

**An Evaluation Model for Assessing the Suitability of Public Private Partnership  
(PPP) Projects**

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## **An Evaluation Model for Assessing the Suitability of Public Private Partnership (PPP) Projects**

### **Abstract**

This paper presents an evaluation model which can be used for assessing the suitability of Public Private Partnership (PPP) projects by studying their attractive and negative factors. A questionnaire survey was conducted with industrial practitioners in Hong Kong. The respondents were requested to rank the importance of fifteen attractive factors and thirteen negative factors for adopting PPP. From the rankings, the relative weightings of each factor were derived. The weightings of these factors formed the basis for the evaluation model presented in this paper. The Hong Kong Zhuhai Macau Bridge (HKZMB) was used to demonstrate how this evaluation model could be applied. From the list of attractive and negative factors the authors selected those which were foreseeable in the HKZMB project. By calculating the total weightings of each group of factors it was found that the negative factors outweighed the attractive factors by 27%. Their relative scores were 3.58 and 2.81 respectively. The result indicated that PPP would not be a suitable method for delivering this project. To make further improvement in the current model, additional attractive factor "Uplift public image" and negative factor "Suspected public private collusion" were derived from the analysis of this case. The evaluation model presented in this paper can help both the public and private sectors to assess whether potential public projects are suited for PPP. Academics are also shown

how their research work could be delivered to a wider audience and applied in more practical applications within the industry.

**CE Database subject headings:** Infrastructure, Partnerships, Private Sector, Procurement.

## **Introduction**

The success of implementing Public Private Partnership (PPP) projects in places such as Western Europe, the United States and Australia has been an attractive alternative for procuring public works projects instead of the usual traditional methods. With benefits such as risk transfer, increased efficiency and innovation, and private financing governments around the world are keen to encourage PPP projects.

Hong Kong is not completely new to the PPP idea. Back in the late sixties several Build Operate Transfer (BOT) projects were conducted. These were mainly transportation type projects. Unfortunately, not all of these were equally successful hence the implementation of PPP projects have decelerated since. Another reason for the slow adoption of PPP is that the Hong Kong Special Administration Region (HKSAR) government has been able to enjoy a budget surplus for many years running. Hence, providing for their own public projects has not been a problem. In other jurisdictions that first adopted PPP, often their motives have been finance driven. But with the matured development seen across the world and the in-depth research conducted, the other

advantages of PPP are even more obvious. The public sector is also aware that in many cases they cannot deliver projects as efficiently and effectively as the private sector. The private sector is able to introduce efficiency, skills, innovation, technology, motivation, finance and most importantly a share of the project risks. On the other hand, the public sector is best dealing with administrative matters. Similarly, the private sector is also interested in public works projects as they tend to be of large scale. And as business persons they are keen to become players within this circle.

Unfortunately, a string of recent projects in Hong Kong linked with PPP have received much opposition. Debates have been going on for many years for certain projects to whether they should be procured by the PPP model. In other cases, projects have been heavily criticised for over benefiting the private consortium. Some cases have even changed from originally being procured by PPP to opting for more traditional methods. These obstacles have heavily discouraged both the public and private sectors from considering the PPP model. Although so, the Efficiency Unit of the HKSAR has been continuously working on PPP related research. Some of the local government departments have also continued to use different forms of PPP such as Design Build Operate (DBO). Obviously this shows that there are still many in Hong Kong who has faith in the PPP model.

Although Hong Kong has not rejected PPP, undoubtedly the local practitioners lack knowledge on how to assess the suitability of PPP projects hence they have become reluctant to do so. Therefore, an evaluation model for assessing the suitability of PPP

projects is necessary. Being aware of this need, this paper presents an evaluation model for assessing the suitability of PPP projects by evaluating the attractive and negative factors of projects being considered. A weighting for each group of factors will be derived and used to assess the suitability of using PPP for specific projects. This evaluation model acts as a simple and effective guideline for both the public and private sectors. The development of this evaluation model is believed to benefit the construction industry at large, as well as introduce new opportunities.

### **Development of the evaluation model**

#### *Step 1 Establish the weighting of attractive and negative factors*

##### Questionnaire design and administration

An empirical questionnaire survey was undertaken in Hong Kong from October 2007 to December 2007 to analyse the attractive and negative factors of adopting PPP. The questionnaire template designed by Li (2003) in the United Kingdom was adopted. Although a new research questionnaire could be developed, there were several advantages foreseeable to adopt Li's (2003) survey questionnaire rather than designing a new template. Firstly, the value of Li's (2003) questionnaire has already been recognized by the industry at large. His publications as a result of the research findings derived from the questionnaire are evidence of its worthiness. Secondly, there would be no added advantage to reinvent the work that has previously been done by other researchers. And

thirdly by administering Li's (2003) questionnaire in different administrative systems, it would be of interest for comparison purposes in the future. In addition, Hong Kong is traditionally influenced by the British, so the construction practice is very close hence no problems in adopting this questionnaire would be anticipated. Therefore, Li's (2003) questionnaire was adopted for this survey with prior permission obtained from the author Dr. Bing Li and his doctoral research supervisor, Professor Akintola Akintoye.

#### Selection criteria for questionnaire respondents

The target survey respondents of the questionnaire included all industrial practitioners from the public, private and other sectors. Target respondents were selected based on two criteria: 1) They must possess adequate knowledge in the area of PPP; and 2) They must have hands-on experience with PPP projects, or experience in conducting PPP research or have followed very closely with the development of PPP. Survey questionnaires were sent to 95 target respondents in Hong Kong. It was anticipated that some of these target respondents would have colleagues and personal connections knowledgeable in the area of PPP to participate in this research study as well; hence some of the respondents were dispatched five blank copies of the survey form. A total of 34 completed questionnaires from Hong Kong were returned representing a response rate of 36%.

