A Location-Based Service for Handyman Order Placement

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Abstract: There has been a growing need of handyman services in most countries around the world which is attributed to several contributing factors which include, local demand, market influence, having second homes, commercial property maintenance and people's lives becoming busier and more hectic with more people now looking for help with odd-jobs around their home, like changing light fittings, or putting up shelves. The existing handyman services solutions striving to solve this problem are defragmented offering contacts scattered in the web and there is no structured method of determining the Location and quality of service provided by these handymen. The proposed model is a mobile application for locating handyman services within a locality to help in streamlining this process and provide a structured approach for determining location and quality of service to be provided by the handymen. The application was developed in android operating system because of its popularity among many mobile users.

Keywords: Handyman Services, Android, Location Based Services

1. Introduction

Handyman services are odd jobs that fall under the category of informal sector in various countries. Several studies (Amenya, 2007; Irungu, 2015) suggest that there are elevated levels of the informal sector because of increased rural to urban migration and the inability of the formal sector to be able to absorb the vast numbers of job seekers in the country which leads to creation of new job opportunities in the informal sector such as handyman service jobs.

The demand for handyman services has been because of several influencing factors. According to The Startups Team (2015), demand for handyman service jobs is attributed to the increasingly busy and hectic lives that people lead. Several studies (Balasundar, 2013; Goldberg, 2015; Kenya Business Ideas, 2015) suggest several factors contributing to the growing need for handyman services as having second homes, income/rental units and commercial property maintenance. Secondly, most countries around the world have experienced a decline in service costs and increase of new phone models which has seen rise in phone handyman services.

Locating handyman services is difficult when one relocates or travels to new areas since these service providers are situated across different areas and differ in costs, quality and type of service that they provide. In case of emergencies like tap leakages, car breakdown among others, it becomes difficult for one to access these services immediately. In cases where the emergency is serious such as an electric fault from electronic equipment’s, this can lead to calamities like fire which have profound consequences (Residential Tenancies Authority, n.d; South Liverpool Homes, n.d).

Another great challenge faced by clients is determining the quality of services to be provided by these handymen. According to Soft Kenya (2015) in an article about investment and business opportunities in Kenya, potential clients perceive small businesses as lacking the ability to be able to provide quality services. The existing solutions are defragmented offering just contacts scattered in the web. This makes the process of finding and locating these services difficult and tedious.

This paper presents a mobile application based on android operating system that uses location based services to locate handyman services within the user’s location and has a rating feature for rating handyman services to ensure quality delivery of services by the handymen.

2. Literature Review

Location based mobile services is the use of mobile devices to be able to provide users with location sensitive information such that a user can access information based on a suitable or preferred location. Mobile location based services make use of the Geographic location of personal phone or
Navigational device and use embedded satellite navigation receivers or network-based technologies like triangulation from the location of the base station transmission cells to be able to determine the position of the device (EGNOS, n.d.).

According to Thiga (2013), context specific information may be delivered to the user by first establishing the users’ location by using existing technologies and services such as Radio Frequency identification, Bluetooth, Near Field Communication (NFC), wireless networks and location-based systems using Global Positioning Services (GPS) technologies. The information is then used to identify relevant information that is relied to the user using short messaging service (SMS), Mobile applications and WAP (Wireless Application Protocol). All these technologies are suitable and applicable in high end devices that support WAP or are JAVA enabled, but are not readily available or accessible universally to all types of mobile devices (Azene, 2014; TechTarget, 2009).

Location based services have been around since 2000 with their use mainly in commerce with a subscription based business model. Developers are now able to introduce millions of consumers to any Location-Based Management System (LBMS) with the release of Apple’s 3G iPhone and Google’s LBS enabled Android operating system. Location Based Mobile services have topped the global league. According to survey conducted by TNS Global, three quarter of all Kenyans with access to mobile phones are willing to share their location details with close friends, family members and business associates which means big opportunities for businesses (Omondi, 2012; TechTarget, 2009).

Study further reveals that almost one fifth (19 per cent) of the world’s six billion mobile users are already using LBMS, with more than three times this number (62 per cent) of people globally are aspiring to use LBMS. “In Kenya, only 8 per cent of mobile users currently use LBMS but a huge 74 per cent would like to. LBMS users are increasingly using services to enrich their social lives, with one in five (26 per cent) using it to find their friends nearby and 12% ‘checking in’ through platforms like Foursquare or Facebook places,” states the report (Omondi, 2012; TechTarget, 2009).

