Routledge
Taylor & Francis Group

Construction Management and Economics

ISSN: 0144-6193 (Print) 1466-433X (Online) Journal homepage: https://www.tandfonline.com/loi/rcme20

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To cite this article: Helen Lingard & Steve Rowlinson (1994) Construction site safety in Hong Kong, Construction Management and Economics, 12:6, 501-510, DOI: 10.1080/01446199400000061

To link to this article: https://doi.org/10.1080/01446199400000061

Construction Management and Economics (1994) **12**, 501–510

Construction site safety in Hong Kong

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Received 16 November 1993; revised 9 June 1994

The structural characteristics of the Hong Kong construction industry, most notably its elaborate system of subcontracting and the casual basis on which labour is employed, pose serious problems for safety managers. By international standards, Hong Kong's construction industry performs very badly in the area of safety. Recent work in the UK and Finland highlights the effectiveness of behavioural techniques to improve safety performance on construction sites. Work is currently under way to test these techniques in the Hong Kong construction setting. The structural properties of the Hong Kong construction industry have been taken into consideration and labour commitments to the group and to the organization have been identified for additional consideration in research. It is expected that these variables will intervene in the application of behavioural techniques to determine their effectiveness. This paper investigates the theoretical background to commitment at the group and organizational level and presents a site-level research model which is illustrative of the possible effects that group and organization level commitment may be found to have on the use of behavioural techniques.

Keywords: Safety, behavioural, organizational commitment, group.

Introduction

By international standards Hong Kong's site safety record is poor. In 1991, 374 reportable accidents per 1000 workers were recorded. This figure is approximately twice that of the USA and 25 times worse than Japan and Singapore (Lingard and Rowlinson, 1991). United Kingdom figures show that approximately three construction workers in every 1000 suffer a major injury each year. The equivalent figure for Hong Kong in 1990 was 66 per 1000 per year (Hong Kong Government, 1992) and this figure has risen steadily since 1986. Although international comparisons are fraught with difficulty due to the different definitions used and varying levels of under- and misreporting it is obvious that Hong Kong has a major problem with site safety.

Given Hong Kong's current labour shortage and the continuing boom in both the property and infrastructure sectors it seems that the construction industry will be even harder pressed to construct safely than it has been to date. It is with this in mind that alternative methods are being sought to improve safety on site. Rather than rely on rules and procedures as a means of controlling unsafe actions a more positive, behavioural approach is being tried. Such an approach has been adopted in Finland and the UK (see Behaviour modification) and this paper describes the framework within which this approach will be tested here in Hong Kong. In particular, the paper investigates the theoretical background to what have been identified as intervening variables in the application of behaviour modification techniques, namely worker commitments to organization and group.

Current problems

Construction site safety is a complex problem and poor safety performance cannot be attributed to one cause alone. In Hong Kong, at least six key areas which affect site safety can be identified.

1. The context of Hong Kong's construction industry.
2. Education and training.
3. Legislation and its enforcement.
4. Licensing and certification of plant operators.
5. Client reaction to safety performance.
6. Insurance policies.

Lingard and Rowlinson (1991) describe Hong Kong's construction industry and the effects of its structure on site safety. The structure of the Hong Kong construc-

