Abstract
The issue of displaced families in the last two decades has become major in many countries due to the increase of natural disasters, armed conflicts or terrorist attacks. It presents great challenges to governments as well as the agencies which manage them. Many agencies reported the difficulty of providing relief to these families because they cannot be tracked after they registered in shelters or camps. It is due to random movement of the families, or the camps are exposed to natural disasters or armed attacks. This study proposes a requirement model for an internally displaced person (IDP) based on online interviews with experts from the International Organization for Migration (IOM) and government officials who worked in direct contact with the displaced families. The requirements were used to develop a web-based mobile application to track, locate, document and verify IDP. An evaluation was conducted to measure the usability of the mobile application. The result of the evaluation suggested that the mobile application is relevant and suitable for tracking IDP. The main contribution of this study is the requirements for a mobile application that is designed specifically to track IDP.

Key Terms: Data modeling, Tracking system, Internally displaced persons, International organization for migration, Conflict, Federal communications commission

Introduction
ICT is a generic definition which is common to any and every communication technology or application. The usage of ICTs is found not only in technologies such as television, radio, cell phones and computers but also their auxiliaries in the form of services linked to them, such as video conference solutions and online learning. ICTs are usually mentioned in reference to particular categories such as healthcare, education, or libraries.

Large data gathering using ICT has seen an exponential rise in the past ten years or so. Political personnel requires it, organizations use it and can observe that the areas of logistics, finance, healthcare, etc. are resorting to data capture, and this is increasing rapidly. Social platforms such as Facebook and Twitter collect data on massive scales, and in all forms: photos, video, audio, as well as PI (personal information). Developments in ICT have resulted in extraordinary enhancements on mobile and smartphones. A mobile or smartphone can prove to be helpful to make calls in the absence of a fixed line. Smartphones have proved to be tools nonpareil in trade and commerce also. The inbuilt GPS facility can guide the users safely to their destination, and thus ensures that to attend the important appointments on time. It does so by coordinating GPS data with a focal mobile mast triangulation.

Global Positioning System (GPS) tracking has made possible thanks to a system of orbiting satellites that work together to determine a device’s location and time. Although once a rare technology after being first introduced in 1973, it is now common for most people with tablets or mobile phones to have some sort of assimilated GPS tracking system. As of 2005, all mobile phones have this technology, since the Federal Communications Commission (FCC) has made it a requirement.

With mobile tracking technology on a person’s mobile device, there is an increased chance of first-aid responders and other emergency personnel locating both the device and its owner. When a person carries a cell phone with GPS technology, the system of satellites calculates the speed and time of the owner’s cell phone signal, as well as its location. This dramatically increases the chances of the lost person being found quickly. The way to access
has changed dramatically since there are increased access to other types of networking services. More mobile device users are using mobile applications to access the Internet instead of traditional browsers. This is due to the increased popularity of such devices and the constant demand for new applications1.

However, organizations in general are facing continuous challenges to produce quality software which are reliable and more effective to compete with companies and under the increase of user demands, from software engineering perspective, identify the user performers and requirement is the first and most important step to create better understanding to user need and demands to ensure reaching a level of satisfaction.

**LITERATURE REVIEW**

In Iraq, the ICT links the private and public sectors so communication can be enhanced and improved. These connections being applied by the ICT should help with job creation, better schools, and improved productivity2. In addition, according to data from International Finance Corp (I.F.C.), Iraq's mobile phone usage has increased exponentially in just the last seven years. Mobile phone subscriptions have risen from approximately 400,000 in 2003 to over 21 million in 20103. Iraq has also achieved significant improvements in the development of the ICT sector4, despite still suffering the continual and ongoing obstacles of security issues and political volatility.

Mobile phones present an excellent opportunity to collect and revised data as network coverage extends to almost all of Iraq. Furthermore, there is an average of 1.56 mobile handsets per Iraqi family, making for a penetration rate of 75%. Yet it cannot be ignored that information is only as relevant as it is current; real-time change presents the biggest challenge of any data collection process. A database may exist but still be redundant without reflecting the changes to a person's circumstances, such as relocation, marital status, even death5. Creating a bridge of communication between executives and customers is key in order to provide the best service. According to previously collected data, developing a process to monitor, collate, process, and revise information brings the user closer to that goal.

Data Modelling can be defined as the analysis of date object and the relationship between them, data modelling is the first step to designing the database and object-oriented programming which initially started with the design the conceptual model which involves defining the relationships between all object and the second step is to create logical model before transforming to the physical schema. By analyzing the requirement modelling the date flows and the process of the target system, the researcher can define the specific task and function and non-functional task for the software6.

Iraq has progressed even some cities like Dhi-Qar is the provision of e-government services and many ministries have provided services through the Internet7. However, getting up-to-date, accurate and reliable data for decision making by government officials are not so easily achieved.

