LESSONS LEARNED FROM EXPANDING Al-AGOZA HOSPITAL IN EGYPT

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ABSTRACT

It is always necessary to expand existing buildings, so that they could meet the growing societal needs. Compared with demolishing them and then constructing new ones, the expansion of existing buildings could not only reduce project cost, but also save the use of energy and raw materials in projects. Therefore, it is widely adopted in most under-developed countries. However, the expansion of existing buildings is not an easy task. It has been involved with a lot of issues in defining the scope of work, planning landscape, managing construction activities, etc. This paper investigates the potential challenges in expanding existing buildings. The project of expanding the Al-Agoza Hospital, one of the biggest and oldest hospitals in Cairo, Egypt, is selected as a case study. In the case study, the project documents have been carefully reviewed. The project engineers and the health-care professionals working in the hospital have been interviewed. This way, the point of views from the owner, the architect/engineer, and the contractor have been taken into account. Several lessons are learned through the discussion with these people. The results from this paper are expected to provide pieces of useful advice and suggestion for the expansion of existing buildings in the future.

KEYWORDS

Buildings expansion, Lessons learned, Case study, Al-Agoza hospital

INTRODUCTION

The global population growth has led to an urgent need to expand existing buildings and/or construct new ones, such as schools and hospitals. Take Egypt as an example. The population growth rate in Egypt was maintained at 1.9% annually from 1990 to 2005 (Awad and Zohry, 2005). As a result, the number of public hospitals in major cities increased from 200 to 387; and the number of the hospitals in the rural areas of Egypt increased to 1,192 (ESI, 2013).

Compared with constructing new buildings to meet societal needs, there are many benefits of expanding existing ones. The expansion could reduce project costs by using less construction material and employing fewer workers. Also, it could save project time, since old buildings do not have to be demolished to construct new ones. Moreover, keeping existing buildings but adding new functions may increase their historical values (HRB 2007).

However, the expansion of existing buildings is not an easy task. Several potential challenges could be involved in the building expansion process, especially when the buildings are expanded in under-developed countries. The challenges that have been identified so far include but are not limited to the unavailability of building documents(Shawkat, 2005) , lack of special building materials for expansion, difficulty to find skilled workers in a building expansion project and finding a best location for the new building (Marzouk, 2012; Abd El Razek, 2005). These studies addressed some of the several problems in the expansion process that eventually emerged during the procedure, but many other problems still have not been well investigated in details.

The literature did not provide comprehensive analysis of the expected problems during the expansion process. In order to gain an in-depth understanding about the challenges involved in the building expansion process, this paper investigates the problems that happened in a real expansion project; the expansion of the Al-Agoza Hospital. The hospital is one of the biggest and oldest hospitals in Cairo, Egypt. During the investigation, the project documents have been carefully reviewed. The project engineers and the health-care professionals working in the hospital have been interviewed. The opinions from the owner, the architect/engineer, and the contractor have been

compiled, and several lessons could be learned through the discussion with these people. The results of this paper could provide pieces of useful advice and suggestion for the expansion of existing buildings in the future.

BACKGROUND

Building expansion is a process in which a new building is added to an old building to increase its capacity or to adopt an additional function (code of ordinances, 2008). Typically, the management process of expanding an existing building includes five phases: initiating, planning, execution, monitoring and control, and closure (Kathy, 2010). The initiating phase includes assessing current situations, collecting information of the previous design and site, identifying and justifying the types of services needed in the new building (Edward M.,2002) , determining the availability of community resources, and electing a management team (M.H.P.P., 2009). The planning phase is the stage of the project during which formal documents are prepared to guide both the project execution and control phases (PMI, 2000). The planning phase comprises scope management, time management, quality management, and human resource planning. During the execution phase, the entire expansion process is managed, from mobilisation to site to the final handover of the completed new facility (VA, 2005). The monitoring phase involves a sequence of steps that if thoroughly and rigorously followed, can lead to the best approach for the new building (Edward M., 2002). These steps include: creating the performance reports, updating the documents and follow up sheets, and obtaining the owner's acceptance (Kathy, 2010). Finally, the closure phase during which, the project manager submits the final report and creates lesson-learned documents to use in other similar projects.