#### Background of questionnaire respondents

The questionnaire respondents comprised experienced practitioners from the industry. As shown in Figure 1 approximately half of the respondents in Hong Kong possessed twenty-one years or above of industrial experience. Figure 2 provides a breakdown of questionnaire respondents who have been involved with PPP projects. Given the few BOT/PPP projects conducted in Hong Kong, it was a surprise to find that 33% of the respondents gained previous experience. Without doubt some of these may have had experience with local BOT projects or PPP projects overseas, but still the experience of these respondents confirmed the quality of the responses from the survey conducted. In addition, amongst those respondents who have acquired experience with PPP projects, 10% had previously been involved with at least five projects.

Insert FIGURE 1 here.

Insert FIGURE 2 here.

#### Assessment of attractive and negative factors by questionnaire respondents

The respondents were requested to rate their degree of agreement against each of the identified attractive and negative factors according to a five-point Likert scale (1 = Least Important and 5 = Most Important). The mean rating of each factor was used as their relative weighting to develop the evaluation model.

#### *Step 2 Analyze the potential PPP project*

A thorough analysis of the potential PPP project being considered should be conducted. Aspects of the project which should be studied include: history, development, future, parties involved, view of general public, preference of public and private sector, normal practice, advantages and disadvantages, political situation, timeframe, opportunities, obstacles, culture etc. These types of information can be sourced from newspapers, magazines, governmental reports and websites, studies conducted by researchers, private sector publications, interviews with parties involved or parties that would be affected, discussions with experts, questionnaire survey with the general public etc. The user of the evaluation model will match the project information available to the list of attractive and negative factors. For each factor the user will then assign a score for the likelihood it would occur in the project being considered. The score will be given according to the same Likert scale used by the questionnaire respondents.

### *Step 3 Evaluate the decision for adopting PPP*

The total score for the attractive and negative factor groups can be derived by the sum of multiplying the relative weighting of the factor (which is the mean score given by the questionnaire respondents) by the score of the factor (this is the score given by the user of the evaluation model). The total score can be expressed by the following formula:

$$TS = \sum W \times S \quad (1)$$

TS = Total score of factor group (attractive or negative factor group)

W = Weighting of individual factor within the factor group

S = Score assigned by user for individual factor within factor group

The total score of the group of attractive factors will be compared with that of the group of negative factors. The group of factors that scores the highest indicates the suitability of adopting PPP for the project being considered. For example, if the total score of the attractive factors is higher then PPP is the preferred option. Whereas, if the total score of the negative factors is more dominant then PPP is not recommended.

### **Weighting of the attractive and negative factors**

The attractive and negative factors for adopting PPP were assessed by respondents from Hong Kong. The means for each factor were calculated and ranked in descending order of importance.

#### *Ranking of attractive factors for adopting PPP*

Fifteen attractive factors for adopting PPP were rated by the respondents. The findings showed that the top three attractive factors ranked in Hong Kong were:

- (1) Provide an integrated solution (for public infrastructure / services);
- (2) Facilitate creative and innovative approaches; and
- (3) Solve the problem of public sector budget restraint.

The first and second attractive factors ranked by Hong Kong respondents show that efficiency-related attractive factors are considered more importantly. Although financial drive in general is a major reason for adopting PPP, these respondents did not rank it as the top attractive factor. Since Hong Kong has enjoyed abundant financial reserve in hand and budget surplus over the past few years, these have allowed Hong Kong to pay for their public works projects upfront (as quoted by the Secretary for Development, Development Bureau of the Hong Kong Special Administrative Region (HKSAR) at the CIB TG72 Symposium on Revamping PPPs held in Hong Kong on 28 February 2009). The government officials generally did not see the need to borrow money when they could provide the cash cheaper. Hence efficiency is a more important attractive factor that could really induce Hong Kong to adopt PPP.

The first attractive factor ranked in Hong Kong is “Provide an integrated solution (for public infrastructure/services)”. PPP is an integrated solution in that a private consortium is responsible for all the functions of design, building, financing, operation and maintenance. This bundling can allow the partners to take advantage of a number of efficiencies and increase economies of scale and scope (European Commission Directorate, 2003). For instance, the contractor’s detailed knowledge of the project design and the materials utilized allows it to develop a tailored maintenance plan over the project life that anticipates and addresses needs as they occur, thereby reducing the risk that issues will go unnoticed or unattended and then deteriorate into much more costly problems.

The second attractive factor ranked by respondents from Hong Kong is “Facilitate creative and innovative approaches”. This observation manifests that Hong Kong has a large urge for having creativity and innovation in PPP projects. Practitioners in Hong Kong have expressed in public the need and importance for creativity and innovation in PPP projects (Kwan, 2005; Ho, 2005).

The third attractive factor rated by respondents from Hong Kong “Solve the problem of public sector budget restraint”. The financing of public sector projects has been recognized as one of the key initial driving forces for implementing PPP schemes internationally. Many experienced practitioners in PPP believe that PPP brings about many other attractions besides financing, and that financial motivations should not be taken as the sole reason for adopting PPP. However, financial reasons are frequently the initial attractive factors for administrative systems adopting PPP. This financial attractive factor is undoubtedly very appealing for governments across the world especially when public money is to be spent amongst competing needs. Therefore, it is not surprising that both groups of respondents have rated this attractive factor highly, but with a subtle difference in emphasis.