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tion industry is very similar to that in other developed countries with a small number of large corporate contractors and many small private contractors and subcontractors (Walker and Rowlinson, 1990). Other distinguishing features of Britain's last major colony's construction industry are the relatively large number of overseas contractors and the extremely high level of subcontracting (Walker and Flanagan, 1991). This latter characteristic is of particular importance when considering construction site safety. The existence of so many small groups on site for short periods of time is a major obstacle to good project management. Lai (1987) reported that in a survey of 17 building projects the amount of work subcontracted was never less than 92% and averaged close to 99%. Prevailing levels of craft skill and training are low and a high proportion of recent immigrants from China enter the industry. Attitudes to safety precautions, use of personal protective equipment and safety awareness are poor amongst this group in particular and they have become a significant high-risk group (*Sunday Morning Post*, 1989). Traditional methods of construction (including bamboo scaffolding and hand-dug caissons up to 40 m deep) predominate and pose safety problems peculiar to the Hong Kong construction industry (Wong, 1987; *South China Morning Post*, 1993b). Many skilled and experienced supervisors and managers have emigrated from Hong Kong in the run up to 1997 (when Hong Kong is returned to Chinese sovereignty) and all these factors combine to make control very difficult on Hong Kong sites. In Hong Kong, property and construction account for 25% of Hong Kong's GDP (Walker and Flanagan, 1991) and land purchase accounts for 75% of most property developments. In such conditions, major developers have paid little attention to the needs of the construction process but have been driven instead to construct as quickly as possible, to the detriment of safety standards. Piece rate working is common practice. In addition, expenditure on safety by contractors averages no more than 0.5% of the contract sum in most cases (Lingard and Rowlinson, 1992). Enforcement of existing legislation is poor and regulations governing safety helmets, safety belts, safety nets, safety committees and safety officers and supervisors are less stringent than those of local neighbours such as Singapore (Lingard and Rowlinson, 1991). Loopholes in the legislation and inadequate enforcement are issues which need attention (*South China Morning Post*, 1993a). The maximum penalty under existing legislation is a $50 000 fine and 1 year imprisonment but the average fine in 1992 was a mere $5302 and no-one has yet been imprisoned. At present licensing and certification procedures for plant operators and inspectors are very lax. At present passenger hoists on building sites do not have to be licensed. Regulations state that inspections of such machinery must be made by a competent person', although no explanation is given as to what qualifications are required for inspectors. As a result of a serious passenger hoist failure in 1993, in which 12 people died, the Builder's Lifts and Tower Working Platforms (Safety) Bill will come into force early in 1995 (*South China Morning Post*, 1994a). This new legislation lays out safety requirements for the design, construction, operation and maintenance of lifts and also details the necessary qualifications for lift inspectors. However, this legislation applies only to builder's lifts and tower working platforms and other heavy plant, such as cranes are not covered by the new regulations. Many loopholes in the legislation still exist. Under current legislation, construction site workers are able to operate large trucks without even standard driving licences because the Road Traffic Ordinances do not apply on private sites (*South China Morning Post*, 1994b). Very few organizations take safety performance into account when selecting a contractor. The Hong Kong Housing Authority's PASS scheme is a rare exception (Bates, 1993). Until recently insurance premiums bore little relation to contractors' safety performance but a recent upsurge in employees' compensation claims and civil law claims has changed this situation. Management commitment to safety plays a vital role in performance improvement and the increasing costs of poor safety performance have changed attitudes at this level. All of the foregoing factors have combined to make Hong Kong a very dangerous place for construction workers. Thus, the improvement of construction site safety performance is a complex calculus. Given initiatives currently under way in Hong Kong this research looks at one specific area – behaviour modification.

Previous work

Hinze and Raboud (1988) identified several factors, at both the company and project level, that apparently influenced the safety performance on Canadian high-rise building projects. Larger construction companies tended to be safer, as did those whose top management supported safety and who had appointed a full-time safety director. Projects with individuals appointed as safety officers were found to be safer than those without and projects on which regular job site safety inspections were carried out had better safety records. Projects on which sophisticated scheduling methods were used were found to be safer than those on which more basic scheduling methods prevailed. The inclusion of the owner or owner's representative in coordination meetings also had a favourable effect on safety. Finally safety performance suffered in times of economic pressure (i.e. when a project runs over budget). According to Levitt

and Samelson (1987),'screening contractors in terms of their expected safety performance is an easy and effective way for construction buyers to reduce accident costs'. They not only recommend that all construction buyers, evaluate prospective contractors but that general contractors also evaluate the expected safety performance of prospective speciality contractors. This latter recommendation could be of particular importance in the Hong Kong context given the extensive use of subcontracting. Levitt and Samelson (1987) list, in order of significance, actions taken by safe as opposed to unsafe construction buyers. These include the following.