LBMS are services that are provided through mobile applications by utilizing the network connectivity and ability to detect the user’s location to be able to adapt the service to a geographic location. An LBMS requires five basic modules: the service provider's software application, a mobile network to transmit data and requests for service, a content provider to supply the end user with geo-specific information, a positioning component and the end user’s mobile device. By law, location-based services must be permission-based. That means that the end user must opt-in to the service to use it. In most cases, this means installing the LBMS application and accepting a request to allow the service to know the device’s location (TechTarget, 2009). A number of technologies are currently used to provide Location based mobile services. They include:

**NFC** According to NFC (2016), Near Field Communication, or NFC, refers to an offshoot of radio-frequency identification (RFID) with the exception that it is designed for use by devices within proximity to each other. This technology enables you to interact securely with the world around you just with by a simple touch. NFC is likely to transform location -based services with their flexibility to embed on wristbands or payment cards, which makes it so easy to use for mobile device owners if the device is within range, it works without any manual intervention unlike other technologies. One of the application of NFC is checking mobile users into a room as they walk in and being able to offer location-sensitive information. It is also used as supplement to GPS to be able to offer more accurate information about the location or position of a device or object (Griffiths, 2012).

According to Wood (2014), **Wi-Fi** is a local area wireless computer networking technology that aids networking of electronic devices. It is a product based on the institute of Electronic Engineers (IEEE) 802.11 standards. Wi-Fi enabled devices emit regular ‘probes’ when trying to connect to Wi-Fi. Wi-Fi access points can be placed in a certain way inside a venue, so that the position of a given device in the space can then be calculated, using the strength of the phone’s probes and timing to estimate the distance from each APC for customers, it can be used to provide people with relevant information to approximately where they are standing Common use of Wi-Fi LBS is restaurant, stadia and even healthcare (Thiga, 2013).

According to (SIG, 2015; Thiga, 2013), **Bluetooth** is the global wireless standard that enables convenient, secure connectivity for an expanding range of devices and services. Exchanges data over short distances using radio transmissions. Enables devices to form networks and exchange information based on master-slave connection model. It has been used to obtain information in a number of location based mobile marketing applications such as beacons, Bluetooth Mobile Advertising and Bluetooth mobile context aware system.
Global Positioning System (GPS) is a satellite based navigation system that is made up of 24 satellites that are placed into orbit by the U.S. Department of Defense. It circles the earth twice a day in a very precise orbit while transmitting signal information to earth. This information is taken up by the GPS receivers which make use of triangulation to calculate and determine the user's exact location. The GPS receiver also compares the time a signal was transmitted by a satellite with the time it was received to be able to determine the location distance. The time difference can tell the GPS receiver the distance of the satellite from its current location. With distance measurements from a few more satellites, the receiver can now determine the user's position and display it on the unit's electronic map (Garmin, n.d).

3. Handyman Services Locator

This section describes the System Analysis, System Design, Implementation and Testing of the proposed solution.

3.1 System Analysis

This phase involves analyzes of a list of functional, nonfunctional and technical system requirements as gathered from the users to assist in determining the feasibility of the system to be developed. This research used a survey that was administered by means of questionnaires to a sample of handyman services persons and random ordinary people out of a target population. The questionnaires structure employed both closed and open-ended questions. A staged approach was used to produce a valid questionnaire. Cross-checks were also used to ensure validity of the questionnaire. The findings of this research lead to the design, implementation and testing of a mobile application that would help in finding handyman services within a locality.

a. Location of the Study

This research was carried out within Nairobi County. The area of research was in south B due to the type of population settlement who form the client base of the application and the variety of handymen found within the area. Most people there also own smartphones therefore the location was well suitable.

b. Target Population

The target population comprised of 83 people. This research focused on handymen offering different services such as plumbing, electrical appliances repair, car repairs among others and ordinary people mostly tenants living around Nairobi who need these handyman services.

c. Sample Size

To arrive at the sample size, the study used a mathematical formula as shown in Equation 3.1, which means every person got a chance to be part of the sample population. The desired sample size obtained was 96 however based on availability, the respondents that were involved in the study were 83 in number. This sample size was selected using simple random sampling method. The sample size was grouped into two groups namely 20 handymen and 63 clients who were all based within Nairobi.

\[
\frac{NZ^2 + 0.25}{d^2 \cdot (N - 1) + (Z^2 \cdot 0.25)}
\]

where:
- \( n \) = Sample size
- \( d \) = Precision level (mostly 0.10 or 0.5)
- \( N \) = Total population
- \( Z \) = Statistic for a level of confidence (for example 1.96 for 95% confidence level)

Equation 3.1 Random Sampling (Frerichs, 2013)

d. Sampling Strategies

The research used simple random sampling method where respondents were selected randomly from the target population. This technique was used to ensure that all the respondents in the target population had an equal chance of being chosen.
3.2 System Design

This section was used to explain the Design and Architecture of the developed solution as a proof of concept.