The mean values for the attractive factors as rated by Hong Kong respondents ranged from 2.94 to 3.79. This observation has reflected that the variation in their responses are relatively small, only 0.85. This finding shows that the Hong Kong respondents rated the fifteen attractive factors consistently.

As the respondents were asked to rate the fifteen attractive factors according to a Likert scale from 1 to 5, a value above “3” would represent that the attractive factor is of importance. Amongst the attractive factors only one was ranked below “3”. This attractive factor was “Technology transfer to local enterprise” which scored “2.94” and was also ranked bottom. This is probably because the immediate results of this attractive factor could not be seen and therefore the other fourteen attractive factors were relatively more important. The other fourteen attractive factors were rated a score between “3” and “4”.

In addition, on top of those factors the respondents were asked to rate, they were also given the opportunity to add others which would be of importance, but they did not do so.

#### *Ranking of negative factors for adopting PPP*

Thirteen negative factors for adopting PPP were rated by the survey respondents. The top three negative factors ranked by Hong Kong respondents included:

- (1) Lengthy delays because of political debate;
- (2) Lengthy delays in negotiation; and
- (3) Very few schemes have actually reached the contract stage (aborted before contract).

In Hong Kong, public works projects are often delayed and complicated by the need for public consultation; hence it is not surprising that “Lengthy delays because of political

debate” was the highest negative factor ranked by the Hong Kong respondents. This problem is well known for causing projects to be held back. For example, the West Kowloon Cultural District project has been cited as a typical example in Hong Kong where political interference has caused the project to be on hold for many years (Chan et al., 2007a). Initially there was much political debate within the Legislative Council as to whether this project should proceed as a PPP, especially whether the whole project with an estimated cost of US\$25 billion (So, 2009) should be handled by one single consortium instead of half a dozen number of consortia each sharing the pie. The local government was also alleged to be unclear of the long-term policy and objectives for this cultural development project, causing much criticism from the general public.

Ranked second by respondents in Hong Kong was “Lengthy delays in negotiation”. This finding has shown that “Lengthy delays in negotiation” are typical for PPP projects irrespective of geographical locations. Due to the size and complexity of PPP projects the procurement process has been known to be lengthy. This can be said to be a typical feature of PPP projects, therefore only projects that are of appropriate value and worthiness should consider PPP.

The third negative factor as ranked by Hong Kong respondents was “Very few schemes have actually reached the contract stage (aborted before contract)”. The high ranking of this factor coincides with the previous argument about political debate in Hong Kong. As a result some projects had to be aborted due to political disagreement.

For the negative factors rated by respondents in Hong Kong the mean values ranged from 2.79 to 3.82. The variation in responses was 1.03. Similar to the variation in responses observed for the attractive factors, the difference is very small. Hence, it can be concluded that the respondents rated the factors consistently.

Also, similarly to the rating of the attractive factors, the respondents were asked to rate the thirteen negative factors according to a Likert scale from 1 - 5, therefore a value above "3" would represent that the negative factor is of importance. The results show that in Hong Kong there were two negative factors below a score of "3". These negative factors were "Less employment positions" and "Reduce the project accountability", which both scored only 2.79.

In addition, on top of those factors the respondents were asked to rate, they were also given the opportunity to add others which would be of importance, but again like for the attractive factors they did not do so.

#### *Agreement of the survey respondents*

Kendall's concordance analysis was conducted to measure the agreement of different respondents on their rankings of attractive and negative factors based on mean values within a particular group. If the Kendall's coefficient of concordance ( $W$ ) carries a pre-defined significance level of say 0.05, a reasonable degree of consensus amongst the respondents within the group on the rankings of obstacles was indicated. As shown in

Table 1, the W value for the rankings of attractive and negative factors is 0.071 and 0.094 respectively. For the attractive factors the computed W is significant with  $p = 0.008$ .

According to Siegel and Castellan (1988), W is only suitable when the number of attributes is less than or equal to 7. If the number of attributes is greater than 7, chi-square is used as a near approximation instead. The critical value of chi-square is obtained by referring to the table of critical values of chi-square distribution, which can be found in Siegel and Castellan (1988). For this study as the number of attributes considered are above seven, the Chi-square value would be referred to rather than the W value. According to the degree of freedom, the critical value of Chi-square is 23.680 and 21.030 for the attractive and negative factors respectively and the computed Chi-square value is above the critical value of Chi-square (29.907 and 35.968 respectively). Therefore the assessment by the respondents within the group on their rankings of attractive and negative factors is proved to be consistent. This finding ensures that the completed questionnaires were valid for further analysis.

Insert TABLE 1 here.

### **The suitability of using PPP for the Hong Kong Zhuhai Macau Bridge**

#### *Background of the Hong Kong Zhuhai Macau Bridge*

#### The proposed design

The Hong Kong Zhuhai Macau (HZMB) is believed to further enhance the economy development of Hong Kong, Macau and the Western Pearl River Delta region (Hong Kong Special Administrative Region Government, 2008). The new bridge is expected to significantly reduce the cost and time for both people and goods transportation between the regions. At the same time it is hoped that the project will increase the region's competitiveness. The construction of the bridge is expected to commence no later than 2010 (Hong Kong Special Administrative Region Government, 2008). And the estimated completion date is set for year 2015 to 2016 (Chen and Lee, 2008).