1. Stressing safety as part of the contract to give contractors the opportunity to include safety-related items in their bids.
2. Conducting safety audits during construction to ensure compliance with the buyer's safety requirements.
3. Maintaining statistics of the contractor's safety performance.
4. Setting safety guidelines into the body of the contract.
5. Setting up a construction safety department to monitor contractor safety.
6. Requiring immediate reporting of contractor accidents.
7. Requiring the contractor to designate safety responsibility to someone on site.

Hinze (1981) reports on a study focusing on the safety performance of individual workers and linking this to individual worker attitudes. This study is of particular interest since the commitment variables identified for consideration in the current research are two aspects of worker attitude. Hinze (1981) found that workers who worked in work crews which 'got along' had better individual safety records than those who felt that friction existed within their work crew. Workers who were able to share their personal problems with someone at work, whether this was a foreman or a fellow worker, had better safety records. Safer workers were found to be those workers who believed that management listened to and took into account, their ideas. Safer workers were found to be those who received more praise from supervisors for a job well done and safer workers were found to be those who felt that their employer was concerned about their welfare. Safer workers were those who would select their present employer, even if other similar work opportunities were available and safer workers expressed a deeper loyalty towards their employer. These latter two findings are particularly important since they indicate that there is in fact a relationship between worker commitment to the organization and safety.

Behaviour modification

The effectiveness of behaviour modification techniques to improve safety performance in industrial settings has been well established over the last two decades (see McAfee and Winn, 1989). Positive reinforcement is the most widely used component of behaviour modification studies. Behaviour modification is based upon the premise that behaviour is a function of its consequences and, thus, the frequency of desirable behaviours can be increased by positively reinforcing such behaviours. The diversity of industrial settings in which the techniques have been applied and the differing treatments administered is discussed in the review by McAfee and Winn (1989). In some studies, monetary or token rewards were used to induce safe behaviour (Zohar, 1980). In other studies rewards were given in the form of graphically displayed performance feedback posted at the work place (Nasanen and Saari, 1987; Fellner and Sulzer-Azaroff, 1984). In yet other studies, practices such as goal setting (Reber *et al.*, 1984) or training (Komaki *et al.*, 1980) were combined with feedback. Two recent studies have examined the usefulness of behavioural techniques to improve safety performance in the difficult construction setting. In a study carried out on Finnish construction sites, Mattila and Hyodynmaa (1988) found that when goals were posted and feedback was given, the safety index was significantly higher than when no feedback was given and, when feedback was provided on a chart, the safety index was again higher than when non-graphic feedback was displayed. Duff *et al.* (1992) tested the techniques of training, goal setting and feedback in the UK's construction industry. Their results showed that goal setting with feedback produced an effect which was stronger than either of these techniques used in isolation. There is a considerable body of research evidence indicating the usefulness of behavioural techniques in the field of industrial safety management. However, the Hong Kong construction context differs from other settings in which behaviour modification techniques have been found to work. Thus, the techniques must be tested from scratch in this different context.

If rewards contingent upon good performance are to be used to elicit good behaviour in the future, it is essential that the rewards given are valued by their recipients. It is expected that rewards which have little or no meaning for their recipients will have no positive motivating effects on their subsequent behaviour. The current research aims to test the techniques of goal setting and posted feedback to improve safety performance in the Hong Kong construction context. It is hypothesized that worker attitudes will operate to moderate the effectiveness of behavioural techniques, insofar as they are expected to affect the extent to which

operatives identify with site goals set and value rewards given in the form of posted feedback. Thus, intervening variables at both the group and organizational levels have been identified for measurement and their effect on the success of behavioural techniques in the Hong Kong construction context will be considered.

Commitment

Many researchers have suggested that organizational commitment is associated with enhanced organizational performance (Steers, 1977) but there has been considerable lack of agreement as to the definition of organizational commitment. Mottaz (1988) states that 'a good deal of research in this area has not been guided by a well specified conceptual model of commitment'. Thus, any discussion of commitment in an organizational context must begin with an attempt to define commitment.