There are many problems faced by the developers during the expansion process of old buildings. These problems can affect different phases of the project. One of significant problems is how to plan for the link between the old and new buildings in an efficient and dynamic way. Many approaches can be used, including a skywalk, tunnel, and bridge. Each approach has many related studies that define its methodology and limitations, by which the most suitable way to link two buildings is determined. Designers should consider certain limitations such as the width and the depth of the gap to be connected, the nature of the foundations, the type and the weight of the traffic, the method of erecting a bridge or a tunnel and the availability of suitable materials for bearing the loads (Bennett,1997), (D.T, 1999).

Lack of materials used in the finishing of the new buildings to match the design of the old buildings is a common problem that may be faced by developers during the expansion process. In Middle Eastern countries, developers working on the expansion process import material from other countries. Italy and France have specialized factories that produce materials suitable for the expansion of old buildings. This importation process causes a delay in the project, which in turn increases costs (Elmasry, 2010).

Expansion projects require highly qualified workers who are familiar with the nature of the work and have a background in architecture history. The lack of professional workers is considered one of the problems that may occur during the expansion process. A new direction to solve this problem is to establish field schools in the expansion project site. These schools provide specialized training programs to improve worker skills. This solution is time consuming and reduces the productivity rate. The promising aspect, however, is that field training provides the developers with a highly qualified team for future projects (Elmasry, 2010).

Finding the best location for a new building in relation to the old building within the landscape is another difficulty that is faced by developers in the expansion process. This problem did not have a readily appropriate solution, but there are some related systems that can help. A system, which can help identify the suitable place, can be developed from an established system to locate the stored materials inside the construction site (Min and Shin, 2001). This system cannot be used to identify a suitable place for the new buildings within the expansion landscape, because it does not consider the required distance from the roads and the old buildings to the new building. Another system uses a technology to correlate the construction site to its predesigned timetables (Zhaoyang, Qiping and Jianping, 2005). This technology can be used only in advanced stages in the planning phase, as full drawings, schedules, and work breakdown structures (W.B.S) are required for the operation of this technology. Recently, a new planning system that considers the safety zones, internal routs, prohibited areas, and fixed facilities to calculate the suitable free areas for constructing a new building (Sanad and Ammar, 2008). The problem with this system is the lack of automated functions, so that all the site has emerged information, including buildings and other facilities information, must be entered manually, and the system's outcome will identify the free areas without considering its suitability to fit a new building.

OBJECTIVE OF THE STUDY

The general objective of this paper is to explore the potential problems during the expansion process of old buildings and to propose recommendations that will help project developers improve the expansion process in the future. The specific aim is to do this in the case of Al Agoza Hospital expansion process.

Background of the Case Study

Al Agoza Hospital is one of the largest hospitals in Cairo. It is located in Al Agoza neighborhood in Cairo, Egypt. This hospital was expanded to adopt a new radiology department. The construction site of this expansion project contained six old permanent buildings and the new building. The site area was 51,200 m^2 with a rectangle shape, and the built-up area was 25,000 m^2. The site has three entrances and six main buildings as shown in Figure 1. All of the old buildings were renovated during the last few years, and the expansion process started in 2005 with an estimated cost of 80,000,000 Egyptian pounds (approximately $14,000,000).

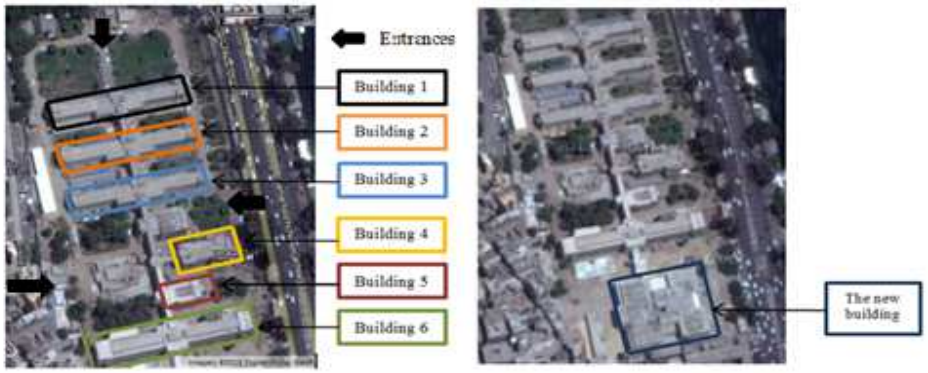

Figure 1 – Al Agoza hospital; original buildings 1, 2, 3, 4, 5, and 6 and the new building.

