A COMPARATIVE ANALYSIS OF ADMINISTRATIVE DELAYS IN HOSPITAL BUILDINGS

David J. Greenwood, Allan N. Osborne and Mohamed A. Aggiag

School of the Built Environment, University of Northumbria, Ellison Building, Ellison Place, Newcastle upon Tyne, NE1 8ST, UK

Hospitals tend to be large, complex projects, with a variety of technological needs that usually change over time. For this and other reasons, hospitals present considerable challenges for those planning their procurement. It is a measure of the extent of the challenge that hospital projects are particularly susceptible to delays, some of which appear to be common to the construction of large hospitals wherever they are built. In a number of surveys of construction professionals, one of the most influential causes of delay on large public projects has been found to be *administrative* reasons, and we undertook to research this factor in more depth in the context of hospital building. In order to do this, two completed hospital projects were chosen as case studies: the Tripoli Medical Centre in Libya and Guy's Hospital, London. The choice was based on the particular interests of the researchers and the availability of information. The aim of the research is to use these studies as a basis for exploring the impact of administrative delays on the construction of hospitals.

Keywords: project delays, hospital construction, case study, cost overrun, design

INTRODUCTION

The timely completion of a construction project tends to be one of the principal objectives for all parties concerned, and one of the most universal measures for a project's actual success (Egan, 1998; Bourn 1998). Nevertheless, it is still common for construction projects to be handed over late (Chalabi, 1984; Chan and Kumaraswamy, 1997, Sasanuma, 1998). According to the literature, delayed completion appears to be a particular problem for large-scale public sector projects (Dlakwa and Culpin, 1990; Assaf, *et al.*, 1995; Al-Khalil and Al-Ghafly, 1999).

Amongst the most fundamental responsibilities for the numerous health authorities that are located around the world are the planning, design and construction of new hospital buildings. As hospitals tend to be very large, technologically complex and expensive to build, the manifestation of unexpected delays, risks and cost overruns can lead to severe problems for everybody associated with the project – most notably the client (i.e. the health authority).

Two case studies have been chosen. In the UK, one of the most publicized of recent hospital projects has been Guy's Hospital, in London, which was completed four years late in 1997. It is a project that has been the subject of scrutiny by the National Audit Office (NAO), whose report and data are publicly available. In Libya, the Tripoli Medical Centre was completed almost 13 years late in 1996. The project has been investigated by the Follow-up Committee[1] in Libya, and although the data are not so

[1] Libya's equivalent of the National Audit Office (NAO).

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easily or publicly available, acquisition has been facilitated by the fact that one of this paper's authors was intimately involved with the project over a number of years.

CAUSES OF DELAY: A CRITICAL REVIEW

There have been a number of published studies on the causation of construction delays. A review of the literature between 1971 and 1999 produced 13 studies from 9 different countries. In countries such as the UK and USA weather conditions, labour supply, and subcontractors tend to be the major causes of delay (Baldwin *et al.*, 1971), whereas in developing economies deficiencies on the part of the client (especially public sector clients), and the availability of resources tend to be most problematic (Chalabi, 1984). Toufic and Tawil (1998) used questionnaires to discover the causes of construction industry delays in the Lebanon. In the owners' view, the most important delay factors were financing and the scheduling of subcontractors, whereas contractors cited contractual relationships and design changes. Arditi *et al.* (1997) investigated public projects in Turkey, and produced four classifications of delay: resource shortages; financial difficulties; organizational deficiencies; and design and change orders. On high-rise projects in Indonesia, Kaming *et al.* (1997) found that the major factors influencing time overruns were design changes, poor labour productivity, inadequate planning and resource shortages. In their comparative study of Thailand and other economies Ogunlana *et al.* (1996) felt that developing economies may suffer specific delay problems, viz. resource shortages or inadequacies in industry infrastructure; problems caused by client and consultants; and contractors' incompetence or inadequacies.