Allen and Meyer (1990) identify three different conceptualizations of organizational commitment to be found in the literature. These are labelled affective, perceived costs and obligation.

The affective attachment approach views commitment as an 'affective or emotional attachment to the organization such that the strongly committed individual identifies with, is involved in and enjoys membership in, the organization' (Allen and Meyer, 1990). Buchanan (1974) defined commitment as 'a partisan, affective attachment to the goals and values of an organization, to one's role in relation to goals and values and to the organization for its own sake, apart from its purely instrumental worth'. He goes on to state that 'Methodologically, commitment consists of three components ... These are (a) identification – adoption as one's own the goals and values of the organization, (b) involvement – psychological immersion or absorption in the activities of one's work role, and (c) loyalty – a feeling of affection for and attachment to the organization'. Affective attachment also closely approximates to Kanter's (1968) concept of cohesion commitment. Kanter (1968) defines cohesion commitment as involving 'the attaching of an individual's fund of affectivity and emotion to the group; emotional gratification'.

The second conceptual approach identified by Allen and Meyer (1990) is the perceived costs approach. Becker (1960) and Sheldon (1971) were proponents of this approach. Becker (1960) identifies commitment as an individual's tendency to engage in 'consistent lines of activity' as a result of his or her recognition of the costs associated with discontinuing the activity. In an organizational context, the individual may be constrained by 'side bets' from various sources. Generalized cultural expectations may prevent him or her from leaving an organization. Since it is often believed that frequent job changes are the sign of an unreliable character an individual, having joined one organization, may feel unable to leave until a reasonable length of time has elapsed. Or, if the rules of a firm's pension fund are such that an employee stands to lose a considerable amount of money through leaving, he or she may decide to remain. Becker's approach is similar to Kanter's 'continuance commitment' which when 'profits and costs are considered (and) participants find that the cost of leaving the system would be greater than the cost of remaining: 'profit' compels continued participation' (Kanter, 1968).

The third conceptual approach is that which Allen and Meyer (1990) term 'obligation'. Commitment is regarded as 'a belief about one's responsibility to the organization'. Wiener (1982) is the chief proponent of this approach, defining commitment as 'the totality of internalized normative pressures to act in a way which meets organizational goals and interests'.

Unsurprisingly, research evidence shows that these three different conceptualizations do not relate to a single, uniform construct. Furthermore, the outcomes of the different types of commitment identified have also been found to differ.

Meyer and Allen (1984) developed and tested alternative scales to measure affective commitment and continuance commitment and found that they measured two different factors which were not significantly correlated with one another. McGee and Ford (1987) re-examined these scales and their results supported those of Meyer and Allen (1984) in that, the Affective Commitment Scale and the Continuance Commitment Scale were found to measure different things. Allen and Meyer (1990) tested a three-component model of organizational commitment, using three scales developed to measure affective, continuance and normative commitment. The reliability of these three scales was found to be good. It was found that 'although there was overlap between affective and normative commitment, both were relatively independent of continuance commitment'.

Given the multidimensional nature of the commitment construct, it is unsurprising that the behavioural outcomes of commitment vary according to the conceptual approach adopted. Indeed Angle and Perry (1981) concluded their study by stating that the 'relationship between commitment and behaviour very likely depends on the form that commitment takes'. Randall *et al.* (1990) observed that the relationships between organizational commitment and outcomes such as tardiness, absenteeism and enhanced job performance have been found by empirical researchers to be inconsistent and weak. They attribute these disappointing results, at least in part, to the multidimensionality of the commitment construct and suggest that 'the strength of

an organizational commitment–work outcome relationship may be highly dependent on the specific conceptualization of organizational commitment adopted'.

The available research evidence suggests that affective commitment is positively correlated with organization-serving behaviours whereas the opposite may be true of continuance commitment.