The initial estimated time of travel is believed to be within 15 to 20 minutes and the total cost of the bridge will be approximately RMB37.4 billion (Mak, 2008). The main bridge will be a 29.6 kilometers dual 3-lane carriageway in the form of bridge tunnel structure comprising an immersed tunnel of about 6.7 kilometres. Vehicle speeds are anticipated to be 100 kilometers per hour. A traffic flow of approximately 12000 – 16000 vehicles are expected per day (Hung, 2008). The bridge will land on an artificial island off Gongbei on the west side, and another artificial island on the east which would be west of the HKSAR boundary. According to the current proposed construction option, the connecting roads are about 12.6 kilometers on the Hong Kong side and 13.9 kilometers on the Mainland side. The bridge will run across the Lingding Channel, the Tonggu Channel, the Qingzhou Channel, the Jiuzhou Port Channel, and the Jianghai Channel etc. (Transport and Housing Bureau, 2008a).

### The original PPP decision

The HZMB project was originally suggested by the private sector hence PPP was the assumed delivery method from the very beginning. A PPP plan was originally drawn up in early 2008 for the bridge. This plan was officially initiated by the three governments from Guangdong, Hong Kong and Macau in 2002. Under the PPP scheme, the three governments would be only responsible for construction of ports and connective parts of the bridge within the three sides and its main part will be constructed by bids (Qiu, 2008). Under the PPP arrangement the bridge was to have a 50 year concession period (Legislative Council, 2008).

Another reason for the HZMB to be delivered by the PPP model was the high project costs. By involving the private sector the governments would not need to take up the financial risks involved (Apple Daily, 2008).

### Changing from private financing to public financing

The idea for the HZMB was first proposed by Mr. Gordon Wu of the Hong Kong listed Hopewell Holdings Limited in the eighties (Kwok, 2009). Mr. Wu's original initiation of the project led minds to think that Hopewell Holdings would definitely be interested to participate in this mega infrastructure project but it has been reported that over twenty years after the idea was first proposed, the company no longer saw a business opportunity in the plan (Lam and Chan, 2008). Similarly, other private sector companies felt the

same. The private sector was no longer interested in this project as the business potential for them was not attractive.

Therefore, the decision for the financing model of the bridge was changed dramatically. In the “8th AWCG Meeting” held in February 2008 it was still assumed that the project would be procured by PPP. The three governments agreed to take up the responsibility for construction and operation of the boundary crossing facilities and the link roads to the bridge within their own territory. It was discussed that private investment would be invited for the main body of the bridge with the funding gap shared by the three governments according to construction needed in their own territories. In this arrangement Hong Kong would have covered 50% of the difference, Guangdong 35% and Macau 15%. The decision showed that the governments were in favour of the PPP arrangement at the time (Transport and Housing Bureau, 2008b).

But in an interview conducted with the Secretary for Transport and Housing Bureau also in February 2008, she was asked by reporters whether the PPP method would be adopted for the HZMB. The Secretary responded that the project would be considered as a whole amongst the governments. Her response did not directly answer whether the project would be financed by the private sector or not (Transport and Housing Bureau, 2008c).

Under some discussion and reviews of the studies that have been carried out such as on the traffic flow and bid price, it was realised that the governments would not be able to come up with an attractive economic package for the private sector to be interested (Ming

Pao Newspaper, 2008a). Finally a decision was made at the “11th Plenary of Hong Kong-Guangdong Co-operation Joint Conference” in August 2008. It was announced that the HZMB would be funded jointly by the governments (Hong Kong Special Administrative Region Government, 2008). It was confirmed that the bridge would be conducted using public money rather than private sector resources.

The preliminary proposed contribution from each government will be RMB6.75 billion from the HKSAR government, RMB7 billion from the Guangdong-Central government, and RMB1.98 billion from the Macau Special Administrative Region government. The total contribution from the three governments will be RMB15.73 billion, which will be equal to 43% of the bridge's construction cost. The remainder will be financed by bank loans (Information Services Department, 2008a).

The new arrangement has meant that the Guangdong government has become the largest stakeholder of the project (Hong Kong, Guangdong and central government and Macau government will take up approximately 43%, 45% and 13% respectively of the upfront payments (Lam and Lai, 2008)). In the original proposal the HKSAR government would have taken this role. The move for this change can be an indication that the Chinese government has high desire to push the project ahead. But there has been no comprehensive answer from the governments why the PPP arrangement was not opted for the bridge. (Chen and Lee 2008)

*Attractive factors of the Hong Kong Zhuhai Macau Bridge*

### Maximize financial resources

To the government, PPP frees up fiscal funds for other areas of public service, and improves cash flow management as high upfront capital expenditure is replaced by periodic service payments and provides cost certainty in place of uncertain calls for asset maintenance and replacement. Public sector projects delivered via the private sector normally involve private sector funding. Consequently, the public funding required for public services can be reduced and redirected to support sectors of higher priority, e.g. education, healthcare, community services, etc. (Li et al., 2005b; Efficiency Unit, 2002). Given this observation “a. Solve the problem of public sector budget restraint” was given a relatively low score of “1”, whereas “c. Reduce public money tied up in capital investment” and “n. Non recourse or limited recourse to public funding” were both given a score of “3”.

### Improve economic development

Mr. Wu had observed the added advantages towards industry with improved infrastructure network in the Pearl River Delta Region. But no further actions were taken by the HKSAR government hence the project was put on hold for over two decades (Oriental Newspaper, 2008).

It was not until September 2002 that the project was rethought. At the “Third Meeting of the Mainland / Hong Kong Conference on the Co-ordination of Major Infrastructure Projects” it was agreed that a study would be conducted on the transportation between Hong Kong and Pearl River West. This was the first proper study conducted to analyse the feasibility of the HZMB. Furthermore, in January 2003, the National Development and Reform Commission (NDRC) and the HKSAR government commissioned the Institute of Comprehensive Transportation to conduct this study. The study was completed in July 2003. The report entitled “Transport Linkage between Hong Kong and Pearl River West” highlights that transportation between Hong Kong and the Pearl River West is insufficient. A point which was mentioned over twenty years ago but only verified till now. The current transport between these jurisdictions via the Humen Bridge is costly and time consuming. Therefore, the report concluded that the HZMB would be advantageous to overcome the problems (Transport and Housing Bureau 2008a). Given the evidence provided the following attractive factors were all awarded a relatively high score of “4” for their likelihood of occurrence in this project if PPP was to be opted: “b. Provide an integrated solution (for public infrastructure / services)”; “j. Benefit to local economic development”; “k. Improve buildability”; and “l. Improve maintainability”.

