Labour and skill shortages in Hong Kong's construction industry

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Abstract

Purpose – With many large-scale infrastructural and residential projects in Hong Kong, the construction industry is suffering from serious labour and skill shortages. The purpose of this paper is to identify practicable strategies for resolving these problems, assess the effectiveness of these identified strategies and finally develop a conceptual labour supply model.

Design/methodology/approach – Data were collected qualitatively and quantitatively through discussion forums and questionnaire surveys. Comprising 30 expert members, two discussion forums were held to identify both practical response strategies and conceptual labour supply framework. Based on ten identified strategies, surveys were then conducted in the form of a web-based questionnaire. In total, 2,900 respondents were invited to take part and 438 questionnaires were completed. Grounded theory approach was adopted to develop a labour supply theory.

Findings – In total, three identified strategies which could deliver quick results to the industry were increasing worker wages, importing foreign workers and engaging employers to provide training. Other identified strategies were also effective over the medium and long terms.

Practical implications – Many of the identified solutions are enforceable. These are not only applicable to Hong Kong, but also transferable to other countries where voluntarily based measures under the free-market economy do not work in an effective manner.

Originality/value – Unlike previous studies largely relied on voluntarily based measures, most of the identified strategies in this study are enforceable to ensure its effectiveness. In addition, based on the grounded theory approach, this study has developed a conceptual model for analysing labour supply issues in both local and overseas situations, thus contributing to the new knowledge in this area.

Keywords Hong Kong, Construction industry, Employee attitudes, Labour shortage, Labour supply model, Skill shortage

Paper type Research paper

1. Introduction

Labour shortages occur when employment has nearly reached its full capacity and employers have faced a difficulty in finding suitable workers to fill available vacancies. Skill shortages occur when there is insufficient number of workers with the required qualifications, skills or experience necessary to carry out a particular job. Both labour and skill shortages may coexist with a substantial level of unemployment.

It is well established in labour economics theory that labour supply is determined by a number of key factors, including the demographic trend, labour force participation rate, education choice, occupational preference of workers and immigration (Boswell *et al.*, 2004). In respect of demographic trends, the fertility rate in many developed countries has been declining for several years, while the average life expectancy has risen. As a result, the average age of the population has been increased, but the proportion of the population under employment has been decreased. In respect of labour force participation rates, there are more people to study tertiary education which has increased the average entry age into the labour market. On the other hand,

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there are also more people to retire at earlier ages which have reduced the labour participation rate. In respect of occupational preferences of workers, one of the causes for labour shortages is that workers are generally not willing to perform low-paid, low-status and low-skilled works. Although the construction industry may offer reasonable high wages, the poor image of the industry and the lack of career advancement would discourage people from joining the industry (Agapiou *et al.*, 1995). In Hong Kong, the inflow of immigrants from the Mainland China can increase the overall the labour force, while balancing the skill composition. However, most immigrants migrate through the family gathering route. They have no or low skills and cannot directly ease the labour and skill shortage problem.

According to Federie *et al.*'s (1993) model of workforce, individual's aspirations, interests, values, perceptions and perceived abilities influence their choice to find a career in the construction industry. Other factors include educational system, family and individual perceptions, wages, weather, overall industry image and labour unions. Fiori (2003) finds from a survey of US's high school students about the attractiveness of different careers that construction is ranged 498 out of 500 occupations, thus reflecting the poor industry image.

In Hong Kong, the construction industry suffered a serious downturn between 1998 and 2007 due to the economic recession. During this recessionary period, many skilled workers were forced to work in other industries. Since 2008, the government has implemented ten mega-infrastructural development projects to promote economic growth. The capital work expenditure in the public sector rose substantially from HK$21 billion in 2007-2008 to HK$62 billion in 2012-2013, and will increase to over HK$70 billion per year in the next few years. Construction in the private sector has also recently picked up due to the rising property price. As a result of the sustained high workload, the construction industry is facing the challenges of skill mismatches and an aging workforce (Development Bureau, 2012).

In view of the labour and skill shortages, the government injected additional funding to the Construction Industry Council (CIC) in enhancing training and trade testing for prospective workers and also in enhancing promotion activities to attract more people to the industry. Supported by this funding, the CIC launched its enhanced construction manpower training scheme under which a sufficiently attractive training allowance is provided to attract new entrants. The CIC also launched its contractor cooperative training scheme under which it cooperates with contractors to provide on-site training and increase the overall training capacity. This scheme is particularly useful for trades whose training centres cannot provide the appropriate training such as tunnel boring machine operators. Contractors can directly recruit suitable workers and provide training under the CIC's supervision. Although many initiatives have been taken, the Hong Kong's construction industry is still experiencing difficulties in recruiting skilled workers. Therefore, the objectives of this study are to: identify practicable response strategies or solutions for resolving local labour and skill shortages; assess the effectiveness of the identified response strategies; and finally develop a conceptual framework for analysing the skilled labour supply in both local and global communities.

2. Literature review

As labour or skill shortages in construction have occurred in many countries, a number of previous studies have been conducted to investigate various responding strategies. For instance, Lobo and Wilkinson (2007) find that construction firms in New Zealand

look to active marketing, overseas recruitment, high wage and labour substitution in order to retain existing staff and attract new staff. This study considers that the government, industry and education should jointly establish a government-coordinated council to solve the skill shortage in construction.