A study by Meyer *et al.* (1989) tested the hypothesis that employees with strong affective commitment should be willing to exert considerable effort on behalf of the organization. On the other hand, those employees with strong continuance commitment who feel compelled to remain in order to avoid financial or other costs would probably do little more than the minimum job requirement. Meyer *et al.* (1989) used the Continuance and Affective Commitment Scales developed by Meyer and Allen (1984) and supervisors' ratings of employee performance to test their hypothesis among a sample of food services organizations' employees. They found positive correlations between affective commitment and three different performance and promotability ratings. In contrast, the correlations between continuance commitment and the three performance ratings were all found to be negative. In conclusion Meyer *et al.* (1989) noted.

> 'the value of commitment to the organization, therefore, may depend on the nature of that commitment. When commitment reflects identification with and involvement in the company, as conceptualized by Porter and his associates ... the organization may benefit both in terms of reduced turnover and superior performance. In contrast, when commitment is primarily on the basis of a recognition of costs associated with leaving, as Becker described it, the benefits of reduced turnover may be obtained at the price of relatively poor performance.'

These research findings indicate that employees who feel a high level of affective commitment towards an organization are more likely to work harder towards organizational goals than are those who feel that, by necessity, they must remain with the organization. The component of commitment chosen for measurement in this research was affective commitment. It is possible that the motivational effects of goal setting will be limited if employees do not identify with and feel involved in the organization. It is also possible that feedback given by the organization, in this case the main contractor, will be of little value to the operative if he/she is not affectively committed to the organization. The characteristics of the Hong Kong construction industry, most notably the transient nature of the work-force and the practice of paying labour on a daily basis, are such that long-term continuance commitment, as defined in other industrial studies, is unlikely to exist at site worker level. However, one commitment element related to continuance commitment could possibly exist. This is the importance of money in a worker's relationship with his/her work team and with his/her employer. If a worker continues working on the site, either under the main contractor or under a subcontractor, solely as a result of the money he/she gets paid at the end of the day then this can be regarded as a type of continuance commitment. If money is the only reason the worker remains on the site, then this indicates that continuance commitment is felt while affective commitment is not felt. If, however, there is more to the relationship than money and some degree of loyalty and/or affiliation is felt, then this indicates that affective commitment exists. There is also the possibility that continuance commitment to the main contractor is felt by subcontractors who have a long-term relationship with the main contractor and/or who wish to obtain follow-on work from the main contractor. Given the fact that Meyer *et al.* (1989) suggest that continuance commitment is associated with lower levels of performance, the existence of the elements of continuance commitment described above will be assessed during this study. Although the main measurement instrument used focuses solely on affective commitment, the implementation of this instrument will be followed-up on each site by a series of open-ended questions allowing workers to express their feelings concerning their relationship with the main contractor and their work group leaders.

The affective commitment measurement instrument to be used in the research can be found in the Appendix. Seven items were taken from the Organizational Commitment Questionnaire (Mowday *et al.*, 1979) and the Affective Commitment Scale of Allen and Meyer (1990). The items, adapted for use in this study, will be translated into Chinese and the reliability of this combined measure will be assessed during the course of the research.

Group level

In any organizational context, groups play an important role in determining behaviour. Porter *et al.* (1983) claim that groups can have a direct and indirect influence on their member's behaviour. Direct influence is established through the use of group-controlled rewards contingent upon behaviour deemed to be appropriate by the group. Indirect control is exercised through the group's key role in communicating to members information about the reward structure prevailing in the organization as a whole. The group, as a source of

influence on behaviour should not be overlooked. Indeed, given the fragmented nature of Hong Kong's construction industry, the influence of the group may be even more pronounced.