#### Reduction in time and cost

Public sector projects delivered by the PPP model can often be completed on time and even with time savings because the consortium would start receiving revenue once the

facilities/services are up and running. Therefore, the project team is keen to complete design and construct as quickly as possible. Once it starts to accrue revenue it can begin to pay off the initial costs and build up profits, whereas in a traditionally procured project there are no extra financial incentives for public servants to deliver projects faster. As a result, projects can best be proceeded along as scheduled (Akintoye et al., 2003; Efficiency Unit, 2003a; Environment, Transport and Works Bureau, 2004; Grimsey and Lewis, 2004; Li, 2003). Therefore, “d. Cap the final service costs” was given a high score of “4”, “f. Reduce the total project cost”, “i. Reduce public sector administration costs” and “o. Accelerate project development” were all given a score of “2” and also “g. Save time in delivering the project” was given a score of “1”.

#### Increase innovation

The factor “e. Facilitate creative and innovative approaches” was also given a score of “3”. Innovation is another important advantage that the private sector can bring to public services. Generally speaking, the public sector may not be as innovative as the private sector. The private sector on the other hand is continuously searching for new products and services to increase their competitive edge and to save costs (Akintoye et al., 2003; British Columbia, 1999; Chan et al., 2006; Efficiency Unit, 2002; Efficiency Unit, 2003a; Environment, Transport and Works Bureau, 2004; Li et al., 2005b; Li, 2003; New South Wales Government, 2006). With regard to the local situation the attractive factor “m. Technology transfer to local enterprise” was given a score of “2”.

### Risk transfer

The attractive factor “h. Transfer risk to the private partner” was given a score of “3”. Risk transfer is one of the main reasons for adopting the PPP approach. The private sector is in general more efficient in asset procurement and service delivery and as a result it is to the government’s advantage to share the associated risks with the private sector. In line with widely accepted principles, Hong Kong government’s Efficiency Unit (2003a) advocated that the most ideal situation is to allocate the risk to the party most able to manage/control that risk. For example, the contractor would take up the construction risk, the designer would take up the design risk, the government would take up environmental approval risks, land acquisition risks etc. (Akintoye et al., 2003; Boussabaine, 2007; British Columbia, 1999; Chan et al., 2006; Corbett and Smith, 2006; Efficiency Unit, 2002; Efficiency Unit, 2003a; European Commission Directorate, 2003; Grimsey and Lewis, 2004; Ingall, 1997; Li et al., 2005a; Li, 2003; New South Wales Government, 2006; So et al., 2007; United Nations Economic Commission for Europe, 2004).

### *Negative factors of the Hong Kong Zuhai Macau Bridge*

### Project accountability

The Cross City Tunnel project of Sydney which was delivered by the PPP model faced many problems. Due to the inaccurate traffic forecasts and the high toll prices which

were applied to overcome the low traffic volume, both the consortium and the New South Wales Government were highly criticised for this project (Jean, 2006). Similarly if high tolls and low usage are experienced by the HZMB, the situation would in turn limit the cooperation between the three jurisdictions and also demean the objective of the bridge. As a result the governments may be reluctant to deliver large infrastructures jointly again. Given evidence from previous experiences “a. Reduce the project accountability” was given a score of “3”.

#### Financial risks for the private sector

The governments were also aware that the private sector lacked motivation for this project. As the bridge was found to be highly costly and uneconomic, the appeal to the private sector even with compensation would be difficult to attract (Van der Kamp, 2008). Bearing these facts in mind the negative factors “b. High risk relying on private sector” was given a score of “3”.

A major reason why the West Harbour Crossing in Hong Kong was so unsuccessful compared to the Cross Harbour Tunnel also in Hong Kong was because it was built 30 years later and at a cost of twenty-three times more. Similarly it has been 25 years since the idea for the HZMB was first mentioned, the cost of construction and the necessity for the bridge has definitely changed. The lack of interest from the private sector maybe an indication that the bridge is not as important as it once was. The original intention was that the bridge could serve the industrial development of the area rather than the general

public. But since the idea was first proposed undoubtedly there has been a large change and movement to the industries in the region. Therefore, the negative factors “g. High participation costs” and “h. High project costs” were both given high scores of “4”.

#### Lack of government commitment

With the comfortable reserve from all three governments there has been less drive to force the project as a PPP. A string of recent projects in Hong Kong have also been linked with PPP but none of these have actually gone through with the idea e.g. the West Kowloon Cultural District. The HKSAR government has shown to be indecisive on the procurement methods to be used hence there is a chance that their views could also affect the Guangdong and Macau governments, therefore “c. Very few schemes have actually reached the contract stage (aborted before contract)” was given a score of “3”.

#### Lengthy delays

Lengthy delays would be one of the main concerns if the HKZMB was to be delivered by PPP. The Chief Executive of Hong Kong, Donald Tsang spoke publicly at the “11th Plenary of Hong Kong-Guangdong Co-operation Joint Conference” in Guangzhou during August 2008 on the advantages for the HZMB to be funded jointly by the governments. He explained that for the governments to take up the financing responsibility would speed up the construction works of the bridge. This argument was also agreed by Chen (2008) who claimed that the project would be delivered two years earlier than the PPP approach

which normally would require a lengthy consultation period and complicated legislative requirements.