However, in Hong Kong, Chan and Kumaraswamy (1997) investigated the perceptions of clients, consultants and contractors towards delays in civil engineering projects. All three groups agreed that the significant causes of delay were unforeseen ground conditions, poor site management and supervision, slow decision-making, and variations, though the groups differed in their ranking of these factors, with clients and consultants emphasizing the contractors' deficiencies and *vice-versa*. Studies in Saudi Arabia (Assaf and Al-Kalil, 1995; Al-Kalil and Al-Ghafly, 1999) have highlighted the problem of contractors' cash flow and related this to the government practice of assigning contractors to the lowest bidder regardless of suitability.

The discovery of oil prompted a construction boom in Nigeria that neither the sector's demand or supply-side could cope with. Dlakwa and Culpin (1990) found the lack of prompt payment by client agencies and cost inflation to be the major underling problems. Mansfield *et al.* (1994) concurred with this, and recommended better phasing of projects. In a third Nigerian study, Okpala and Aniekwa (1988) highlighted the role of resource shortages, financing, payment and poor contract management as the major causes of delay.

CAUSES OF DELAY: A CATEGORIZATION

An analysis of these studies was undertaken with a view to categorizing the causes of delays they identified. In the 13 studies respondents cited 53 different factors that contribute to delays and these were grouped into four primary categories (*administrative*, *financial*, *technical* reasons and *unforeseen* events) and three secondary categories that represent more complex combinations of the four primary ones. As already noted, the 13 studies represented the views of clients, consultants, contractors (with the majority of the studies using all three sources), and in some cases

'others'. Some of the respondents concurred in their assessment of some factors, while other factors were not identified by all the groups. This meant that in fact there were 140 different citations of factors by the different respondent groups and this allowed us to perform a fairly crude ranking of the categories we had defined.

The first primary category (appearing in 42% of the 140 citations) was that of delays due to *administrative* reasons (A). These include slow decision-making and excessive bureaucracy on the part of the client, and contractor-deficiencies in areas such as planning, site management and supervision, and contractual relations. The second primary category (12% of citations) was *financial* causes (F). These appear as contractors and public agencies financial difficulties (particularly cash flow) which often result in lack of prompt downstream payment. An additional problem can be that of inflationary increases in the cost of resources. The third most common primary category (10% of citations) was what could be described as *technical* reasons (T), examples being design errors, problems in the production of working drawings, and inaccurate estimating. These often result from inadequacies in industry infrastructure, poor labour productivity, or lack of social, statistical or operational data. Finally there is the influence of *unforeseen* events (U) which can range from ground or weather conditions, to major political or social upheavals. Such factors were mentioned in 2% of citations.

The secondary delay categories are combinations of one or more of the primary categories. It was found that some of the specific causes cited by respondents did not fit exactly into any of the four primary categories, but could be accommodated by a combination of two or three of them[2]. The most frequently encountered (in 28% of citations) was the integrated *administration* and *technical* cause (A+T). An example is where the effects of frequent client-initiated variations are exacerbated by slow or bureaucratic decision-making. The fifth category was the combination of the *administration* and *financial* categories (A+F) (4% of citations). Typical examples included inaccurate estimating and difficulties encountered by the client in financing and making payments. The final 2% of citations involved multiple problems, chiefly involving the client and consultant, which could best be categorized as a combination of *administrative, financial* and *technical* causes (A+F+T).

Although this ranking is crude, and reveals little in terms of causation frequency, the point of interest is the key role of administrative issues: they form a part of four of the seven categories identified, which together amounted to 76% of the citations in the studies reviewed.

PROPOSED RESEARCH METHOD

The main objectives of this research are to:

Identify the significant factors and factor categories that cause delays in hospital construction for two specific case study projects in Libya and the UK.
Compare the findings of both case study projects.
Assess the viewpoints regarding of the main project participants (viz. clients, consultants and contractors) regarding the delay factors and delay factor categories.
Test for any disagreements regarding the delay factors and factor categories between any two groups of survey respondents.

[2] The fourth primary category - *unforeseen events* - remained a 'stand alone' category.

Suggest recommendations in order to reduce the extent of project delay, and to use those findings as an empirically-based model for the study of other projects.