Gunderson (2001) suggests that the skill shortage in Canada can be alleviated by government's responses by managing demand fluctuations through policies, providing financial support for vocational education, considering loans for self-employed entrepreneurs and considering immigrants to fill specific skill shortages. He also suggests that construction employers may help alleviate the problem by increasing efforts to attract young, female and aboriginal workers, reducing narrow job classifications to encourage multitasking, recognizing foreign equivalency standards, treating labour as a resource to ensure a highly committed workforce and fostering labour management initiatives to alleviate shortages.

Watson (2007) identifies several influential factors concerning skill shortages in the Australian construction industry: under-investment in education and skills training, reduction in entrants into the apprenticeship programme, increase in aged population, imbalance between the demand for, and supply of, specific sills, insufficient training packages to meet the industry demand, and a major percentage of low-level/education immigrants.

In a survey of the UK's construction skills shortage response strategies, Mackenzie *et al.* (2000) identify seven schemes: the considerate construction scheme, the construction skills certification scheme, the Construction Industry Training Board (CITB) equal opportunities initiative, the investors in people initiative, National Construction Week, the New Deal employment scheme and the CITB trainee recruitment strategy. They further identify nine alternative response strategies: adult trainees, ethnic minorities and women as new sources of workforce, greater proportion of direct employment, greater contractor involvement in the provision of training, long-term training plans for the whole industry, greater economic and workload stability within the industry, and greater use of advanced technologies, prefabrication and automation of construction sites. However, Dainty *et al.* (2004) identify that response strategies should aim to attract new entrants by a robust campaign that promotes the industry, engages employers in workforce development, opens up funding and training frameworks and provides market intelligence for effective future manpower planning. More recently, Barrett *et al.* (2014) made several recommendations to rectify the skills shortages in the UK construction industry: the government should embed employment requirements in public procurement contracts, local authorities should allow apprentices to move across boroughs to complete their training, the government should also fund schools to provide unbiased careers advice for students, schools should be evaluated on the basis of destination measures including progression into apprenticeships, the Skills Funding Agency should fund pre-employment qualifications and also redesign training and apprenticeship frameworks to reflect modern methods of construction, local authorities should also enable the demand-led training provision, and the government must review the impact of proposed changes to the apprenticeship funding system. In addition, a cross-party parliamentarians' inquiry was held to investigate the barriers to training and employment of young people and to find ways to create a sustainable, better-skilled industry. They come up with six recommendations: strengthening leadership in construction, using public-sector contracts to boost employment for young people, attracting the best talent, creating a better apprenticeship experiences, matching skills and training with changing

industry need, and making it easier to employ and train young people (Chartered Institute of Building and Construction Industry Training Board, 2014).

Recognizing that incentives and wage increases are effective solutions for the labour shortage but are difficult to endure without a long-term strategy, the Construction Industry Institute and the US's Centre for Construction Industry Studies propose a two-tier workforce strategy. Tier I is for managing an existing workforce, focusing on utilization, communication and organization of field management. Tier II is for improving workers' skills and productivity, thus enhancing their values. The overall goal is to increase their wages, while retaining them in the industry (Brandenburg *et al.*, 2003; Castañeda *et al.*, 2003). Rojas and Aramvareekul (2003) find that labour productivity is not significantly determined by the industry environments; rather, management and manpower issues are the two areas with the greatest potential to affect productivity. These findings indirectly support the two-tier workforce strategy.

In Hong Kong, the Building and Civil Engineering Training Board makes several recommendations in response to the labour and skill shortages: stakeholders should raise the overall image of the industry, the government should seek to provide more training incentives to attract new entrants and upgrade the skills of existing workers, employers should encourage their non-skilled workers to attend specified training courses and take various trade tests, the public should be informed of the industry's upcoming opportunities and career paths for new entrants, resources should be allocated for training ethnic minority workers, the government should exhibit better long-term planning on large-scale projects to maintain the stability of the workforce, training organizations should be more sensitive to the changing training needs of the industry, and the labour market should be closely monitored (Vocational Training Council, 2011).

Previous studies in the USA, Canada, UK, New Zealand, Australia and Hong Kong have provided many good ideas for mitigating labour and skill shortages. Unfortunately, most voluntarily based measures cannot resolve the local problem due to the industry's highly competitive environment. Therefore, it is necessary to work out some enforceable strategies to ensure its implementation. In addition, it is also desirable to develop a conceptual model which can analyse the labour supply issue in a broader global community.

3. Research methodology

This study has three main objectives: identification of the appropriate response strategies for resolving labour and skill shortages; assessment of the effectiveness of the identified strategies; and development of a conceptual framework for analysing the skilled labour supply. A mixed quantitative/qualitative method is adopted to capitalize the complementary strengths of both research methods. The data collection process was divided into two stages. Stage 1 explored the appropriate response strategies and conceptual framework for labour supply qualitatively through in-depth discussion forums. Stage 2 assessed the effectiveness of various identified strategies quantitatively through a survey. By the triangulation design, the quantitative findings complement the qualitative evidences, thus strengthening the validity of conclusions.