The extended duration of the tendering and negotiation process due to the project being a PPP was foreseeable. Also the differences in legislation between the three jurisdictions, made it even more difficult to come up with a unique agreement on aspects such as vehicle flow and sharing of risks between the public and private sectors. As a result to continue with the PPP plan would mean that the timeframe for the project would be more unpredictable and a lot further away (Apple Daily, 2008).

The governments' decision in this project has also been supported by some of the media. If the project continued as a PPP, the private sector would need to prepare a bid based on their financial benefits in which they will take in to account their expenditure for the project, the traffic forecast and the toll price. Bid preparation is a lengthy and costly process in PPP type projects (Zhang, 2001). If the governments are to find that their proposals are unsuitable, the process for the project would be further extended. Similar situations as the Kai Tak Cruise Terminal in Hong Kong could arise. From the evidence available, the negative factors "d. Lengthy delays because of political debate", "i. A great deal of management time spent in contract transaction" and "m. Lengthy delays in negotiation" were regarded as highly foreseeable for the HKZMB hence were given the maximum score of "5" for likelihood of occurrence.

#### High charges for the general public

Another problem foreseeable if the project was to be delivered by the PPP model would be the high toll fees that may be imposed. The private sector are profit making organisations, hence they would adjust the toll fees so that they can cover their expenditure acquired during the delivery and maintenance of the project. In addition, they will hope to seek reasonable financial rewards. In doing so there is a risk that the project would follow in the footsteps of the East and West Harbour Crossings in Hong Kong (Apple Daily, 2008). These projects were procured under the BOT model, controversy to the Cross Harbour Tunnel (Hong Kong's first and probably most successful BOT project) they suffered much bad publicity due to the high and continuously increasing toll prices. As a result, the general public has tended to use the cheaper Cross Harbour Tunnel more frequently than the other two tunnels for the crossing between Hong Kong Island and Kowloon Peninsula.

In the case of the HZMB, the general public could also choose to travel on cheaper routes if the prices were to be too high. Studies showed that the HZMB would not be commercially viable hence that would mean that the governments would have to cover the financial costs if the bridge was to be delivered by PPP (Brown, 2008). If the private sector was to be involved they would be left with no choice but to raise the toll process incredibly to compensate for their expenses acquired as in the case of the East and West Harbour Crossings (Apple Daily, 2008).

Originally calculations showed that if the bridge was procured by the PPP model the toll fares would be approximately \$150 for each vehicle crossing the bridge (Mak, 2008), but whether this price will be lowered due to public financing is still unknown (Hong Kong Special Administrative Region Government, 2008). Chairman of the Container Transportation Employees General Union, Mr. Chiu spoke publicly that the toll fees should be lowered between the range HK\$80 to HK\$100 to be reasonable for the general public (Mak, 2008). Another local Hong Kong car rental enterpriser believed that for such a short journey the fare should not be beyond HK\$100 to HK\$120. The responses show that the proposed toll prices would be far too high for the general public to benefit from the project.

So (cited in Ming Pao, 2008b) conducted an analysis on the probable toll fees under different financing models. Three different scenarios are considered. The first and second scenarios estimates the toll fee for crossing the HZMB, with the project financed by the host governments according to a 120 year and 60 year investment return period respectively. Other factors considered in the estimation include the savings from the private investor's profits if the project was to be financed by the PPP model, and also the estimated annual usage of the bridge. The toll fees estimated per trip were RMB\$193 and RMB\$387 for the first and second scenarios respectively. The third scenario considers the project under the PPP model. The investment return period was set at 30 years which is also a typical concession period for PPP type projects (Howes and Robinson, 2005). Other factors considered in the estimation also included the estimated annual usage of the bridge. Under this scenario the toll fee was calculated to peak RMB\$830 per trip.

Analyses of these scenarios have illustrated that the use of the PPP financial model (Scenario 3) may be 2 (Scenario 2) to 4 times (Scenario 1) more expensive than if it is funded primarily by the government. Therefore “e. Higher charge to the direct users” was also given the maximum score of “5”.

#### Allegation of collusion between the public and private sectors

There are also other advantages that have been perceived of the new arrangement. Chen and Lee (2008) quoted from a Hong Kong academic that the new arrangement will minimise the chance of negotiation between developers and the governments; hence will reduce allegation of collusion between business and the government. Hong Kong has previously been criticised for favouring certain developers and giving developers high financial returns through delivering public projects. An example is the Cyberport project a technological centre and the West Kowloon Cultural District a proposed cultural hub (both in Hong Kong) (Wong, 2005). Given the previous experiences of Hong Kong “k. Confusion over government objectives and evaluation criteria” was given a score of “2” and “l. Excessive restrictions on participation” was given a score of “3”.

#### Other negative factors

Other negative factors include those related to staffing issues and lack of experience or skills. Although no related information was sourced for the HKZMB project, these negative factors may possibly be foreseeable. Therefore both “f. Less employment

positions” and “j. Lack of experience and appropriate skills” were both given a score of “2”.

