
• Defining the type of provided service: Inpatient/ Outpatient/ Emergency
• Defining the approved medications within the country in question

### 2.4.2.2 Control of Users and Privileges:

Figure 2 illustrates the process of controlling the users privileges. This includes the following:

• Assigning different privileges with regard to use and access according to job title
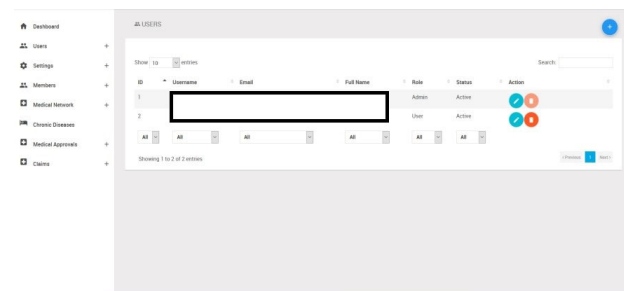• Assigning access to different interfaces according to user type.

Fig. 2 The process of controlling the users privileges

### 2.4.2.3 Control of General Information

This includes the following:
• Currencies
• Capital cities
• Names of cities for each country
• Occupation of client

### 2.4.2.4 Table of Benefits and Exceptions

This unit contains the services that are included in or excluded from the client's insurance coverage and is linked to the claims and approval interfaces.

### 2.4.2.5 Adding users and clients

Through this interface new users or insurance clients can be added to the system, and they are automatically given a unique identification number. The entered information includes:
• Name of user
• Employee number
• National number
• Date of birth
• Gender
After entering all relevant information and insurance card is issued through the card-printing interface.

### 2.4.2.6 Chronic illnesses

If the clients suffer from any pre-existing medical conditions and requires chronic medications the following information will be added:
• Diagnosis
• Date of prescription
• Name and dose of medication
• Frequency of medication
• Define the number of medicine boxes based on the number of tablets per box and the dose and frequency of the medication
This information is saved, and a medication form is issued that contains the clients information, their medications, a designated pharmacy where these medications are dispensed, and a date when the medications are due (Figure 3). A report is also issued once the medication has been dispensed.
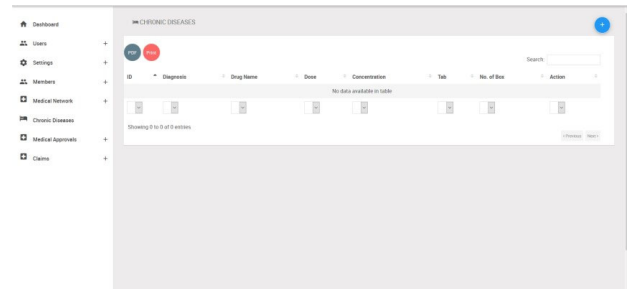


Fig. 2 Chronic illnesses interface

### 2.4.2.7 Medical Approvals

This interface contains the medical service providers that have agreed contracts with the insurance company and includes the terms of the contract. It includes:
• The name of the medical service provider
• Type of provider (hospital, laboratory, radiology, specialist, etc.)
• Defining doctors' and hospitals' specialties
• Starting date of contract
Each service provider is allocated a unique identification number.

### 2.4.2.8 Medical claims

These are processed through a number of interfaces
Claim reception:
Through this interface the claims are received including:
• The provider and their ID number
• Date of the claim
• Number of claims per provider
• Total amount claimed
Claim entry:
The following information is entered:
• Client's name and ID number
• Date of treatment
• Invoice number
• Amount claimed
• Diagnosis
• Medical procedures
Claim auditing:
This includes the discounts and refusals only.
Repeat auditing:
Here claims are double-checked at a higher level to ensure accuracy and quality.
Financial processing:
Claims are approved and transferred to the finance department to be added to the providers account.

### 2.4.2.9 Users interface:

This contains the usernames, passwords, and access privileges of the health insurance employees.

#### 2.4.2.10 Setting interface:

Contains the following:
• Diagnosis code ICD
• Medical procedure code CPT
• Name of local and international medications, their prices, and number of tablets per box.
• Type of medical establishment (Inpatient/ Outpatient)
• Type of specialty

#### 2.4.2.11 Members interface:

Client information can be added through this interface.

#### 2.4.2.12 Medical Network Interface:

Through this interface the medical service providers are added including any relevant information such as names, contact details, price lists, etc. the provider is allocated a serial number and is linked to the claims and approvals interfaces as well as the chronic disease section. The (+) button can be used to add a prescription for chronic medications. The user choses a diagnosis, the name of the medication, the dose, the number of boxes, and then saves the information. A starting and ending date covering a period of 30 days is also specified for each prescription. The prescription is then communicated to the designated pharmacy via email to be dispensed to the client.