Recently, there are many displaced families in Iraq because of war and other natural calamities like flood, the main goal of the government is to provide the best support to as many families as possible in terms of lodging and monetary aid. It is difficult to get a complete up to date data from the families, as they will move on or be moved to other places if there are new conflicts or disaster in that location.

So even if the data collected are assumed to be complete and correct the displaced families, the delivery of services and monetary relief cannot be given within the specified time as the displaced family now cannot be found after the second relocation. The data of the displaced families need to be up to date and more importantly be able to show their current location for the disbursement of the financial aid8.

People particularly vulnerable in areas or in situations of armed conflict are those who are forced to abandon their homes or flee settlements. These are known as internally displaced persons (IDPs). Displaced people face substantially higher mortality rates compared to the general populace. Furthermore, they have a continued greater risk of physical attack and are often without sufficient accommodation, food, and healthcare9.

The vast majority of IDPs are females and kids who are particularly at risk of exploitation of their fundamental rights. Compared to refugees, the IDPs are more subject to conflict zones and crossfires and face the threat of being used as hostages, shields, or targets by the belligerents10.

As per government statistics, in Colombia, 6.5 million people were registered as IDPs during mid-year. Other nations where a substantial number of IDP populations were sheltered or aided by UNHCR included Iraq (4.0 million), Sudan (2.3 million), Pakistan (1.6 million), South Sudan (1.5 million), the Democratic Republic of the Congo (1.5 million), Nigeria (1.4 million) and Ukraine (1.4 million)11.

In Iraq the International Organisation for Migration (IOM) collected data from January 2014 to 5 November 2015, pertaining to the status and whereabouts of displaced Iraqi individuals. The organisation identified about 3,181,176 IDPs (530,196 families) across 103 districts and 3,542 locations in the country12.

These IDPs moved around constantly and were displaced in multiple areas due to the armed conflict, which elucidates why the majority of government and non-government agencies which have gathered the data do not possess all the most recent facts and details of the displaced households, such as names of each family member, passport numbers, and date of birth, which have been stored manually or also on their individual servers. Furthermore, retrieving precise information is arduous, thereby making it tougher to help these families, particularly if the areas they shifted to are still insecure13.

This data needs to be updated and categorized so as to be useful14. If a request is made for specific data, a long procedure of paperwork is necessary to recover and utilize the data from the various agencies so a decision can be made to offer relief and monetary support for the displaced households15. Since these agencies are the sole sources for the necessary information to make decisions about these circumstances, the government and the organisations must create new systems and improve existing ones to gather, process, and update data and, in our case, assimilate with IDPs to reduce the difficulty in transferring information for decision making and ease the communication which is considered the key challenge16.

A constantly round-the-clock updating system will improve the efficacy of the data-driven systems, and this can be defined as a series of steps that enhance the data quality by updating the existing data on an hourly basis. Other techniques are:
standardize or normalize the data, acquisition, error localization and rectification, record linkage, data assimilation, source trustfulness, and cost optimization.

Many changes have and will accrue while providing service to people in Iraq, including health, agriculture, and social services. These changes make it necessary that the data gathering process is enhanced from all sources such as institutions, ministries, and non-profit organizations, so that decision makers get solid, up-to-date data to ascertain the degree and amount of aid they can offer.

Data updating, however, is mainly used for its importance in its ability to synchronize with and display real-time happenings. The data is regarded by some researchers as a part of the whole data process since it shows the recent changes about the use of collected data. Updating data can be highly valuable for displaced people since it can harness data from both government and non-government organizations that eliminate common problems in tracking IDPs in conflict areas. The rise of iPad, Android phones, and other mobile platforms complements with the rise of organizational information systems' use of the mobile network as its major platform.

Although there are new technologies such as smartphones that come with internet connection given by mobile companies, there are still many families who are not convinced to provide data because of fear, which is a hindrance for the advancements of governments offices. Updated data can help countries like Iraq, which is affected by flooding and threats of war that cause families to change locations frequently. It can help in sending displaced families the relief effort they need.

**Internally Displaced Person Management Model**

This task aims to understand the flow of system function, the tasks that they perform and the environment in which they perform these tasks. The whole point of any new product or service is to help people to do things better. These “things” can include activities such as carrying out work tasks, informing IDP, using SMS, and monitoring position Fig.1 show the process of registering IDP and sending the mobile link using SMS all the way to monitoring position and distributing funds.

The system's process of managing the displacement come as the main goal and in the figure 1 this process is well be explained in details as shown in table 1 as follows:
The process of IOM TS explains the steps in which displaced persons flee from their area and register them in system along with the persons in order to distribute the funds and supplements, on the other hand, Fig. 1 gave details about all the stockholders who represented by IOM admin and local government admin and authorized user admin process of connecting and using the system.

Logical Design

The process of logical design involves arranging data into a series of logical relationships called entities and attributes. An entity represents a chunk of information. In relational databases, an entity often maps to a table. An attribute is a component of an entity and helps to define the uniqueness of the entity. Therefore after gathering the requirement from the expert in IOM and government officials then categorize and define this requirement according to the expert needs, analyzing these requirement is important in order to better understand the actor’s role and the relationship between them, logical design is the next step as shown in Fig. 2.

