

## Geo-Located I.T Assets Management: The Case of University of Sharjah, Sharjah, UAE

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**Abstract.** The University Of Sharjah (UOS) is one of the leading academic institutions in the Middle East and around the world. An important part of its appeal lies in the fact that it provides students and faculty cutting edge hardware and software facilities as well as a completely networked environment using the latest information and communication technologies. In the process of building up this vital capability, the university has acquired thousands of individual pieces of hardware equipment and software assets. The current tools used by UOS to manage these assets are not efficient since they present considerable difficulties in knowing the exact location for these assets. The present research aims to find a solution to this problem by developing and presenting a Geo-located asset management system which take benefits from the Geographic Information Systems (GIS) technology. With GIS systems, UOS's managers can manage its asset efficiently with an access to an informed operational picture.

**Keywords:** Assets management, IT assets, Geographic Information Systems, GIS, location, QGIS, University of Sharjah.

### 1. Introduction

Many departments within the University Of Sharjah (UOS) have an interest in knowing information about the presence, location, and the state of all assets owned by the university. This is very important from several aspects in order to ensure the safety and security of the assets against misuse, theft, and accidental damage. It is also important to know whether students, teachers, researchers, and administration are using the assets in an optimal manner and for planning future acquisitions, additions, and changes in resource allocations.

For the management of physical assets, presently UOS uses an asset tracking system which is web based provides solutions to the university which intends to automate the tracking process of its assets such as furniture , IT equipment, Office equipment etc., which are distributed at the various locations of UOS with the help of bar-coding technology . By this technology, all the information will be registered in a database which can be displayed in records in a table format.

Geographic Information Systems (GIS) offer an elegant solution to the problem of management of assets that can help in locating, analyzing, managing, and presenting a base for management of such assets. Implementing GIS at UOS will allow management to locate individual assets at the click of a mouse button in one picture instead of relying on thousands of records maintained in the current system.

While the university has many types of assets, this research focuses on management of Information Technology (IT) assets such as CPUs, printers, servers, multimedia facilities in classrooms located indoors on its premises.

This research paper explores the present system of IT asset management and its strengths and shortcomings to emphasize the need for change by identifying the advantages of GIS-based management approach.

## **2. Research Method**

In order to achieve the aim of this research, we first assessed the existing system of asset management at UOS. Interviews with the 'Fixed Assets Department' manager helped gain an insight of how the department manages fixed assets presently. The manager also provided us with information about the list of IT assets and location currently available with the department in Excel spreadsheets.

The second step was to carry out a review of literature on the use of GIS systems for asset management with particular emphasis on the automatic acquisition of asset location in indoor situations. We also studied the possible methods of interfacing this data with a database maintained as GIS maps using QGIS software. An appraisal of the available technologies mentioned in earlier research and potential vendor websites helps determine the desired system state for efficient IT asset management.

Finally, we used the open-source Quantum Geographical Information System (QGIS) software to draw a GIS map of the UOS Women's Campus, UOS Main Building, W7 Building (College of Communication ground and first floor) and add the existing information on assets such as CPUs, Printers, and Servers contained in the Excel spreadsheets in layers onto the map. Use of this map to locate each of the identified assets helped us demonstrate the advantages of using GIS systems in asset management. The QGIS system provides a number of capabilities through its core functions. Using the system one can visualize, edit, and analyze data and turn thousands of raw information into knowledge for decision-making.

## **3. Current practice of assets management at UoS**

Assets constitute all items purchased by UOS using its own funds and grants (gifts given to university are also considered as assets). UOS holds responsibility for proper use and management of all assets. In simple words, an asset is an item that university owns and uses while providing education, administration, and research services.

UOS assigns a specific identification to each IT asset unit it owns. IT asset unit includes CPUs, printers and servers, etc. The identification system provides a permanent system for internal controls to safeguard and protect UOS property using specific criteria committed to the university systems so as to ensure that UOS meets its need to maintain the IT assets, make optimum use of the IT assets, and plan for future need for such assets. In addition, it guarantees the right of users (administrative and academic) to know the number of the IT assets any person is using under his/her identity number given by the university.