Initially the concept of group cohesiveness was considered for measurement. However, a survey of the group cohesion literature showed that, as with the commitment construct, cohesion is often ill defined. Mudrack (1989) writes that group cohesiveness 'does not lend itself readily to precise definition, consistent measurement, or standard experimentation'. Traditionally, cohesion has been defined by drawing a comparsion between the group and an atom. Festinger (1950) defined cohesion as 'the resultant of all forces acting on members to remain in the group'. Alternative definitions rely on the concept of 'attraction to group'. Lott and Lott (1965) define cohesiveness as 'that group property which is inferred from the number and strength of mutual positive attitudes among members of a group'. Mudrack (1989) is critical of those definitions utilizing the 'atom' metaphor (Festinger, 1950) as impossible to operationalize and is critical of definitions which employ notions of 'attraction to group' (Lott and Lott, 1965) as oversimplistic. He notes that contemporary researchers are prone to adopt these definitions wholesale, without considering their relevance or meaning in the context of the study in which they appear. It is also evident that the terms employed in current definitions of group cohesiveness, relating to an individual's feelings towards a group are similar to those used to describe an individual's feelings towards his or her organization, in the organizational commitment literature. The notions of valued membership in something and feeling attracted or attached to something are common to both definitions of commitment and cohesiveness. The similarity between the cohesiveness and commitment concepts is apparent. Indeed Piper *et al.* (1983), in a non-industrial study, factor analysed responses to an 80-item questionnaire and came up with a five-item factor which they called 'commitment to the group'. They then related this back to their theoretical definition of cohesiveness by stating that 'Commitment to the group represents our conception of cohesion as a basic bond quite well.'

In the context of the current research, one question asked is 'do construction site operatives feel part of, identify with and adopt the goals of their immediate work team or the main contractor on whose site they are operating?' Since the aim is to draw direct comparisons between an operative's feelings towards the main contractor and his/her feelings towards his/her immediate work group, it was deemed to be appropriate to employ a measure of affective commitment at the organizational level and adapt this same measure for use at the group level.

Most writers on commitment in organizations do not recognize the importance of multilevel attachments prevalent within an organizational setting. Many definitions of commitment refer to the binding of an individual to an entire organization. Whether this binding is affective in nature (Buchanan, 1974; Mowday *et al.*, 1979), based on a reward (Becker, 1960; Sheldon, 1971) or a feeling of obligation (Wiener, 1982), research on commitment within organizations has focused on the organization as a whole. This oversimplifies the situation in any organizational setting. Employees working within any organization may feel differing degrees of work-related commitment to different levels of the organizational hierarchy. Zaccaro and Dobbins (1989) recognized this problem and investigated the correlates of commitment to the organization as a whole and commitment to the group. Their findings indicate that there is a clear distinction between group and organizational commitment. The outcomes of group and organization level commitment are also discussed by Zaccaro and Dobbins (1989) who state that organizational commitment can have a direct influence on organizational goals such as attendance and productivity whereas the effect of group commitment on organizational goals will be moderated by the effect of group standards.

Seashore (1967) and Greene (1989) have commented on the effects of group cohesiveness on the level of organizational effectiveness. Both writers stressed that high levels of cohesiveness do not automatically lead to greater organizational effectiveness. In relation to productivity, Seashore (1967) found that highly cohesive groups had less variation in productivity among members than did low-cohesiveness groups and they differed significantly from the plant norm of productivity. However, the direction of this deviation (i.e. towards higher or lower productivity) was a function of the degree to which the larger organization is perceived by group members to provide a supportive setting for the group. Greene (1989) found strong evidence to suggest that group cohesion positively affects productivity when organizational goal acceptance is high but negatively affects it when organizational goal acceptance is low. These findings indicate that where employees feel a strong sense of belonging to a group, this group has a powerful influence over that individual's behaviour but that this influence may be either good or bad for an organization depending on the extent to which group members identify with and accept the goals of the organization as a whole. Seashore's (1967) and Greene's (1989) studies were both concerned with cohesiveness and the similarities between cohesiveness and commitment have already been discussed. As Zaccaro and Dobbins (1989) point out, the extent to which group commitment has a positive effect on organizational goals (including safety goals) will probably depend, to some

extent, upon whether group members accept these goals.