#### 2.4.2.13 Medical approvals interface:

There are two types of medical approvals:
Telephone approval: through this interface approvals are issued for hospitals, pharmacies, radiology centers, labs, and some medical procedure. Prescriptions exceeding a certain threshold also need approval. The approval is added by entering the clients ID number and is processed and sent to the provider via email.
Impatient approvals: through this interface approvals are added for inpatient medical services and are sent to the provider by fax or email.

#### 2.4.2.14 Claims interface:

Through this interface the claims are analysed technically and managerially and processed as follows:
• Claims are directly sent to the health insurance fund with the date it was received and a batch number for the provider, detailing the name of the provider, the date the claim was received, the number of claims and the total amount, and this information is saved and printed.
• Claims are entered through an online program as well as in paper version, and they are audited by the appropriate department.

## 3. Statistical analysis

The sample was analyzed using SPSS version 18 [11; 12].

### 3.1 Focus group discussion:

According to a focus group [13] consisting of 10 users of the traditional claim processing systems the following areas with potential for improvement were identified:
•The current systems are difficult to grasp for first-time users
• Using the current systems is time consuming
• Using the current systems is cumbersome
•The current systems are not streamlined and this can lead to loss of data or lack of accuracy.
• It is difficult to add new medical networks.

### 3.2 post-development survey:

1. Sample characteristics:
A questionnaire was distributed to 43 users of the newly developed system including insurance clients, insurance companies, and healthcare providers (Table 1). The participants were asked to complete the questionnaire after exposure to and use of the system in real life. The below tables shows the analysis of sample for the demographic factors. The number of male participants was 32 (74.4%) versus 11 (25.6%) females.

Table 1: Sample characteristics

| Gender | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Male | 32 | 74.4 | 74.4 | 74.4 |
| | female | 11 | 25.6 | 25.6 | 100.0 |
| | Total | 43 | 100.0 | 100.0 | |

2. Statistical Analysis
The questionnaire consisted of 9 questions as demonstrated in table 2 with responses ranging from 1 (strongly disagree) to 5 (strongly agree) on a five-point likert scale [14].

Table 2: Questionnaire questions

| Question Number | Question |
|---|---|
| 2 | I found the system easy to grasp and use |
| 3 | The control of information and data entry was easy to understand and use |
| 4 | The Medical approvals interface is useful and covers all related aspects |
| 5 | Medical claims interface is useful and reduces the daily routine workload |

| 6 | The claim auditing interfaces provides a higher level of accuracy and quality than the manual process |
|---|---|
| 7 | The interface, menu and icons are easy to identify and user friendly |
| 8 | I found the interface and icons hard to follow and understand |
| 9 | I can easily add a new medical network |
| 10 | I found the various functions in the system were well integrated |

Standard deviation for each question was calculated to check whether the participants understood the question and answered it clearly (Table 3). Standard deviation less than one for all of the question except Q8.

**Descriptive Statistics**

Table 3: Standard deviation checking for Each Question

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Q2 | 43 | 3 | 5 | 4.63 | .536 |
| Q3 | 43 | 4 | 5 | 4.72 | .454 |
| Q4 | 43 | 3 | 5 | 4.58 | .545 |
| Q5 | 43 | 3 | 5 | 4.44 | .590 |
| Q6 | 43 | 3 | 5 | 4.60 | .541 |
| Q7 | 43 | 3 | 5 | 4.56 | .548 |
| Q8 | 43 | 1 | 5 | 1.81 | 1.139 |
| Q9 | 43 | 3 | 5 | 4.51 | .551 |
| Q10 | 42 | 3 | 5 | 4.45 | .550 |
| Valid N (listwise) | 42 | | | | |

## 2.1 Question Analysis

For question 2 I found the system easy to grasp and use, the answer was found to be in the acceptance area since the standard deviation less than one.
For question 3 The control of information and data entry was easy to understand and use, the answer was found to be in the acceptance area since the standard deviation less than one.
For question 4 The Medical approvals interface is useful and covers all related aspects, the answer was found to be in the acceptance area since the standard deviation less than one.
For question 5 Medical claims interface is useful and reduces the daily routine workload, the answer was found to be in the acceptance area since the standard deviation less than one.