System Architecture

The client-server architecture was adopted for the development of the system. This acts as a distributed model that divides tasks between resource providers known as servers and service requestors known as clients. Figure 3.1 shows the architecture of the system and how its various components interact. The proposed model uses GPS to provide location based information to the mobile app clients of the proposed system which includes a front-end which is an Android application, a back-end web application and a database. The client requests for location details from the GPS. These Location details are then used to determine the location of the client to be able to provide information based on his location. The web dashboard is used for reporting and monitoring the data submitted by the client mobile app to the database.

The database is used to store data from both the client mobile application and the web dashboard. The server is used to process request between the clients and the database.

![System Architecture Diagram](image)

**Figure 3.1 System Architecture**

A feasibility study was made for the project through the reviews of literature. Unified Modelling Language (UML) notion was used for modelling and designing diagrams to present both structural and behavioral aspect of the system (Object Management Group, 2015). The study employed four different UML diagrams for its design which included a use case diagram, database schema, sequence diagram and entity relationship diagram.

i. Use Case Diagram

The Use Case diagram shown in Figure 3.2 was used to model the system functionality. The system functionalities were identified which lead to identification and separation of the system into actors and use cases. The actors of this system were handymen, clients and the administrator. The use cases or actions to be performed were represented as text (Object Management Group, 2015).
ii. Sequence Diagram

The system sequence diagram shown in Figure 3.3 was used to show how the information was passed between the main entities of the system and used to model the system flow (Object Management Group, 2015).
iii. Entity relationship Diagram

This was used to show the tables, their attributes and relationships and was used to model the database as shown on Figure 3.4 (Object Management Group, 2015).
3.3 Implementation and Testing

After the system design discussed in section 3.2, the designs were converted into the actual system. The mobile application was developed in Android platform using java for android and PHP5 programming language together with JavaScript Object Notation (JSON) which was used for building the communication logic for communicating with the data base. Android was preferably chosen as the main platform for developing the mobile application due to its ease of learning and use, and availability for free use with a large community support.

The web system has been developed using Laravel (https://laravel.com) which is a PHP5 development framework and web scripting languages which included HTML5, CSS, JavaScript and jQuery. The main development environment was the NetBeans IDE (https://netbeans.org/) running on Linux operating system. Apache web server was used to host and test the system locally. Laravel was chosen as the main development framework due to its stability, security features and high performance. The database that was used for the storage and retrieval of data was MySQL since it is free, open source, light, easy to use and to customize (Oracle, n.d.).

The system was then put on a series of tests to test the workability and whether it meet the requirements as outlined in the actual designs. This section presents the implementation and testing results. The following are screenshots of the mobile application and their functionalities

a. Registration

A user is supposed to register either as a client or handyman. When one registers as a handyman, when he logins for the first time he must pay to activate his account as shown on Figure 3.5.

![Figure 3.5 User Registration Screen](image)

b. Search Handyman Process

The client selects the category of service then the system searches for a handyman in that category near the user’s current location and displays the request on a map as shown on Figure 3.6. The algorithm used for implementing the search works by first fetching the users coordinates i.e. longitude and latitude from the database and fetching the desired service from the search request. It then compares this against the locations and services of different handy persons registered in the application and relays the results of the handymen providing the desired service 5km away from the client on the map. The client can then can choose to request any handyman of his choice by clicking the handymen displayed on the map and viewing their profile details. The handyman then receives a notification of this request.
c. Rating Handyman Process

When the handyman finishes his work, he requests the client to rate his services. The client selects the ongoing services option and clicks on the handyman. The application allows the client to rate the handyman via a comment and five-star rating feature as shown on Figure 3.7. When he finishes rating, the handyman gets a notification about this and the system registers this as finished work. The rating algorithm works by checking whether the client initiating the rating request has an ongoing work request with the handyman to be rated. If so, the client is allowed to rate the handyman and this rating score is updated on the handyman details. If the client does not have a pending ongoing work request, then the rating ability is disabled. The algorithm computes the total score by adding the score value from the five-star rating widget with the current handyman score in the database.