#### *Final assessment of the HKZMB*

With the identification of the weightings for the attractive and negative factors of PPP, these could be identified as checklists for assessing the suitability/feasibility of using PPP. If the attractive factors are prevailing in a given project scenario, the use of PPP will be more positive. Conversely, if the negative factors are dominant PPP might be considered as unsuitable. Tables 2 and 3 summarize the assessment of the HKZMB according to their calculated weightings. The findings show that the attractive factors scored between 0.06 and 0.30, whereas the negative factors scored between 0.13 and 0.45, indicating that on average the negative factors were more prevailing. The highest scoring attractive factor was found to be “b. Provide an integrated solution (for public infrastructure / services)” and the highest scoring negative factor was “d. Lengthy delays because of political debate”. As discussed in previous sections of this paper, these factors are well supported with much evidence. The total scores for the attractive and negative factors in respect of the HKZMB are 2.81 and 3.58 respectively. This result shows that the negative factors are much more dominant than the attractive factors by 27% hence PPP is not the suggested procurement method for the HKZMB.

Insert TABLE 2 here.

Insert TABLE 3 here.

*Additional attractive and negative factors*

The attractive and negative factors discussed in this paper were derived from a comprehensive literature review and verified by previous researchers. Their relevance and appropriateness was also confirmed from data collected in the United Kingdom and Hong Kong. The survey respondents were also given the opportunity to suggest additional factors to ensure that the ones already derived were representative for PPP projects. Nevertheless, the questionnaire surveys sought opinions on PPP projects in general and not for particular projects. Therefore it is still anticipated that there may be additional factors depending on the case being considered due to the uniqueness of each project. As a result of the HKZMB analyses, there are a couple of additional factors which should also be considered if a proper evaluation model for assessing the suitability of PPP for this case was to be conducted.

From the case analyses of the HKZMB, the attractive factor “Uplift public image” should also be considered. If the public image of a project can be uplifted as a result of being delivered by PPP then this should be an additional attractive factor which needs to be considered. The analyses demonstrated how the general public’s opinion was also vital in reflecting a project’s success. In the case of the HKZMB its public image had dropped immensely due to the lengthy discussion regarding the financing options. The support

from the general public is vital as they also represent the future end users of the facilities and services.

One recent argument over PPP projects in Hong Kong is whether they are giving the private sector too much financial benefits in return of providing the services and facilities. The media have often portrayed news regarding the existence of public private collusion. The HKZMB did not attract much private interest, providing a more attractive business case would not have been evitable. But due to the continuous hyped up critique of providing private sectors with unreasonably high economical benefits, the government has been careful to avoid such allegations. In this case, the government was able to avoid these as they paid for the project themselves. Therefore, the negative factor “Suspected public private collusion” should also be included as one of the negative factors.

The HKZMB case study has shown that at different time and stages, the attractive and negative factors may vary slightly depending on the project it is applied for and its geographic location.

## **Conclusions**

This paper presents an evaluation model for evaluating the suitability of PPP projects. Using this model potential PPP projects can be assessed and assigned a score for their attractive and negative factors. The HKZMB was used to demonstrate the feasibility of this model. The results show that the negative factors outweigh the negative factors of

this project hence the use of PPP to deliver this project would not be recommended. This suggestion also falls in line with the actual decision made by the host governments of this project. This evaluation model has presented a system for users to analyze whether potential public projects should be procured by PPP. Although the evaluation model was developed based on a questionnaire survey conducted in Hong Kong, having defined the weighting of the attractive and negative factors of PPP, this method could be easily replicable and applied in other jurisdictions. The method presented is believed to be useful for both the public and private sectors especially during the early stages of project evaluation.

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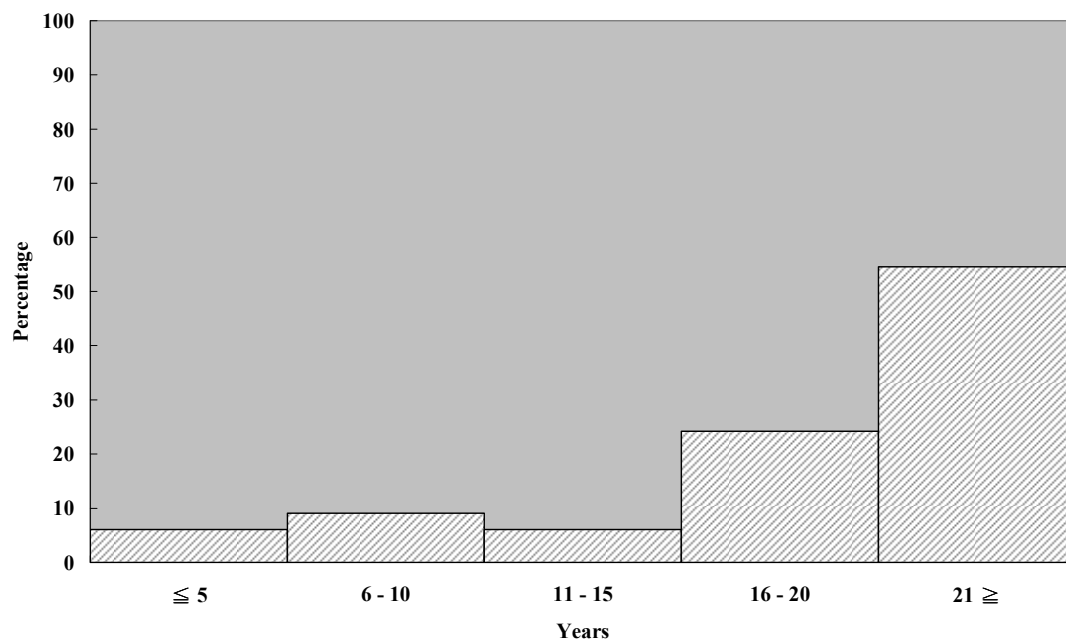
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Figure 1 Histogram showing the number of years of working experience in construction industry for the Hong Kong survey respondents

Figure 2 Histogram showing the number of PPP projects the Hong Kong survey respondents have been involved with