Logical Diagram for IOM TS

One output of the logical design is a set of entities and attributes corresponding to the fact tables and dimension tables. Another output of mapping is operational data from the researcher source into subject-oriented information in study target data warehouse schema. You identify business subjects or fields of data, define relationships between business subjects, and name the attributes for each subject as shown in Fig. 3.

---

### Table 1: International Organization for Migration TS Management Process

<table>
<thead>
<tr>
<th>Step No</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Displacing happened</td>
<td>When conflict or natural phenomena happen the displaced families come in large waves</td>
</tr>
<tr>
<td>2</td>
<td>Gathering basic information</td>
<td>The IOM teams take (name, phone number, ID) for only the paterfamilias regardless of the family number</td>
</tr>
<tr>
<td>3</td>
<td>Information entering</td>
<td>IOM teams enter (name, phone number, ID) into IOM TS SYSTEM</td>
</tr>
<tr>
<td>4</td>
<td>Information save</td>
<td>System save the record</td>
</tr>
<tr>
<td>5</td>
<td>First level of verifying the IDP</td>
<td>System send SMS to phone number (plz download the application using the link bellow and complete registration and upload your document)</td>
</tr>
<tr>
<td>6</td>
<td>IDP registrations</td>
<td>IDP download the mobile application</td>
</tr>
<tr>
<td>7</td>
<td>The second level of verifying the IDP and documenting</td>
<td>Login using his personal (ID) and fell the information (family number, reason of displaced, home address, upload personal document) Note (the application will offer number of records to bellow according to family number)</td>
</tr>
<tr>
<td>8</td>
<td>The third level of verifying the IDP and documenting</td>
<td>Information and the document save in the system and the IOM admin approved the information and document</td>
</tr>
<tr>
<td>9</td>
<td>Tracking</td>
<td>Based on the information the system will save GPS (Latitude, Longitude) of two location (current location (camp) and home location based on address and set up range of 5 KM)</td>
</tr>
<tr>
<td>10</td>
<td>Tracking</td>
<td>1. If the IDP leaves the camp for whatever the reason and cross the 5 KM range. 2. The system sends SMS (plz go back to camp or update your information.</td>
</tr>
<tr>
<td>11</td>
<td>Tracking</td>
<td>If the IDP leave the camp and enter the 5 KM range of home address (means he is back home)</td>
</tr>
<tr>
<td>12</td>
<td>Tracking</td>
<td>The system send SMS to local government (this family go back home plz check their records in the system)</td>
</tr>
<tr>
<td>13</td>
<td>Funds distribution</td>
<td>1. If IOM admin want to distribute funds and supplements 2. the system check the current location 3. the system check the nearest location of distribution</td>
</tr>
<tr>
<td>14</td>
<td>Funds distribution</td>
<td>1. The system sends SMS to IDP (plz go to this (location) at this (date) to receive your funds). 2. The system save the funds amount into IDP records.</td>
</tr>
<tr>
<td>15</td>
<td>Add agency</td>
<td>1. If an agency request to assist the IDP 2. The IOM admin add (username and password) for the user who represents the agency</td>
</tr>
<tr>
<td>16</td>
<td>Add agency</td>
<td>The system send SMS (username and password) to the agency to check only (search and report) of the IDP records</td>
</tr>
</tbody>
</table>

---

![Fig. 2: Guideline to Design Data Modeling](image)

![Fig. 3: logical diagram for IOM TS](image)
The elements that help you to determine the data warehouse schema are the model of our source data and your user requirements. Sometimes, they can get the source model from target organizations data model and reverse-engineer the logical data model for the data warehouse from this. The physical implementation of the logical data warehouse model may require some changes due to your system parameters e.g. the size of the machine, the number of users, storage capacity, type of network, and software.

**LIMITATIONS & RECOMMENDATIONS**

- Functions in the system were designed according to limited time and budget, however, some function needs to be upgraded like using the camera to take a picture of the document and then uploading. Scanning tool will provide a better quality of document uploaded.

- This study managed to gather 30 subjects in the evaluation, both for functionality and user usability tests. It was able to provide sufficient data. However, a bigger set of data may explain the findings in more detail. Hence, it is highly recommended that future studies consider users of various other countries, covering various services besides the immigration.

- For the purpose of this study, the prototype has been tested using limited environment for the real implementation, the web-based mobile application needs to be tested using online environment to provide a better result. For that purpose, more time and budget are required because more considerations including technical infrastructure should be planned and put in place.

- The data were collected quantitatively only. This study recommends that qualitative data would make the discussions more convincing. Hence, future studies should consider observing users when they interact with the portal, and interview them. It is significant because they can provide deep elaboration on the findings.

**REFERENCES**