A web based asset tracking system provides solutions to UOS to automate the tracking process of its assets such as furniture, IT equipment, and Office equipment etc., distributed at various locations of UOS with the help of bar-coding technology. The system uses handheld terminals interfaced with web application tools to facilitate tracking of assets in the UOS. All the information provided from the tracking system will be registered in a database and can be displayed in records in a table format.

## **4. Literature review**

### **4.1. Assets management and its importance**

Asset management has much to do with putting in place systems that monitor and maintain things that an organization deems valuable to it. It applies to both tangible assets and intangible concepts [1].

Some of the examples of physical assets are buildings, equipment, and infrastructure. Fixed asset management on the other hand is an accounting process that helps in tracking fixed assets for financial accounting purposes. IT asset management combines the aspects of financial, contractual, and inventory functions in support of life cycle management and strategic decision making in an IT environment [2].

Asset management has got many strategic advantages. Because asset managers are presently called upon to account for the decisions they have made, managers making decisions touching on physical assets have become more knowledgeable on issues and implications of those decisions. They have a deeper understanding of the role of assets in areas of productivity, cost, and equality [2] [3]. They have also become more knowledgeable in issues pertaining to risk of damage to the corporate image of the company. They also

know the implications of failing to understand production needs and adequately determine capital planning requirements based on current physical assets and future requirements [3] [4].

With asset management, companies are able of understanding if their assets are capable of achieving the set objectives. Besides, it enables them to determine the maintenance strategies required to ensure they achieve the spelt out objectives. Finally, asset management enables companies to determine what enhancement actions are required to meet corporate requirements [3].

## **4.2. Geographic Information Systems (GIS)**

A Geographical Information System (GIS) is not simply a useful tool to find one's place geographically. The best way to think of GIS as it is used as a kind of a 'smart map' that can link multiple databases and show the relationships between different bits of information [5]. These smart maps offer windows into the information resources of the database when users submit queries, and engage in the analysis and editing of the information. This makes GIS a powerful business intelligence and knowledge management tool. GIS technology enables to graphically visualize patterns, relationships and trends in the marketplace [6] [7].

GIS is based on a structured database, called a geodatabase. The geodatabase is rendered in spatial terms such as points, lines and polygons rather than presents the information in a single mass of information. GIS is also more comprehensive in nature because it can integrate data from multiple sources and produce a single, spatial visualization. However, GIS technology is an effective tool for improved access and utilization of all types of data. Swift access to comprehensive, accurate information is worth its weight in gold to a company because of its value in expedited decision-making [6].

## **4.3. GIS and assets management**

Geographic Information Systems (GIS) have on numerous occasions been used in indoor asset management [8]. It has consistently been used in mapping internal assets like fire extinguishers, security cameras, and first aid stations. GIS can also be used in managing outdoor infrastructures, natural resources, and assets like cables and piping system installations and vehicles [9]. In construction planning, GIS can be used by facilities and property managers to prevent costly construction delays by knowing the location of utility lines, where environmental clearances or special permits are required, and other projects being facilitated in such locations [10]. Government institutions are also increasingly adopting the use of GIS in managing public assets that are spatially distributed over landscape. Spatial data about these assets are captured and input into GIS. These data provide an appropriate infrastructure for asset management [11].

# **5. Implementing GIS System for managing IT assets at UoS**

## **5.1. Adopting GIS System for IT assets management at UoS**

Considering the advantages of GIS, it has been decided that a GIS can be an agile and useful system to manage IT Assets at University of Sharjah (UOS). GIS offers an effective solution to the issues faced in managing assets at UOS. GIS is a viable tool that enables locating, analyzing, managing, and presenting a base for management of such assets [12]. Implementing GIS at UOS will facilitate management to locate individual assets at the click of a mouse instead of sifting and analyzing thousands of records maintained in the existing system.