3.1 Discussion forums

The discussion forums were established to identify the appropriate response strategies and to develop a conceptual framework for analysing the skilled labour supply. The forums were conducted by panels of experts, comprising 30 members from the relevant government departments (two members), property developers (two members), professional institutes (eight members: two architects, two civil/structural engineers,

two building services engineers and two quantity surveyors), universities (two members), construction worker training organizations (two members), main contractors (six members), electrical and mechanical contractors (six members) and labour unions (two members). Invitations were sent to the relevant professional institution/associations, requesting their presidents/chairmen to nominate the appropriate members. For instance, for surveyors, invitation letter was sent to the Hong Kong Institute of Surveyors. Thus, all of the expert panel members were senior executives of their respective organizations. To provide a consistency check, the expert members were divided into two panels, each consisting of 15 members. Each expert panel held separate three-hour discussion forums in June 2014 to explore new solutions for resolving the labour and skill shortages. Following an inductive approach, members of the expert panel were encouraged to freely express their views during the discussion forums. Transcriptions were prepared immediately after completion of the forums. The software, VNivo, was used for the qualitative data analysis.

3.2 Questionnaire surveys

Following the discussion forums, members of the expert panel identified a list of practicable response strategies. A large-sample questionnaire was then conducted to assess the effectiveness of the various identified solutions. The questionnaire consisted of two main sections. Section 1 collected the respondents' demographic data, including their positions, disciplines, educational levels and years of work experience which were to explore the diversity of respondents. Section 2 collected the respondents' ratings on the effectiveness of the identified response strategies. A brief description of each strategy was provided in the questionnaire. Respondents were requested to rate the questionnaire, the ratings of which were based on the conventional seven-point Likert scale as follows: 1 = extremely ineffective, 2 = very ineffective, 3 = moderately ineffective, 4 = neutral, 5 = moderately effective, 6 = very effective, 7 = extremely effective and 0 = no idea. At the end of the survey, respondents were asked to express their views about any aspect of labour and skill shortages.

The survey sample was based on a number of contractors' registers, including the Housing Authority Registered Contractors, Registered General Building Contractors, Hong Kong Contractors Association, Registered Specialist Contractors, and Hong Kong Electrical and Mechanical Contractors Association, which should cover nearly all active contractors in both public and private construction sectors. The senior executives of these companies were targeted as respondents, as they were considered to have good knowledge of and experience in the industry. The survey was conducted in the form of a web-based questionnaire through the online survey tool SurveyMonkey. The survey was opened between early June and end September 2014. Realizing that the response rate might be low, invitation e-mails were sent to all member organizations in these registers in order to obtain as many responses as possible. This was not a random sampling; rather, it tried to cover the whole population. Totally, 2,900 respondents were invited to take part in the survey. In total, 438 surveys were completed successfully, representing a response rate of about 15.1 per cent. SPSS was used to carry out the quantitative analysis and graphical presentation.

4. Findings from discussion forums – practicable response strategies

An inductive approach was adopted in conducting the discussion forums. It was emphasized that the response strategies previously used in either local or overseas

countries should not be taken for granted; rather, members of the expert panels were encouraged to challenge the current strategies, explore new strategies, examine their practicalities, uncover their conceptual relationships and discover linkages between different strategies so that a theoretical framework could be generated in addition to some practicable solutions. As a result of these discussion forums, ten response strategies emerged are reported as follows.

4.1 Increasing workers' wages and benefits

Fundamental economics theory pronounces that increasing workers' wages and benefits would lead to an increase in the labour supply (Borjas, 2005). However, most young workers do not consider the construction industry as a high priority in their career choice because the current wage level is not high enough to justify the physical work it demands. Therefore, unless workers' wages and benefits can be increased to a sufficiently attractive level, the industry will not be able to attract young workers.

The expert panels suggested that both contractor associations and trade unions should work together to formulate a roadmap on how to raise worker wages to an agreeable level to both employers and employees over the next three years. This is more than a bargaining agreement on wages, benefits, hours of work and other terms and conditions of employment. Rather, they should aim at setting competitive wages that can attract new entrants into the industry. Based on the composite labour wages index for building contracts in the past three years (Census and Statistics Department, various dates), the average wage is estimated to increase by at least 10 per cent per annum over the next three years. Offering competitive wages would give prospective workers a clearer picture of their future income prospects. In order to make this response strategy to be workable, the expert panels also suggested that construction clients should allow a fluctuation provision in contracts so that contractors can recover the increased labour cost. Without the clients' support, it would not be fair for contractors to bear the increased workers' wage.

Because a raise in workers' compensation would push up the construction cost, it is necessary to critically examine the cost implications of various design options during the design stage. To this end, the expert panels suggested that construction clients should incorporate additional provisions in the consultancy agreements, requiring design consultants to conduct value management studies at various design stages to ensure that the required project functions can be met at the lowest possible cost without compromising quality and performance standards.

4.2 Importing foreign skilled workers

Simply raising workers' compensation would not entirely resolve the problem of labour and skill shortages, particularly when the economy reaches the nearly full employment level. Under such circumstances, one immediate solution is to import foreign skilled workers to supplement local workers. In fact, there is a Supplementary Labour Scheme which allows employers who have genuine difficulties to find local workers to import foreign skilled workers. As some political parties would stand on the workers' side to fight for their rights and benefits, the government is reluctant to import foreign workers into the construction industry. However, the expert panels reached a view that the government should adjust the current policy to cope with the skilled worker shortage if recruitment efforts eventually fail to meet the labour demand. This would ease the inflation and delay caused by the labour shortage.

The expert panels suggested that construction employers in trades with serious labour shortages (such as bar fixer, concretor, formwork erector, welder and scaffolder) could be allowed to employ foreign skilled workers on the condition that they would maintain a certain ratio of local to foreign workers. Based on the estimated shortage of 10 per cent of the total workforce, the appropriate ratio would be one foreign worker for every ten local workers. Foreign workers should be paid with wages and benefits not less than local workers in the same trade. In addition, employers would be required to pay a "foreign worker levy" equivalent to 10 per cent of the foreign workers' wages. This extra levy would ensure that employers would not jeopardize the employment of local workers.