The work described in the present paper was completed in three distinct stages. Firstly, several causes of delays were identified at Guy's Hospital in London. This identification process was undertaken through literature reviews and an examination of the NAO report. Secondly, the causes of delays at the Tripoli Medical Centre in Libya were identified. This recognition process involved a comprehensive examination of the project correspondence between the client and contractor, as well as the Follow-up Committee reports. Thirdly and finally, a questionnaire was developed in order to gather further explanatory data from the relevant parties.

CASE STUDY SYNOPSES

Guy's Hospital in London

Guy's Hospital Phase III development project, now known as Thomas Guy House, was completed in April 1997 at a cost of approximately £160 millions. The project comprises an eight storey block (50,000 m^2 gross floor area in 2400 rooms) four atria, and ancillary works including a link to London Bridge Station. The project covers 1.5 acres on a landlocked site and houses 40 clinical, academic and support departments. The Department of Health and Social Security (DHSS) promoted Phase III as a model of co-operation between the private and public sectors: Guy's Hospital Special Trustees and other private and charitable donors contributed 45 per cent of the original funding for the project. In December 1986, the Treasury had approved the project at an estimated cost of £35.5 million; in September 1989 this was formally revised to £74.6 million. At the same time the Department agreed that, for budgeting purposes, a site location factor of £8.5 million should be added to the revised approval to give a budget cost figure of £83.1 million. Following completion in April 1997, the Final Account (settled in December 1997), showed that the cost had increased to £151.8 million plus £8.1 million for modification works. The project was planned to be completed in December 1993. However, it was beset by difficulties which, despite adopting various strategies to maintain the programme, led to several extensions to the project completion date. The project was finally completed in April 1997, 3 years and 4 months late. The new building was opened to patients in July 1997.

Tripoli Medical Centre in Libya

Libya was a relatively poor country until oil began to be exported in 1961. In 1972 the oil industry was nationalized and the increase in the nation's receipts was used to fund a major public building programme. In the health sector this resulted in the planned construction of more than 1200 health care buildings by 1996, and the pick of these achievements was to be the New Tripoli Central Hospital, now known as the Tripoli Medical Centre. The Tripoli Medical Centre was completed in August 1996 at a cost of approximately £260 million. The project comprises three ward blocks each with nine story (165,000 m^2 gross floor area in 6200 rooms) eight open courts, and ancillary works including a link to the medical school. The project covers 67 acres on a wide site and houses 65 clinical, academic and supports departments. The sole source of funding was the National Treasury. In November 1973 a contract for £ 31 million was signed for the building works; in October 1975 the cabinet approved an increase of this to £45 million. In July 1977 construction work was suspended. In August 1981 a second contract of £78 million was signed for the completion stage. By this time many technical and planning problems had risen, and subsequent

revisions added another £78 million to the cost of the building works. Following completion in August 1996, the Final Account for the second stage contract (settled in December 1999), showed that the cost had increased to £156 million. The project was planned to be completed in August 1984, but its numerous difficulties led to several extensions and the project was finally completed in August 1996, 12 years and 7 months late. The Tripoli Medical Centre was opened to patients one month later, in September 1996.

Reasons for delay at Guy's Hospital

The anticipated completion date was December 1993 but actual completion was not until April 1997. Key factors that influenced the delay were:

Delays in putting the design team in place (A).
Delays in resolving cost and funding problems (A+F).
The failure to freeze the design, and significant subsequent design changes (A).
Delays in designing the engineering services and producing associated drawings (A+T).
Problems with the service installation, the insolvency of works package contractors, technical problems, rectification and modification works (A+T).

The project has been marked by numerous changes in management and control (A). Between 1986 and 1993 there were four changes in client body with overall responsibility, six project sponsors responsible for day to day issues on behalf of the client, and five project managers. There were several attempts to mitigate the delays and to deliver the project on time. These included changes to the project management arrangements and the adoption of an accelerated programme and subsequently a management contract for the main construction stage (A).

When the decision was taken to use a management contract, the main perceived advantages were a quicker re-commencement and a shorter construction period. The management contract provided for completion of stage 2 in May 1993. However, it was recognized that experience with this approach in the NHS had not been wholly successful and that it carried additional risks and greater uncertainty over costs. In the event, deemed practical completion for stage 2 was in June 1996 and final completion was in April 1997.