For question 6 The claim auditing interfaces provides a higher level of accuracy and quality than the manual process, the answer was found to be in the acceptance area since the standard deviation less than one.
For question 7 The interface, menu and icons are easy to identify and user friendly, the answer was found to be in the acceptance area since the standard deviation less than one.
For question 8 I found the interface and icons hard to follow and understand, according to the analysis the answer was found to be in the Rejection area since the standard deviation more than one.
For question 9 I can easily add a new medical network, the answer was found to be in the acceptance area since the standard deviation less than one.
For question 10 which is related to I found the various functions in the system were well integrated, according to the analysis we found the answer in acceptance area and we can accept it since the standard deviation less than one.

## 2.2 Answer distribution:

Table 4 and Figure 4 demonstrate the percentage analysis for each question.

Table 4: demonstrates the percentage analysis for each question

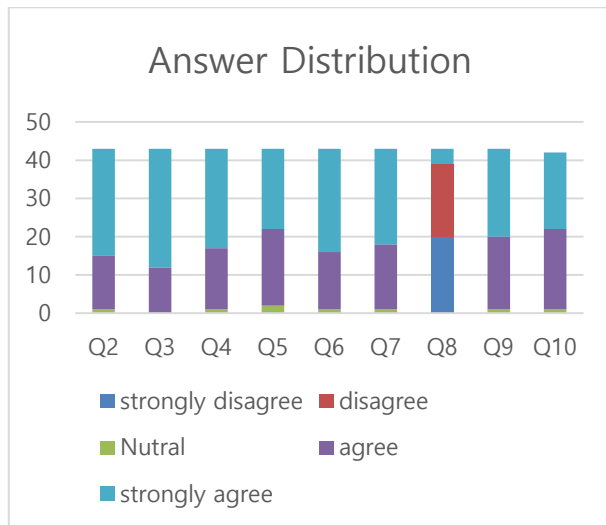| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| Q2 | 0 | 0 | 1 | 14 | 28 |
| Q3 | 0 | 0 | 0 | 12 | 31 |
| Q4 | 0 | 0 | 1 | 16 | 26 |
| Q5 | 0 | 0 | 2 | 20 | 21 |
| Q6 | 0 | 0 | 1 | 15 | 27 |
| Q7 | 0 | 0 | 1 | 17 | 25 |
| Q8 | 20 | 19 | 0 | 0 | 4 |
| Q9 | 0 | 0 | 1 | 19 | 23 |
| Q10 | 0 | 0 | 1 | 21 | 20 |

Fig. 4 demonstrates the percentage analysis for each question

## 4. Discussion

Successful management of medical insurance requires solid links between the insurance provider, health care provider, associated health services, and the client. Existing management system has aimed to facilitate the interaction between these parties. These systems are either operated manually, or since the emergence of information technology applications in this field, are computer-based or web-based. However certain flaws within the system continue to exist and render this interaction less than optimal. Several attempts have been made to improve the functionalities and performance of the systems by designing new systems or adding novel features. There remains, however, room for improvement.

In our study, a focus group discussion with ten users of the traditional claim processing systems that are currently available for medical insurance management yielded a number of points where improvement is required. The most recurrent issues were that new users found it difficult to learn how to use the system and to get familiar with its functionalities. Furthermore, once they got to use the system, it was time consuming and cumbersome to do so. There were several gaps in the interaction between service providers, insurance providers, and insurance clients, as this was not streamlined, leading to a number of problems. Several users noted the hazard of loss of data in the process of managing claims, as part of the process was manual or poorly linked within the system. Adding new components such as new medical networks to the system was also complicated and required a lot of time and effort.

This led to the development and implementation of a novel web-based insurance system that was purpose-designed to overcome the weaknesses identified above. The system has a variety of functionalities and is operated through a number of interfaces that provide a streamlined claim management process that easily accessed and used by all parties involved. After implementation, a questionnaire containing nine questions with answers on a five-point likert scale was developed to assess to which degree the system had fulfilled its aims (Table 2). This was distributed to 43 users of the system and showed that users found the new system easy to grasp and use, the claims management process components were successfully covered in the design, a higher level of efficacy and accuracy was achieved, and adding new medical networks was easily done[17].

The system described in this study, provides the user with a means to easily complete the claim management process, by linking all components of the process in an easily overseen and streamlined manner, while overcoming some of the gaps and shortfalls of the currently used systems.

## 5. Conclusions

Traditional insurance claims processing systems a have a number of drawbacks which are demonstrated both in relevant literature and results of a focus group discussion conducted in this research. The system developed in this study takes into consideration the unmet needs of users of the current traditional systems and aims to offer a more efficient and user-friendly way to process claims. This was achieved by following a meticulous design process to address a number of novel functionalities that lead to a number of improved features to satisfy users' needs. The usefulness and efficacy was confirmed through the survey of actual users of the system, which demonstrated that the system is easy to use, reduces time and effort, and improve the quality of service provided to the whole spectrum of system users.

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