## **5.2. Reasons for choosing the case of UoS**

The university plays a vital role in the socioeconomic development by offering educational opportunities to many aspirants. With huge campuses surrounding with many buildings such as university men's campus, women's campus, main office building, registration block, and so on. All these buildings contain thousands of assets and other equipments, which need to be effectively and efficiently managed in a professional manner. The existing system, asset tracking system with the aid of bar-coding technology, has got more shortcomings comparing to advantages. The drawback is mainly due to the fact that thousands of rows in tables are maintained by the existing system, which results in time-consuming and weighty load of work for the university personnel. To overcome these anomalies, GIS can be considered to manage the assets at UOS.

Implementation of GIS at the university facilitates users to make various queries about any asset such as its location, shape, description, type, room number, and so on. All these information will be provided at a single click of mouse, which enables management to take better decisions in a swift manner.

Additionally, utilizing GIS at the university has advantage of invoking the unique “Buffers” tool in GIS, which can be used to query and find the exact location of a specific asset within a determined distance at the university.

### 5.3. Using QGIS software for UoS Campus IT asset management

The Quantum GIS (QGIS) system provides one method for recording and storing asset information. Our attempt to layer the existing information on GIS maps of the UOS Women's Campus , Main Building and W7 building ( Ground and first floor) shows the possibility of use of the QGIS platform for record and storage of location data of physical IT assets linked to detailed records of the particular asset through simple one-click mouse operations.

By using QGIS software, which is a proprietary GIS tool, the university’s AutoCAD files are scanned to create a Raster layer. The Raster layers are created with unique attributes for selected IT assets such as printers, CPUs and servers in term of its code, description, type, building name, floor name and room number at the university. See Figure 1.

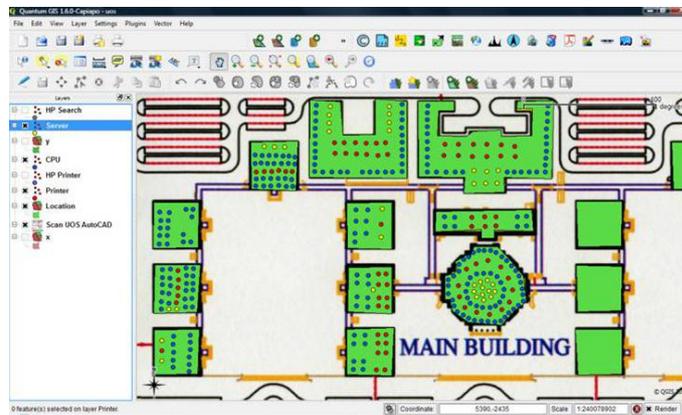


Fig. 1: QGIS Map for UOS Women's Campus UOS Main Building.

### 5.4. Benefits of Using GIS System to manage IT assets at UoS

- **Locating IT assets by using queries:**

Basic queries by location are used to locate an IT asset. These queries include Search by Type, by Description, by Location for any IT asset, and so on. By using QGIS map for the Women's Campus & UOS Main Building and selecting all printers by using basic query which the valuable information can be observed. For example in Figure 2, W6 building does not contain a printer. This result will not be seen from the tables available in the existing system. However, the printer cannot be recognized physically, using GIS can provide vital information such as the geographical location of the printers in one view.

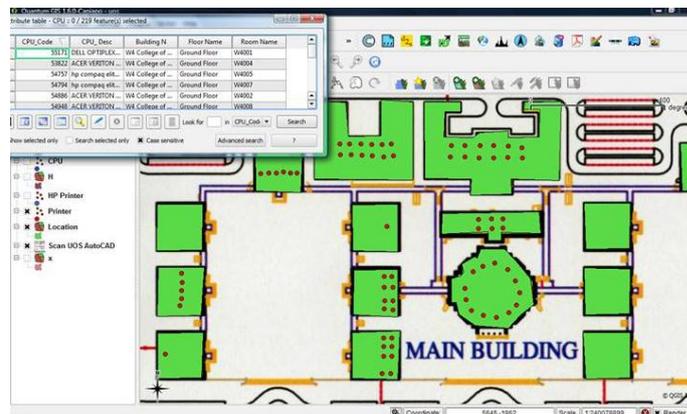


Fig. 2: Women's Campus & UOS Main Building displays all Printers by location in red color