Following the receivership of the mechanical and electrical engineering subcontractors in January 1994, the Trust agreed a supplemental agreement with the management contractors to bring more certainty to the project in terms of time and cost. However, delays continued and the terms of the agreement were not met. In September 1996 a second supplemental agreement was needed to ensure completion (A+F).

At the time of completion in April 1997, the management contractors still had various modification works to complete. This work, and the commissioning work, was completed in July 1997 (A+T).

Reasons for delay at the Tripoli Medical Centre

Ten extensions (totalling 155 months) were granted to the contractor from August 1984 up to the completion and commissioning of the project, which was finished in August 1996. Some outstanding works were carried out until June 1997. In

August 1984 the first extension (totalling 17 months) was issued for the following reasons:

Preparing new design and redesigning the existing architecture plans to suit the approved modifications done by the engineering and medical committees, which led to extra variation orders (A+T).

Removal and completion of executed works done by the previous contractor, which was not in accordance with technical specifications (T).

Execution of the following unexpected new building work (A+T):

Nuclear medicine
Intersection project linking the hospital and university with the main highway.
Forensic medicine
Endocrinology department.

Preparing the design in order to modify the general site plan and external works (A+T), including:

Removal and repositioning of existing fencing in accordance with the new approved design layout.
New visitors' parking area suitable for 500 cars.
New visitors' entrance and linking road with staff housing scheme.
Redesign of the landscape areas.
New connection between the hospital and medical school.
Preparing variation orders for the above modifications.

The time needed for the medical committee to study and prepare the technical specifications of the medical equipment that was to be installed in the completed hospital (A+T).

The time needed for the original equipment suppliers to undertake the necessary inspection and testing in order to confirm its validity and performance. This equipment was supplied by the original contractor and had to be tested by the new contractor (T).

In February 1989 the second extension (totalling 11 months) was granted based on the following reasons:

Delays in approving and issuing variation orders in architectural, mechanical, civil and electrical works, internal guidance systems, water treatment plant and radio paging systems (A+T).

The Higher Committee recommendation to build a water treatment plant before going ahead with the completion of the remaining work (A).

Delays in payment of certificates, amounting to £16 million (F).

No plans for technical staff recruitment (A).

In August 1991 a further extension (totalling 24 months) was granted for the following reasons:

Delay in the preliminary handing over procedures for all stages. At this point there was no confirmation of approval about the pre-installation plans (A+T).

Delay in providing the related technical information for the pre-installation works for medical equipment (T).

In November 1993 the penultimate extension (totalling 24 months) was given for the following reasons:

Cabinet approval for the new contract amendments (approval of all additional works and the 'ceiling' amount) (A).

Execution of the pre-installation works for medical equipment (T).

Execution of the scope of works as indicated in the new bill of quantities (A+T).

In July 1995 the final extension (totalling 24 months) was granted for the following reasons:

Delay in paying certified amounts (F).

Delay in approvals for x-ray equipment that in turn delayed the construction of several spaces due to non-availability of pre-installation drawings (A).

Delay in approving construction of MRI building (A).

Delay in arranging a suitable water supply for the project which led to postponement of the performance tests to the electro-mechanical equipment as well as the medical equipment related to water use (A).

Delay of approval for the construction of a new sewerage line (A).

Delay in approving the technical documents related to the above (A+T).

ANTICIPATED OUTCOMES OF THE RESEARCH

Despite the obvious differences between them, the problems encountered by the two projects exhibit some interesting similarities. An analysis of the delays and cost overruns on the two projects, suggests that there are similar administrative failings associated with large public sector projects regardless of factors such as geographical location and relative economic development.

The preliminary findings show that, in most cases, hospital projects in any part of the world face similar difficulties, including slow decision-making, late approvals and changes to the make-up of administrative teams. Based upon that, the research will be focused upon the following points:

The importance of the role of administrative factors in facilitating and speeding the decisions related to the project;

The importance of continuity and consistency in the administrative support to the project, particularly that of the client;

The importance of confirmation of the method and provision of the necessary funding; and

The importance of complete and adequate plans before their implementation, avoiding client-initiated variations.

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