Site-level model

The Hong Kong subcontracting system is such that the majority of workers on a site are not in the direct employ of the main contractor or *Dai Poon*. Many workers will be employed by a subcontractor (*Yee Poon*) or even a sub-subcontractor (*Saam Poon*). Thus, work teams will only be on a particular site for a short period before moving on to another site. Given that most site operatives are far removed from the main contractor in terms of employment and only come into contact with them for a brief period, it is unlikely that they will identify with and demonstrate affective organizational commitment towards the main contractor. It is perhaps more likely that they feel commitment at the group level. In the Hong Kong construction context, individual work teams constitute groups. Commitment among members to the group or work team may be high because they are directly connected to the group and may have friendship or even kinship ties with other group members. It is common practice for the *Mah Foo* or direct employer at the subcontractor level to use a small number of operatives on a regular basis. Thus, it is possible that work team members identify with the group to which they belong rather than to the main contractor. On the other hand, it is also possible that site operatives do not feel affective commitment at either the group or organization level. Instead they may feel commitment to their trade with no feeling of involvement or identification at *Dai Poon*, *Yee Poon* or *Saam Poon* level. The extent to which site operatives feel affective commitment to the main contractor and to their group will possibly have a significant impact on the usefulness of behavioural techniques. In previous studies (Mattila and Hyodynmaa, 1988; Duff *et al.*, 1992) goals have been set and performance feedback has been given at the site rather than the group level. Improved safety performance represents the organizational goal of the main contractor. If the extent to which most site operatives identify with and feel an involvement with the main contractor is low, then they may not respond to goals set or performance feedback provided at the site level. If affective commitment is found to exist at the group level but not at the main contractor level, it is unlikely that the techniques will be particularly effective since this suggests that operatives identify with group goals as opposed to the organizational goals of the main contractor. If, on the other hand, there is found to be strong affective commitment at both the organization and group level or affective commitment is found to exist at the organizational level but not exist at the group level, it is expected that the techniques will prove effective. The moderating effects of the elements of continuance commitment identified will also be considered. On the basis of the findings of Meyer *et al.* (1989), it is expected that the existence of continuance commitment at either the main contractor or subcontractor level will not contribute to the effectiveness of behaviour modification and, indeed, an inverse relationship could exist.

Research framework

The above model is currently being tested through the use of field studies in Hong Kong's construction industry. On-site experiments to assess the effectiveness of behavioural techniques to improve safety in the Hong Kong construction context have been set up. The techniques of goal setting and feedback used in combination will be implemented during the research owing to the fact that Duff *et al.* (1992) found this combination of behavioural methods to yield the best results. A measurement instrument has been developed to assess the levels of affective commitment to both the main contractor and the subcontractor. Owing to the high level of illiteracy amongst Hong Kong construction workers it is not deemed appropriate to collect this information by written questionnaire. Instead, structured interviews will be carried out on all of the experimental sites under investigation. The affective commitment measurement will be supplemented by an additional series of open-ended questions to ascertain exactly how the worker perceives his/her relationship with the main contractor and his/her work team leader.

The research reported here deals with one method of safety management, behaviour modification and the effect which commitment to the main contractor and the work group has on the usefulness of this method. It is recognized that commitment represents only one factor, among a whole host of factors which have been found to influence safety. However, in order to be able to generalize from the results of this research a highly homogeneous sample has been chosen. The Hong Kong Housing Authority is the client for all sites involved in this study. The building design and the specifications are very similar on all seven sites. Furthermore, many organizational and client-based factors identified by Hinze and Raboud (1988) and Levitt and Samelson (1987) which have been found to influence construction site safety are already uniformly applied on all of the sites as a result of Housing Authority policy. The Housing Authority has led the way in promoting safe performance amongst its contractors. The Authority has built safety measures into its conditions of contract and specifications and bidding opportunities are based

on performance in existing contracts. There is an ongoing system of auditing contractors during the construction process and contractor accident rates are recorded continuously. The Housing Authority have their own Safety Committee comprising of high-ranking designers and other professional staff who meet regularly to deal with site-safety issues. Contractors must meet certain safety criteria before they are allowed to tender for Housing Authority contracts and, as a result, all of the companies participating in the study have substantial Safety Departments headed by a Safety Manager. It is a requirement of the Housing Authority that each site must have at least one full-time Safety Officer who takes responsibility for the safety on that site. Safety performance is one of a number of criteria used in the Authority's PASS performance assessment scheme, under which monthly site inspections are carried out by representatives of the Housing Authority. Thus, the usefulness of behaviour modification and the effect of commitment, are being observed in an environment where safety management is already a key element of project management. Many factors, identified as important determinants of safety by other researchers (Levitt and Samelson, 1987; Hinze and Raboud, 1988) are already controlled for.