During the expansion processes several companies and offices were involved in the project. Two of the largest offices are the Scientific Office of Electromechanical Engineering and the Ecological Consultant Office (ECO) for Architecture. The Scientific Office of Electromechanical Engineering contributed to the renovation process in buildings four and six, and also designed and executed each of the distribution substations, lighting and powers, fire alarm system, telephones, master antenna TVs, satellites receivers and nurse-call system in the renovated and expanded buildings. The ECO office designed and executed the new construction with special requirements to fit the needs of the dermatology departments as shown in Figure 1.

Method (survey)

A case study was conducted on Alagoza hospital. Recruitment; ten engineers and ten healthcare professionals were contacted by phone asking them to join the study. Participants: five engineers; two architects and three civil engineers who worked in the expansion process and seven healthcare professionals who were working in the hospital before and during the expansion process agreed to join the study and verbal consent was taken from them. Interference and data collection: a survey was conducted over the phone and it time ranged from 15 to 30 minutes. Data was collected and transcripted during the interview. Data analysis; descriptive statistical analysis was done calculating the risk difference for each item. Three probabilities were weighted yes = 2, no = -2, and sometimes = 1. The cut-off value to consider the item relevant is +6 or -6. Results: on one hand, 12 items of the 14 items of the four constructs were considered relevant with risk difference ranging from 9 to 24 for the positive and -7 to -24 for the negative items. On the other hand, two items were considered irrelevant with risk difference 3, and 4.

Results from Survey (The Problems in the Expansion Process of Al Agoza Hospital)

Regarding the old building information construct, the final results concluded that the old buildings had problems in different aspects. The main problem was the lack of the available data regarding the design and the finishing materials. The finishing material's nature and sources were missing which in turn made it difficult to choose the suitable finishing materials throughout the renovation and expansion process. Thus, the engineers used the Gypsum material and painted it with same colors of the old building elevation as shown in figure 2.

Figure 2 – Al Agoza hospital: new (1) and old (2) elevation.

The expansion process was questioned using three consecutive constructs. First, planning phase construct which explored probable problems during the planning phase of the project. The main problem concluded was the failure to design a suitable connection between the old and the new building, which led to difficulty in transporting the patients between the two buildings. The problem emerged after operations began in the new radiology department; staff found it difficult to transport patients, especially the bedridden patients. In the beginning, patients were transported by going outside of the building to reach the radiology department in the new building. Subsequently, the Egyptian Ministry of Health addressed this problem and assigned the executing company to find a way to link the new building and the hospital. The ECO office designed a covered bridge with a special design to facilitate the movement of the patient trolleys into and out of the new building. This bridge was twenty-nine meters long, and eight meters in its maximum width and five meters in its minimum width. Because of this mistake during the planning phase, this bridge cost more than double the amount in case it was built at the same time as the new building. In addition, the operations of the radiology department were also affected before and during the construction of the covered bridge.

Second, executing phase construct. During the execution phase, developers faced limitations in the availability of free areas, which in turn negatively affected the movement and storage of heavy equipment required for the construction process. The hospital has three entrances; emergency entrance which have a specific route to the emergency department; so there was no chance to use this way for construction work, and another two entrances for visitors, service vehicles, and the hospital staff. These later two entrances were used to transport labor tools and equipment into the construction location, which slowed down the operation in the hospital.

Third, site-layout management construct, which explored the project landscape management. The results showed inappropriate management of the available landscape; for example, developers failed to design parking lots that suit the number of workers in the hospital. At the same time, they did not consider the probability of future expansion in their management to the site layout. Although there were many suitable places where parking spots could have been added, the designers and the developers did not consider this need during the expansion process. Meanwhile, patients were usually unfamiliar with the area and prone to become easily confused if a parking space was difficult or impossible to find (I.P.I., 2009). In addition, during the expansion process the developers added the new building to fit the requirements, however they did not consider the probability of adding new extensions in the future. The new building shape is square and has a different design from the other old buildings which are rectangular shapes. This square shape limits almost all of the capacity for future expansion. Furthermore, this new building is located very close to other neighboring buildings, and this could affect maintenance and operation processes.