4.3 Engaging contractors to provide training for new entrants

Access to high-quality training programmes is integral to the development of new skills and the long-term sustainability of the construction industry (Chartered Institute of Building, 2013). In Hong Kong, the CIC is the main player in the provision of training in the construction industry. Contractors' participation in the CIC's Contractor Cooperative Training Scheme to provide on-the-job training would increase the overall training capacity of the industry. As contractors recruit trainees from the beginning of the training period, this would provide the trainees with employment. In addition, the success rate is high because if the trainees could not accept the site's working environment, they would cease their training at an early stage. However, the expert panels recognized that the success of this scheme would largely depend on whether contractors are willing to pay sufficiently high wages that could attract new people into the training scheme.

The expert panels suggested that the Contractor Cooperative Training Scheme should be implemented as a compulsory rather than voluntary scheme in projects exceeding a certain amount of contract sum (e.g. $>$ HK$500 million). Construction clients should include a training provision in those sizable contracts that require contractors to employ trainees either directly or indirectly through subcontractors for a number of labour days no less than the number derived by multiplying the accepted contract sum by 0.01 per cent (i.e. contract sum $\times$ 0.0001 = number of labour days). Contractors would have a contractual obligation to provide on-the-job training and to bear or allow all of the associated costs, including the payment of reasonable wages, to attract the number of trainees specified under the contract.

4.4 Increasing training quotas with a reasonable training subsidy

Based on the overseas experience, training new entrants and in-service general workers is the most important solution for resolving labour and skill shortages over the medium and long terms. The CIC implemented its Enhanced Construction Manpower Training Scheme for those trades with acute labour or skill shortages (Development Bureau, 2012). Due to the physically demanding and unpleasant nature of the construction work, the recruitment process is relatively slow. Some trainees drop out halfway through the training scheme. Even after completing the training, some fail the trade tests and do not join the industry. Because all training schemes last for a few months, trainees may carry a financial burden during the training period. Therefore, one of the key issues for attracting more trainees is the amount of subsidy provided during the training period. The expert panels suggested that the training subsidy should be increased to two-thirds of the average skilled worker wages. In addition to

the government funding, the foreign worker levy collected can be used to provide the required training subsidy for trainees.

The training scheme should be flexible and diversified to bridge the gap between the actual site environment and training centre and should aim at improving the training success rate. The construction industry should also nurture a mentor system so that practical advice can be provided to trainees to help them adapt to the industrial environment.

4.5 Alternative sources of workers: new migrants, women and ethnic minorities

In many countries like USA, UK, Australia and Singapore, new migrants, women and ethnic minorities are three alternative worker sources. Based on the current government policy, approximately 150 migrants arrive from Mainland China per day (i.e. 54,750 per year) (Chou *et al.*, 2013). For instance, if 5 per cent of these migrants joined the industry, there would be 2,730 new entrants each year, which could lessen the labour shortage problem. Women construction workers are common in many countries. For instance, according to the Bureau of Labor Statistics, 10 per cent of US construction industry workers are female. Thus, women should have no problem being trained as semi-skilled or skilled workers, particularly in less physically demanding trades such as an electrician, carpenter, plumber, painter and crane operator. More ethnic minorities are also willing to join the construction industry.

The key issue is how to attract new migrants, ethnic minorities and women to join the construction industry. The expert panels suggested that the CIC, in collaboration with contractor organizations and trade unions, should actively launch recruitment campaigns in districts (such as the Sham Shui Po and Tai Po Districts) where the unemployment situation is more serious. They should offer tailor-made training courses for women and conduct training courses in the languages of ethnic minorities. Given the proper training and work opportunities, new migrants, women and ethnic minorities would relieve the pressures of labour and skill shortages.

4.6 Adopting new construction technologies and techniques to enhance construction productivity

Reducing the labour demand requires enhancing construction productivity by adopting new construction technologies and techniques. Achieving further use of new technologies and techniques above the current level requires the resolution of two key issues. First, most projects are still procured under the traditional method (i.e. the design and construction work are carried out by a design consultant and contractor, respectively). To a certain extent, the design itself dictates the subsequent construction method (e.g. the use of precast or in-situ concrete in the main structure). Second, the use of new construction technologies and techniques requires an additional investment. Unless there will be a reasonable return on investment or other client-provided incentive, contractors may only adopt new construction technologies and techniques as needed.

The expert panels suggested that construction clients should specify in the consultancy agreements to require design consultants to identify a productivity enhancement scope that could reduce the workforces in trades suffering acute labour shortages. The consultant should consider the workers' demands among other constructability implications when evaluating alternative design options. Before the option evaluation, the consultant should prepare a topical study on the construction methods, including the implementation of the mechanization, prefabrication and other

productivity enhancements. To ensure quality design along with construction productivity, the consultant should include a core personnel member (or a sub-consultant) as the construction design manager to provide this constructability input to the design development. His qualifications and construction experience should be commensurate with the scope, nature and complexity of the project. These requirements should be one of the assessment criteria in the consultant selection process so that the consultant would seriously consider the issue, starting from the preparation of technical proposals for submissions under the two-envelope tendering system. As this would create an additional work for the consultant, the client should pay a reasonable fee for these deliverables. The expert panels also suggested that a similar provision should be provided in the main contract requiring contractors to submit productivity enhancement proposals that could reduce manpower demands. Again, these should be one of the assessment criteria in the contractor selection process to ensure that all contractors properly address this issue at the tendering stage.