- **Locating IT assets by using buffer tool:**

Basic queries by location are used to locate an IT asset. These queries include Search by Type, by Description, by Location for any IT asset, and so on. By using QGIS map for the Women's Campus & UOS Main Building and selecting all printers by using basic query which the valuable information can be observed. For example in Figure 3, W6 building does not contain a printer. This result will not be seen from the tables available in the existing system. However, the printer cannot be recognized physically, using GIS can provide vital information such as the geographical location of the printers in one view.

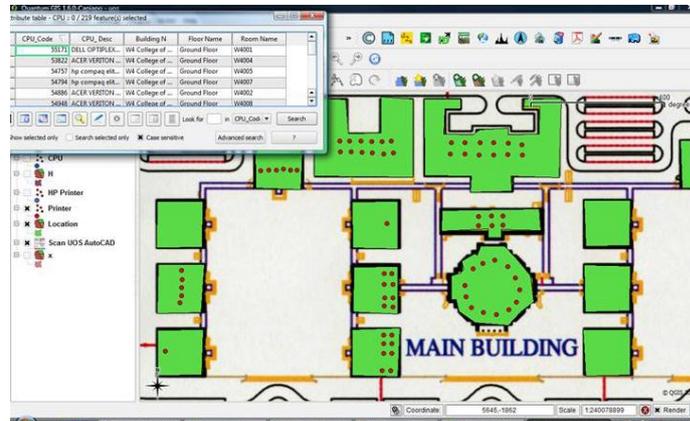


Fig. 3. Women's Campus & UOS Main Building displays all Printers by location in red color

Using agile and capable GIS enables better decision-making. Moreover, this results in many benefits such as cost saving, less time and efforts. All these information can be observed by following simple steps in a swift manner which not possible in the existing system.

## 6. Conclusion and Future work

Geographical Information Systems (GIS) is very pivotal in both indoor and outdoor asset management. Additional advantages that can accrue to UOS through the adoption of GIS based technology for IT asset management include accurate and real-time records of exact location of each asset. In addition, GIS provide efficient management of utilities such as providing power and cooling systems. Further, by using simple querying of the QGIS database, UOS managers responsible for asset management can get reports immediately at any time and take immediate decisions and plan for future. Moreover, GIS system provides with efficient and optimum resource utilization that offers good opportunities for cost saving. Finally, the proposed GIS system will create better accountability and ensure safety, upkeep, and only authorized users of its assets.

Geographic Information Systems (GIS) has provided assistance in asset and data location, analysis, and presentation thus solving the problem of management of assets. Since implementing GIS at UOS will enable the key players to locate individual IT assets at any convenience, all networks will be covered including network lines, access points, and wireless. This will be an extension because this paper deals with specific assets such as printers, CPUs and servers on IT assets. Therefore, in order to access these networks, data will be accessed through web application, and this will enable users to access all assets simultaneously (Dooley, 2011). Moreover, future plans will incorporate mobile technology and synchronization so that all assets' data will be accessible from mobile phones. Mobile phone technology data access will be convenient because data will be accessed anytime from everywhere. Mobile technology incorporation can be done to both IT and non IT management; for example it can be applied in furniture and equipment and this will be considered so that all assets are well managed.

Moreover, it will be applied in indoor institutions such as UOS hospital where it will be incorporated in medical machines and equipment. This way, patients' data access by physicians will be efficient and timely. In the case of hospital, mobile GIS technology will be connected to non static assets such as medical machines and beds. This will make it easy for doctors to locate and track these assets around the hospital premises. It will be a convenient and reliable technology because apart from checking on theft; it will save

time and lives in times of emergencies when such assets are required urgently [4]. Moreover, the GPS technology will also be used to manage assets outside the hospitals and institutions. Therefore, it will be easier to use GPS chips to track assets anytime anywhere, and assets management will be easy, convenient, and effective for all institutions.

## 7. References

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