Lessons Learned from the Expansion of Al Agoza Hospital

After analysis of the information in our case study, we addressed the most common problems during different phases of expansion process, and we constructed our recommendations as follows: First, data collection is an important stage in the renovation and expansion of old buildings. Data Collection enables the project team to formulate and test working assumptions about the renovation and expansion process and develop information that will lead to the improvement of the key quality characteristics of the project. Data Collection improves the project manager decision-making by helping him focus on objective information about what is happening in the process, rather than subjective opinions. Although it may take time to find the archived information or retrieve it if it were lost, this will help choosing the suitable materials and design during the planning phase and save time during the execution phase. This information can be collected using cadastral mapping, old buildings architectural drawings, photographic documentations, and expert opinion.

Second, proper planning of the new design requirements, considering future needs, and establishing effective connections with the surrounding buildings are important when renovating or expanding a new building. Efficient planning and diligent work during the planning phase will help developers save time and money during the execution process. This will help make the project objectives clearer and more specific. Besides, it will reduce the problems with the operation of the building by using informed decisions. In turn, this will increase the ability to deal with risks during the projects.

Third, for an efficient execution phase, developers should consider the available resources and the fluency of the work. It is important to determine a convenient entrance to facilitate the circulation of labor and equipment in the construction field. It is also important to consider a safe area for storage of materials and frequently used tools. In addition, it is important to isolate the construction activities from the original building functions throughout the expansion or renovation process. Collectively, this will be more fitting to different activities, improvements in the productivity and quality, fluency of the construction process, and maintains efficient operation in the old building.

Fourth, landscape management is an important concept throughout the expansion and renovation process. It is important to address the current and the future needs of the building, such as parking lots and entrances. Any building should have enough public and emergencies entrances based on the buildings area and conceding the future expansions. Each entrance should have a welcome desk with people who can help the visitors reach them destination. This may be affected by the construction laws, but it can still be controlled during the planning phase.

CONCLUSUON

This paper overviews the advantages, the limitations, and the procedure of the expansion process. It addresses some of the potential problems during the expansion process. Based on the literature review, these problems are: the difficulty to plan an efficient link between two buildings, the lack of the materials and skilled workers, and the limitations of site layout planning. Based on a case study of Al Agoza hospital expansion project, more problems were identified, such as the lack of information about the old building design, the defects in the planning phase, the difficulty to manage the executing phase, and the inappropriate management of the available landscape. After studying and analyzing these problems from the literature and the case study we conclude that:

(1) It is important to collect all the available information about the old buildings design and the site.
(2) Proper planning for current and future needs of the building will save money, time, and effort.
(3) Developers must consider circulation problems and manage effectively the executing phase.
(4) Planners should consider adequate emergency entrances and parking lots for old and future buildings.

If these recommendations are followed, developers can satisfy the owners and the users' requirements with minimal cost and in less time.

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APPENDIX

Name: Position:
Experience: Date of survey**:**

Introduction

I'm Nehad Elsafty, a master student in Building Management in Concordia University. Our research aims to explore and to understand the problems that may happen during the expansion process. Al Agoza hospital was selected as a case study.

	Yes.	No.	sometimes	
1- Old buildings information				
A- Do you think it was easy to collect information about old building?*	0	5	0	-10
B- Do you think the old buildings' design was suitable to fit the hospital requirements?	4	8	0	-8
C- Do you think that the hospital old building fitted the huge numbers of users?	0	11	1	-21
D- Did you face any problems in the circulation before the expansion?	6	5	1	3
E- Were the parking spots enough to fit all the users of the old buildings?	2	7	3	-7
F- Was there a suitable emergency entrance?	7	5	0	4
2- Expansion process (planning phase)				
A- Do you think it was important to expand Alagoza hospital?	12	0	0	24
B- Did you face any problem during the planning phase?	5	2	5	13
3- Expansion process (executing phase)				
A- Did you face any problem during the executing phase?	9	1	2	20
B- Do you think the planning phase defaults were affected the executing phase.	6	3	3	9
C- Do you think that the execution process was affected by the activities in the old building?	10	0	2	24
D- Do you face any problem to it manage the execution site during the expansion process?	9	1	2	19
4- Expansion process (site layout management)				
A- Parking spots were added to fit the increase of patient number?	0	12	0	-24
B- Are there available places to fit the future expansion processes?	0	10	2	-18

*question asked for engineers.

B-What are the most common problems that faced the developers during the expansion process?

Finally, thank you so much for your collaboration