In addition to the contractual means, the expert panels suggested that applied research should be conducted to review the current design and construction practices with a view to reducing the manpower demands of trades suffering labour shortages. The Innovation and Technology Fund, Research Grants Council and CIC should provide the financial support for this kind of research.

4.7 Improving working conditions including health, safety and welfare facilities

The perplexing issues of unpleasant, dirty and dangerous working conditions have created difficulties in attracting new entrants to the industry. Unpleasantness and dirtiness may be resolved by improving a site's operating environment, uplifting site cleanliness and tidiness and providing uniforms for site personnel to help build a clean and tidy image for construction workers. The issue of danger should be taken seriously because one major accident can provoke a large drop in new recruitment in the industry.

The expert panels suggested that the construction industry should adopt the "pay-for-safety" scheme under which construction clients set aside a certain percentage of the contract sum for the contractor's effort to ensure the safety of workers. Each tenderer would receive the same pre-priced safety items, thus separating the safety provisions from competitive tendering. The amount set aside for safety should be a reasonable estimate (0.5-2.0 per cent of the contract sum) necessary for the contractor to carry out its safety obligations. This ensures that the contractor allocates adequate resources for the provision of site safety measures. The safety-related payment is released to the contractor during the interim payment process. A penalty is immediately enforced if the contractor fails to conform to its obligations (Construction Industry Council, 2012). In addition, the government should significantly increase fines for the contravention of any construction-safety-related regulations. In addition to contractual and statutory measures, the expert panels also suggested that trade organizations should establish a relief fund for providing immediate relief to the families of victims of serious accidents on construction sites. It was further suggested that construction firms should implement programmes that focus on the quality of working life to make jobs more attractive.

4.8 Providing long-term employment and better career paths for workers

In addition to basic wages, workers' secured employment and career advancement are important in attracting new people to the industry (Boswell *et al.*, 2004). However,

most workers are currently employed on a daily basis and have no long-term job security. In the long run, construction firms should transform to become professionally oriented companies with a stable income prospect, clear career advancement roadmap and good working environment that can attract young people to the industry.

In the short run, construction firms should offer workers long-term employment contracts after they gain sufficient working experience, and should also develop a career path for promoting workers to supervisors. However, construction firms are not willing to recruit direct labour in the current competitive environment. To help improve this undesirable situation, the expert panels suggested that construction clients should include a contractual provision that requires contractors, either directly or indirectly through subcontractors, to employ at least one-third of the total workforce on a long-term employment basis. This would ensure that quality skilled workers are regularly available under the direct control of the contractor.

4.9 Developing multi-skilled workers in construction

Some countries have promoted the development of multi-skilled workers so that the multi-skill can be transferred to facilitate more job opportunities and bridge the skill mismatch gap (Haas *et al.*, 2001). Due to high competition, most local contractors adopt specialization of skill to increase productivity and reduce labour costs. It is thus difficult to take multi-skilled workers into new projects comprising repetitive construction processes. However, multi-skilled workers are productive in fitting out, maintenance and alteration projects which comprise many small and non-repetitive tasks. The expert panels suggested that contractor associations and trade unions should develop multiple skills in their workforces on small-scale projects. Workers with skills in one trade should be encouraged to stay on the project and work in different trades by providing an incentive payment through an overall productivity increase.

4.10 Increasing collaboration among industry stakeholders to plan future manpower requirements

The Building and Civil Engineering Training Board conducts a manpower survey in the construction industry every two years. Due to the rapidly changing requirements, this manpower survey is neither accurate nor adequate for future manpower planning purposes. The expert panels suggested that the CIC should collaborate with the government, training institutions, contractor associations and trade unions to forecast the construction workload and manpower requirements over the next five years. These workload and manpower forecasts should be continually reviewed and revised every six months so that the appropriate action can be taken in a timely manner.

The government is the biggest client in the construction industry. The proper planning and distribution of all major government projects could balance the overall manpower requirements to a large extent. While those infrastructural projects that have already been commenced could not be stopped, the expert panels suggested that the programme of large-scale projects in the planning stage should be reviewed to avoid worsening the current labour shortage problem.

5. Findings from the survey – effectiveness of individual strategies

The previous discussion forums identified ten different response strategies for resolving labour and skill shortages. This qualitative analysis was supplemented by a quantitative analysis to satisfy the principle of triangulation and increase the validity

of conclusions. As such, a large-scale survey was conducted to assess the effectiveness of these solutions. In all, 438 respondents successfully completed the survey. Figures 1-4 present the demographic characteristics of the respondents including their positions, professional disciplines, educational levels and years of work experience. As shown in Figure 1, more than half of the respondents were in either top or middle management positions, and the rest were professionals. In view of their senior positions, all of the respondents should have a thorough knowledge of current labour issues in the industry.

