



Time–cost relationship of public sector projects in Malaysia

Albert P.C. Chan

Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

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Abstract

Earlier research by Bromilow in Australia found that the duration of construction period can be modelled by a time–cost formula expressed in the form of $T = KC^B$, where T is the actual construction time in working days, C is the final cost of contract in millions, K is a constant characteristic of building time performance, and B is a constant indicative of the sensitivity of time performance to cost level. The aim of this paper is to identify whether such time–cost relationship can be extended to the building projects in Malaysia. Time and cost data from 51 public sector projects were collected to verify whether such a relationship holds in the Malaysian building industry. Regression analysis was used to compute the values of K , B and check how well the model actually fits. Analysis of these 51 projects identified that the best predictor of average construction time of public sector projects in Malaysia is $T = 269C^{0.32}$. The predicted time for a RM 1 million public project was 269 days. The time–cost relationship identified in this paper serves as a convenient tool for both project managers and clients to predict the average time required for delivery of a construction project. © 2001 Elsevier Science Ltd and IPMA. All rights reserved.

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1. Introduction

Malaysia is a rapidly developing country in the Asian region, with its economy heavily dependent on agriculture, forestry, petroleum and, more recently, manufacturing. Geographically, Malaysia consists of 13 States on Peninsular Malaysia, Sabah and Sarawak, with the latter two States on the island of Borneo.

As in 1998, Malaysia has a population of 21.9 million comprising of three main ethnic groups: the Malays or ‘Bumiputras’, the Chinese and the Indians in the respective ratios of 50, 40 and 8%. Other nationalities make up the minority of 2% [1].

Malaysia has undergone rapid economic growth since 70s. In 1996, the Malaysian economy expanded at a more sustainable pace, following a period of rapid expansion in the last eight years. The gross domestic product (GDP) in 1996 registered a slower growth of 8.5% when compared with the 1995 figure which had a growth rate of 9.6%. The key sector that contributes to the continuous growth is manufacturing, which recorded a double-digit growth, while the service and construction

sectors are also expected to perform better than the national average growth [2]. Further to the growth of the GDP, the nominal gross national product (GNP) has also continued to increase by 13.1% (RM 235.3 billion) in 1996 with the per capita income rose by 10.5% to reach RM11,118.00 as shown in Table 1.

Attempts to predict construction durations represent a problem of continual concern and interest to both researchers and project managers [3–20]. Given the significant impact of the property and construction sector on the Malaysian economy, this paper attempts to establish a time–cost relationship based on 51 building projects in Malaysia. The unique characteristics of the industry in the local context will be reviewed, and the time–cost formula ($T = KC^B$) developed by Bromilow [21] will be used as a basis to verify whether such a relationship holds in the Malaysian building industry.

2. Characteristics of the construction industry in Malaysia

The construction sector achieved a more moderate growth of 11.8% in 1996 after recording a high growth of 15.2% in 1995. With this growth, its contribution to GDP is estimated to be stabilised at 4.5%. The slower

E-mail address: bsachan@polyu.edu.hk (A.P.C. Chan).

Table 1
Key economic indicators of Malaysia 1993–1996^a

Indicators	1993	1994	1995	1996
Gross domestic product (% per annum)	8.3	9.2	9.6	8.5
Gross national product (% per annum)	8.7	9.1	9.3	8.5
Per capita national income (RM per annum)	8,126	8,975	10,068	11,118
Inflation rate (% per annum)	3.6	3.7	3.5	3.6
Unemployment rate (% per annum)	3.0	2.9	2.8	2.8

^a Economic Reports Ministry of Finance, 1997.

growth in 1996 reflects partly to the low level of new construction starts as new projects approved under the Seventh Malaysia Plan (1996–2000) are generally expected not to take off after the first year of the period. The monetary and fiscal measures introduced by the Government in October 1995 to contain asset inflation, excessive speculation in the higher-priced residential properties and to discourage the purchases of real estate by foreign interest is another attribution to the slow-down of the construction activities [2].

2.1. *Bumiputra¹ contribution in management*

As a consequence of a declared Government Policy to foster bumiputra involvement in business and commerce, all substantial investments should have a ‘bumiputra status’. This term describes a limited company with a bumiputra shareholding above a certain percentage and with genuine bumiputra involvement at senior management level.

2.2. *Non-uniform skill and plant distributions*

Malaysia has a varying concentration of development across the whole country. As a result, skilled labour is less plentiful in less developed areas. The same is also true for the level of mechanisation. There is a marked contrast on the utilisation of modern plant between the capital city and other smaller cities [22].

2.3. *Different administration between States*

Since Malaysia has a federated government, consisting of thirteen component States and a number of Federal Territories, different local authorities may have varying administration procedures. For example, different States and Territories have their own ‘Uniform Building By-laws’. In comparison, the Federal Territory of Kuala Lumpur exercises more control on buildings and has a more comprehensive system.

¹ Malay word, meaning native Malays.

2.4. *Foreign labour*

A noticeable trend during the Sixth Malaysia Plan period (1991–1995) was the increasing utilisation of foreign labour to augment labour force requirements. This followed by the decision of the Government in 1991 to liberalise the policy on the employment of foreign labour given the emergence of labour shortages then. The end of 1995 issued a total of 649,680 work permits to migrant workers. About two-thirds of the temporary work permits were issued for work in the plantation and construction sectors.

2.5. *Contractor service centre (PKK)*

The contractor service centre (PKK) was formed on 11 April 1984 under the supervision of the implementation and coordination unit (ICU) of the Prime Minister’s department. It has taken over the function of Public Work department as the central registration body for all contracting works both at federal and state level as well as a profile reference centre. With effect from 1988, only contractors with the PKK registration can tender for government projects. In the case of private sector projects, contractors are registered either with PKK or the construction industry development board (CIDB).

2.6. *Construction industry development board, Malaysia (CIDB)*

In 1991, the Working Committee on Construction Sector under the ambit of the Cabinet Committee on Training recommended the formation of a board to coordinate construction activities. The Bill for the formation of the CIDB was approved by the Parliament in May 1994 and was gazetted as CIDB Act 520 in July 1994. The CIDB, which reports to the Ministry of works, Malaysia, began its operation as the highest regulatory body for the construction industry on 1 December 1994. It becomes mandatory for construction works both in the public and private sector to be registered with CIDB prior to commencing of works [2].

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