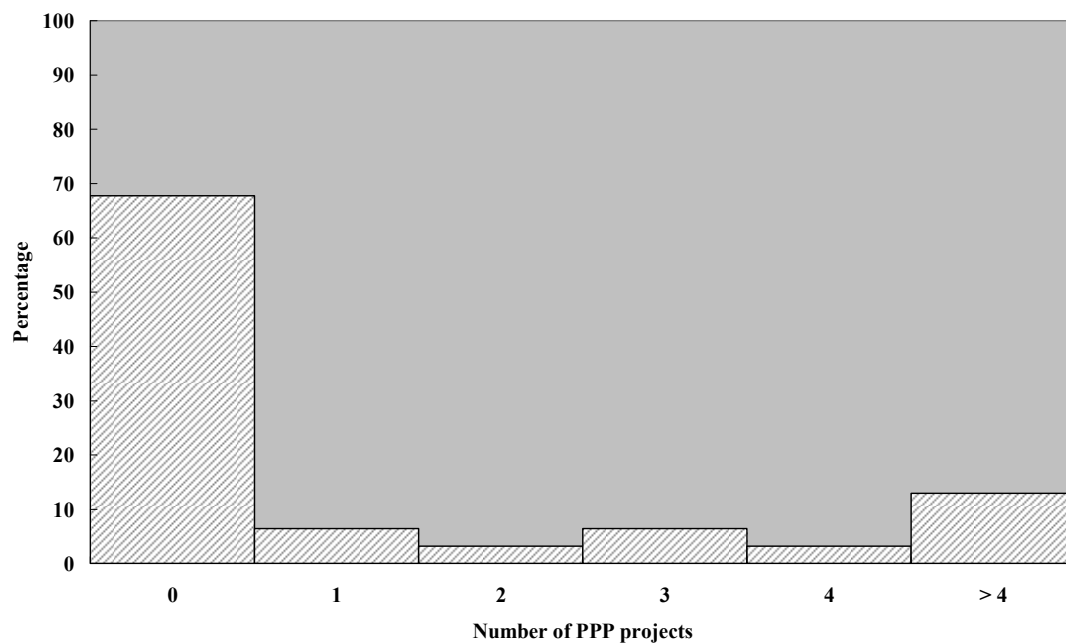
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Table 1 Results of Kendall's concordance analysis for the attractive and negative factors  
 of PPP

	<b>Attractive factors</b>	<b>Negative factors</b>
Number of survey respondents	30	32
Kendall's coefficient of concordance (W)	0.071	0.094
Chi-square value	29.907	35.968
Critical value of Chi-square	23.680	21.030
Degree of freedom (df)	14	12
Asymptotic significance	0.008	0.000

Note: For the attractive and negative factors only 30 and 32 respectively out of 34  
 responses were suitable for subsequent statistical analyses

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Table 2 Mean scores and rankings for the attractive factors of PPP

Attractive Factors	N	Mean	Rank	Weighting	Assessment of the HKZMB	
					Likert scale assessment	Score
a. Solve the problem of public sector budget restraint	34	3.65	3	7.16%	1	0.07
b. Provide an integrated solution (for public infrastructure / services)	33	3.79	1	7.43%	4	0.30
c. Reduce public money tied up in capital investment	33	3.48	6	6.82%	3	0.20
d. Cap the final service costs	34	3.26	10	6.39%	4	0.26
e. Facilitate creative and innovative approaches	34	3.74	2	7.33%	3	0.22
f. Reduce the total project cost	33	3.09	14	6.06%	2	0.12
g. Save time in delivering the project	34	3.21	13	6.29%	1	0.06
h. Transfer risk to the private partner	34	3.65	4	7.16%	3	0.21
i. Reduce public sector administration costs	33	3.39	8	6.65%	2	0.13
j. Benefit to local economic development	34	3.56	5	6.98%	4	0.28
k. Improve buildability	33	3.24	11	6.35%	4	0.25
l. Improve maintainability	34	3.32	9	6.51%	4	0.26
m. Technology transfer to local enterprise	34	2.94	15	5.76%	2	0.12
n. Non recourse or limited recourse to public funding	34	3.21	12	6.29%	3	0.19
o. Accelerate project development	34	3.47	7	6.80%	2	0.14
<b>Total</b>		51		100:00%	42	2.81

Table 3 Mean scores and rankings for the negative factors of PPP

Negative Factors	N	Mean	Rank	Weighting	Assessment of the HKZMB	
					Likert scale assessment	Score
a. Reduce the project accountability	34	2.79	12	6.60%	3	0.20
b. High risk relying on private sector	34	3.09	10	7.31%	3	0.22
c. Very few schemes have actually reached the contract stage (aborted before contract)	34	3.41	3	8.07%	3	0.24
d. Lengthy delays because of political debate	34	3.82	1	9.04%	5	0.45
e. Higher charge to the direct users	34	3.26	9	7.72%	5	0.39
f. Less employment positions	34	2.79	13	6.60%	2	0.13
g. High participation costs	34	3.35	5	7.93%	4	0.32
h. High project costs	34	3.03	11	7.17%	4	0.29
i. A great deal of management time spent in contract transaction	34	3.29	6	7.79%	5	0.39
j. Lack of experience and appropriate skills	33	3.27	8	7.74%	2	0.15
k. Confusion over government objectives and evaluation criteria	34	3.41	4	8.07%	2	0.16
l. Excessive restrictions on participation	34	3.29	7	7.79%	3	0.23
m. Lengthy delays in negotiation	33	3.45	2	8.17%	5	0.41
<b>Total</b>		42.25		100:00%	46	3.58