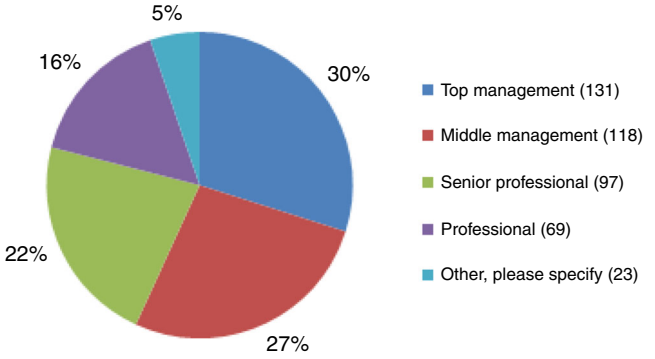

Figure 1. Respondents' positions in their organisations

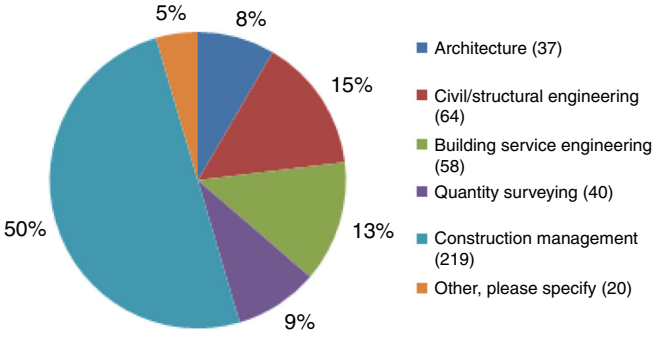

Figure 2. Respondents' professional disciplines

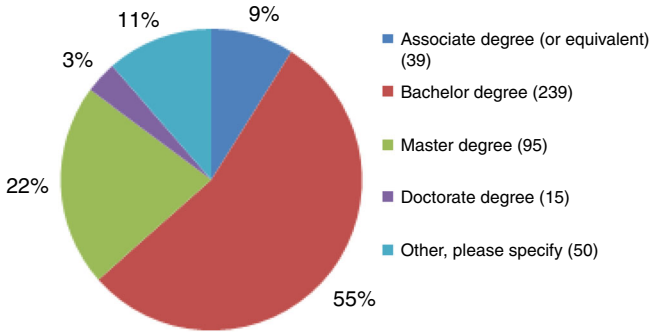

Figure 3. Respondents' education levels

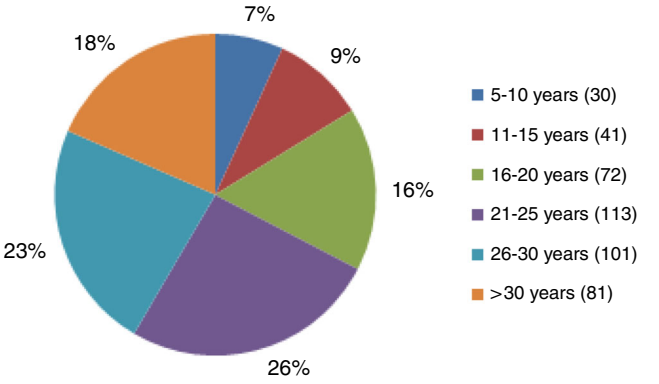

Figure 4.
Respondents' years of working experience

Half of the respondents came from the construction management discipline, while the rest came from the architecture (5 per cent), civil/structural engineering (15 per cent), building service engineering (13 per cent), quantity surveying (9 per cent) and other (5 per cent) disciplines. This could provide diversified views for different professional perspectives.

In terms of educational levels, 80 per cent of the respondents possessed a bachelor's degree or above. In terms of years of work experience, 67 per cent of the respondents had more than 25 years of work experience, and 25 per cent had 11-20 years of experience. The respondents should have the adequate qualifications, knowledge and work experience necessary to objectively assess the effectiveness of the identified response strategies.

Based on the completed questionnaires, the data were analysed by descriptive statistics, and the results are shown in Figure 5. Based on the mean values, the respondents rated three response strategies as "very effective" or above: increasing workers' wages and benefits (6.66), importing foreign skilled workers (6.53) and engaging employers to provide on-the-job training (6.02). The first two strategies

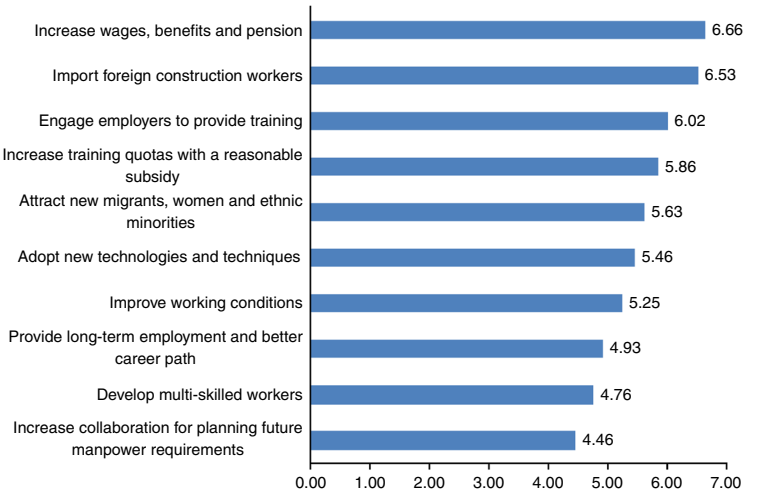

Figure 5.
Respondents' ratings of the effectiveness of response strategies for resolving labour and skill shortages

(i.e. increasing workers' wages and importing foreign workers) were rated between "extremely effective" and "very effective", and the third strategy (i.e. engaging employers to provide on-the-job training) was rated closer to "very effective".