Figure 3.6 Search Handyman Screen

Figure 3.7 Search Handyman Screen
d. Web Dashboard Interface

This web dashboard shown in Figure 3.8 is used by the system Administrator for managing the mobile application. He is the main system administrator who has super administrative rights over the system and can access all the features of the system. He can edit the details of handymen, add them into the system and remove them if they are no longer needed in the system.

![Handyman Web dashboard Interface](fig3_8.png)

**Figure 3.8 Handyman Web dashboard Interface**

**User Testing** the study sought to obtain the users feedback on the application. This was done through supplying of post questionnaires as to get their feedback on the mobile application. Users were given instructions on how to download and interact with the application by being supplied with the name of the application on the Google Play Store. This is covered in the sections that follow below.

i. Accessing the Application

The application was hosted on Google play store for testing. A bulk SMS account was also obtained for use in sending the messages to the users during the testing process. The users could be able to interact with the application by downloading, launching the application and creating dummy client and handymen’ account for testing. The Figures 3.9, 3.10 and 3.11 show the results of the tests.

![Is Search for a Handyman Service working as expected?](fig3_9.png)

**Figure 3.9 Search for a Handyman Service**
Usability  The study sort to see if the application was easily understood and the users could interact with it without any issues or need for any human intervention need to explain to them on how to use it. Figure 3.12 shows the response from users with regards to their interaction with the application.
4. Conclusion

This research paper established the factors that lead to acquisition of handyman services as increased busy and hectic lives led by people today, work, family time and other commitments which leads to demand for odd jobs. A number of existing technologies are already currently being used to determine and locate handymen services within an area. From the data collected, it was clear that the users were in need of a new system that would strive to address the shortcomings of the already existing systems.

First, the users wanted a system that would provide them with the details of a handymen near their location or current place of settlement which is not the case with the already existing systems. The research discovered that the existing systems currently used to locate handyman services lack in providing trust in the quality of service being provided by handymen as desired by the clients. The results led to the development of a Handyman application with both a web and mobile interface to streamline the process of locating Handyman services within a locality.

The developed solution serves to build the public trust in handyman’s quality of service by providing them with a rating feature and work history information to determine the quality of service. It is very interactive, easy to use and suitable for on demand services which greatly increases its relevance and the chances of it being adopted and is a distinguishing factor from the current existing systems. It provides users with details of handyman’s in consideration to the nearest location, best price offered and highest rating score making it more suitable and efficient as compared to the existing systems. The new system is also of relevance and of great importance to the informal sector as it seeks to streamline the process of acquiring these handymen with the current rise and demand of handymen in this sector.

i. Advantages of the Proposed Mobile Application

Compared to the existing systems used to locate handyman services within a locality, the proposed solution offers a more streamlined approach for locating handyman services within a locality. First, the application has been developed to target android mobile users who form the majority of users as compared to web users currently targeted by the existing systems. Secondly, the rating score and completed work statistics for each handyman serves to provide guarantee in the trust and quality of services to be provided by these handymen. The application is more interactive as it uses live Google maps to show the location of handymen and clients and makes the process of accessing handymen fast and very efficient.

ii. Limitations of the Application

This mobile application only targets handyman services which are majorly home-based repairs and maintenance. Secondly, it is only useful to smartphone users running android operating system. Finally, the application is dependent on the availability of internet connectivity for users to be able to send and retrieve data, hence Internet connectivity is required for one to use the application.

iii. Recommendations

The new system is very important to the informal sector as it provides a platform for the job seekers mainly handymen to connect easily and efficiently with their clients by streamlining this process. It serves to build the public trust in handyman’s quality of service by providing them with a rating feature and work history information to determine the quality of service. It also serves to meet the growing need for on demand handyman services by easing and fastening the process of acquiring handymen.

iv. Suggestions for Future Study

The researcher has seen that the proposed solution can be expanded in the future. The following can be used to further enhance the system:

a) Implement the application for different mobile platforms such as Windows, iPhone and blackberry to cater for users who do not have Android mobile phones

b) Integrate other payment gateways to aid in the activation of handymen.

c) Have premium features on the application that require clients to pay to be able to use as an alternative revenue model for the application

d) Support other common languages such as Kiswahili to increase its usability and target more users.
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