The respondents rated four strategies between "very effective" and "moderately effective": increasing training quotas with a reasonable training subsidy (5.86), attracting new migrants, women and ethnic minorities (5.50), adopting new construction technologies and techniques (5.46) and improving working conditions (5.25). The first strategy (i.e. increasing training quotas) was rated closer to "very effective", while the last strategy (i.e. "improving working conditions") was rated closer to "moderately effective". The other two strategies (i.e. attracting new migrants, women and ethnic minorities and adopting new construction technologies and techniques) were rated in the middle of these two extremes, reflecting their effect on the labour requirement and its timing.

Other three strategies were providing long-term employment and better career paths (4.93), developing multi-skilled workers (4.76) and increasing collaboration among stakeholders to plan future manpower requirements (4.46). While these strategies were rated between "moderately effective" and "neutral", this does not mean they are not useful, but rather their effects only become apparent in the long term.

The survey results indicate that the identified response strategies could have good potential to resolve the labour and skill shortages in Hong Kong's construction industry.

6. Discussion on survey findings

Training is considered essential to resolving labour and skill shortages in the medium and long terms. Construction firms are in the best position to directly recruit non-skilled workers and then provide them with on-the-job training. By imposing a training obligation in their contracts, contractors are obliged to recruit the required number of trainees by offering a sufficiently attractive wage, while ensuring they will eventually pass the relevant trade tests to become semi-skilled workers. In parallel, the CIC should attract more trainees by significantly increasing the amount of training subsidies. They should also offer training courses specifically designed for female workers and provided in the languages of ethnic minorities. These two strategies could significantly increase the overall training capacity and gradually increase the supply of semi-skilled and skilled workers to the industry.

According to influential economist Adam Smith (1776), it is not only wages that are compared in a competitive labour market, but also the positive and negative characteristics of the positions. Firms with unpleasant working conditions must offer positive characteristics to attract workers, whereas firms that offer pleasant working conditions can get away with paying lower wage rates, effectively making workers pay for the enjoyable environment. Given the relatively poor working conditions in construction sites, offering a higher wage is one of the most effective solutions to attracting more workers to the industry. As the labour cost in a typical project amounts to approximately 30 per cent of the total construction costs, a 10-15 per cent increase in the labour cost would increase the overall construction costs by 3.0-4.5 per cent. This range of wage increase may be bearable over the short term, but is definitely not sustainable over the medium and long terms because the property price has been increased by about 300 per cent since 2009 based on the Rating and Valuation Department's statistics, leading Hong Kong as the world's most expensive property markets. Therefore, as an obligation imposed in the consultancy agreements,

value management should be conducted for each major project to reduce the construction costs.

Based on classical labour supply theory (Borjas, 2005), a rise in wages initially increases labour supply (i.e. the "substitution effect"). However, a further rise in wages has no extra effect on the work eventually after reaching a certain level (i.e. the "income effect"). Therefore, increasing a worker's remuneration does not result in an increased labour supply if the overall unemployment rate is at a very low level. Under such circumstances, it is necessary to consider another source of workers to supplement local workers. The importation of foreign skilled workers can deliver an immediate solution for the current problem. In addition, new migrants, women and ethnic minorities can also increase the labour supply.

Besides wages, job characteristics also influence the labour supply. While construction jobs have positive characteristics, they are wildly insufficient at offsetting their negative characteristics such as unpleasant and dangerous working conditions and a lack of advancement opportunities. The obvious solution is to make construction jobs more attractive by improving their working conditions and providing long-term employment and better career advancement for workers. Recognizing that voluntary measures depend on individual contractors' efforts, contractual measures such as the pay-for-safety scheme and one-third direct labour employment can be effectively enforced in new contracts.

While all of the above strategies aim to increase the labour supply from local and foreign labour markets, it is necessary to reduce the labour demand by adopting new technologies and techniques and developing multiple skills in construction. For instance, design consultants and contractors can use dry trades, make wider use of prefabricated components off-site in controlled environments and use modular designs to allow a more extensive implementation of standard formwork systems. Considering design consultants and contractors' efforts to enhance construction productivity during the selection process and subsequently imposing the same obligation under consultancy agreements and construction contracts would ensure their full consideration and implementation of these strategies in reducing the labour demand.

While each of these strategies is analysed individually, they are not mutually exclusive. Indeed, all of these strategies can be implemented together, thus achieving a greater effort in both the short and long terms. The implementation of these strategies requires a collective effort from the government, industry council, contractor associations, trade unions and contractors.

7. Development of conceptual labour supply model

In addition to identifying practicable response strategies, it is also desirable to generalize geographic-specific strategies into a conceptual model which can be used to analyse the labour supply issue in a broader global community. This study adopts a grounded theory approach to developing a labour supply theory. In grounded theory, data are not used to test an a priori theory; rather, data are used to evolve a theory (Jaccard and Jacoby, 2010). Although the identified strategies emphasize its practicable applications, each of these seemingly unrelated strategies indeed represents individual conceptual themes that can be linked together to form a conceptual framework.

As shown in Figure 6, labour supply is available from several sources in the labour market and can be broadly classified into various market segments such as local workers, new migrants, female workers, ethnic minorities and foreign workers. Under a perfectly competitive labour market, whether a job seeker joins the construction

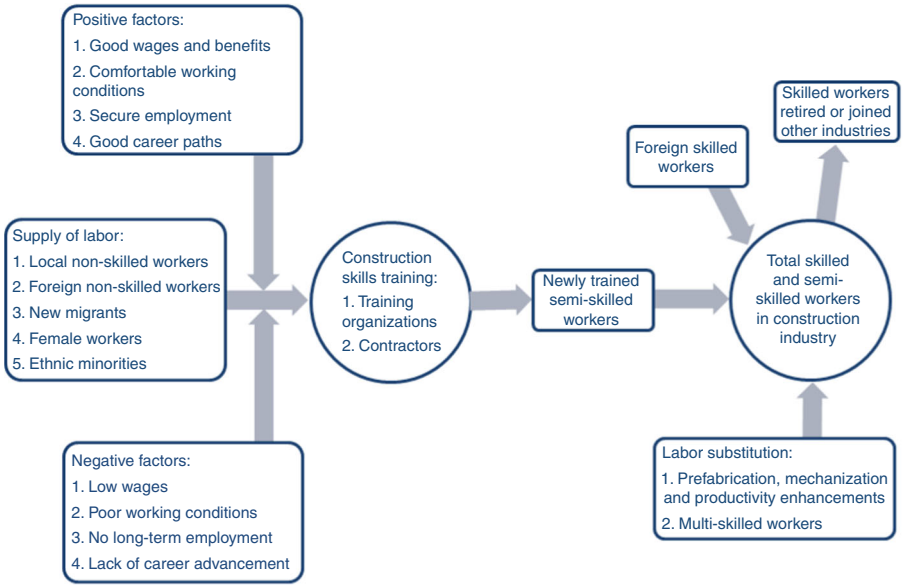

Figure 6. Conceptual framework for labour supply

industry is influenced by a number of positive and negative factors. Positive factors such as good wages and benefits, comfortable working conditions, secure employment and good career paths provide an affirmative force to attract people to the industry. In contrast, negative factors such as low wages and benefits, poor working conditions, an absence of long-term employment and a lack of career advancement discourage people from joining the industry. Some of these factors (such as wages) are more significant than others. The combined effect of the positive and negative factors determines the attractiveness of the construction industry and must be compared with other industries that also compete for labour in the free labour market. Based on different personal preferences for the nature of employment, each job seeker may perceive individual positive and negative factors differently. Various groups of people such as new migrants, female workers and ethnic minorities may also perceive these factors differently from locals. For instance, new migrants may accept a lower wage compared with local workers. It is thus necessary to adjust the employment terms and conditions accordingly.

When a society has not yet reached its maximum employment level, more labour is attracted to the industry by enhancing the positive factors and alleviating the negative factors. Therefore, if the construction industry demands more people to solve the labour or skill shortages, it should aggressively improve the positive factors and mitigate the negative factors so that the overall employment terms and working conditions are better than those of the other industries. However, if the industry's overall employment terms and working conditions are not sufficiently attractive, it will not be able to attract people, resulting in an aging workforce, labour shortage and skill mismatch (as is the current situation in Hong Kong). Further, when a society has reached its maximum employment level, the provision of better employment terms and working conditions cannot attract more people to the industry because the local labour has been utilized up to its maximum capacity. Under such circumstances, it is necessary to import foreign workers to supplement local workers.

All workers must undergo the appropriate trade training to become semi-skilled and then skilled workers after some years of experience. Either training organizations or contractors can provide training in construction. In particular, if contractors can participate in the provision of formal training, it would significantly increase the overall training capacity, thus releasing the bottleneck in the training process and enabling more semi-skilled and skilled workers to join the industry. During the training period which normally lasts for a few months, trainees may carry a financial burden if they are not provided with an income or training allowance. If the construction industry needs to attract more people, this barrier must be eliminated by providing reasonable wages or training allowances.

Whether the total workforce increases or decreases depends largely on the balance between the inflow and outflow of workers in the industry. After balancing the new entrants and retired workers, the total workforce can ideally meet the industry's labour demand. However, if the workforce cannot cater to the construction workload, the labour demand must be reduced by labour substitution measures such as prefabrication, mechanization and multiple-skilling, etc. These require a collaborative effort of both design consultants and contractors. If the workforce remains inadequate, the final solution is to import foreign skilled workers to increase the total workforce. In any situation, the construction workload and labour supply and demand should be closely monitored to ensure that the appropriate action is taken in a timely manner.

8. Conclusions

Hong Kong's construction industry is facing the issues of an aging workforce, shortage of young skilled workers and skills mismatch. Although the government and industry's stakeholders have taken many initiatives to tackle this labour problem, the industry continues to experience difficulties in recruiting local skilled workers. New and practicable solutions must be explored from diverse perspectives. Through discussion forums, the expert panels in this study identified ten response strategies for resolving the current labour problem. The effectiveness of these solutions was assessed by a large-scale survey, which confirmed that all of the identified strategies are effective to different extents. Whereas some strategies could deliver quick solutions to the industry, others would become effective only in the medium or long terms. Voluntary measures will depend on individual design consultants and contractors' cooperative efforts; however, contractual measures (such as the value management study, on-the-job training for a specified number of labour days, the topical study on construction methods, the pay-for-safety scheme and the employment of one-third direct labour) can be effectively implemented and enforced under the contracts.

While this study aims to identify solutions for resolving the labour and skill shortages in Hong Kong's construction industry, many of the proposed strategies are also applicable to many other countries where the labour supply and demand does not work under the normal free-market economy and certain interventions from the government are required. This study can illustrate to other countries on how Hong Kong is solving the labour and skill shortage problem. Based on the grounded theory approach, this study has also generalized the geographic-specific strategies into a generic conceptual model which can be applied for analysing labour supply issues in other countries, thus contributing to the new knowledge in this area. It is suggested that the dynamic interrelationships among various variables proposed in this conceptual model would provide a fruitful area for further study.

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Further reading

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