Despite the emphasis on safety in projects within the sample, baseline measurements have shown that safety compliance is still at a relatively low level. Below are the mean safety compliance results for the sites under investigation.

1. Housekeeping, 62% safe.
2. Access to heights, 15% safe.
3. Personal protective equipment, 34% safe.
4. Use of bamboo scaffolding, 20% safe.

It is anticipated that the outcome of the research will highlight the degree of significance attached to behaviour modification as a safety management technique in addition to the impact of other factors.

Conclusion

Behaviour modification has proven to be effective in the European construction industry setting. However, intervening variables have been identified which could reduce its effectiveness in Hong Kong. The most important of these is commitment to the contractor and to the work group. An analysis of the impact of commitment on the effectiveness of behaviour modification on site safety in Hong Kong has been presented. This is used as the basis for interpreting the results of research now under way on Hong Kong construction sites. This framework can be used in any study of site behaviour at the operative level and should not be confined solely to the study of safety performance.

References

Allen, N.J. and Meyer, J.P. (1990) The measurement and antecedents of affective, continuance and normative commitment to the organization, *Journal of Occupational Psychology*, **63**, 1–18.

Angle, H.L. and Perry, J.L. (1981) An empirical assessment of organizational commitment and organizational effectiveness. *Administrative Science Quarterly*, **26**, 1–13.

Bates, R. (1993) Construction safety: the developer's responsibility, In *Proceedings of the Legal Business in Asia Construction Safety Conference*, Hong Kong.

Becker, H.S. (1960) Notes on the concept of commitment, *American Journal of Sociology*, **66**, 32–40.

Buchanan, B. (1974) Building organizational commitment: the socialization of managers in work organizations, *Administrative Science Quarterly*, **19**, 533–546.

Duff, A.R., Robertson, I.T., Cooper, M.D. and Phillips, R.A. (1992) *Improving Safety on Construction Sites by Changing Personnel Behaviour*, Department of Building Engineering and Construction, Manchester School of Management, UMIST, Manchester.

Fellner, D.J. and Sulzer-Azaroff, B. (1984) Increasing industrial safety practices and conditions through posted feedback, *Journal of Safety Research*, **15**, 7–21.

Festinger, L. (1950) Informal social communication, *Psychological Review*, **57**, 271–282.

Greene, C.N. (1989) Cohesion and productivity in work groups, *Small Group Behavior*, **20**, 70–86.

Hinze, J. (1981) Human aspects of construction safety, *Journal of the Construction Division, Proceedings of the American Society of Civil Engineers*, **107**, 61–72.

Hinze, J. and Raboud, P. (1988) Safety on large building construction projects, *Journal of Construction Engineering and Management*, **114**, 286–293.

Hong Kong Government (1992) *Commissioner for Labour's Annual Report*. Hong Kong Government, Hong Kong.

Kanter, R.M. (1968) Commitment and social organization: a study of commitment mechanisms in Utopian communities, *American Sociological Review*, **33**, 499–517.

Komaki, J., Heinzmann, A.T. and Lawson, L. (1980) The effect of training and feedback: component analysis of a behavioral safety program, *Journal of Applied Psychology*, **65**, 261–270.

Lai Man-yi (1987) A Review of the Subcontracting Systems in the Hong Kong Construction Industry. MSc thesis. The University of Hong Kong, Hong Kong.

Levitt, R.E. and Samelson, N.M. (1987) *Construction Safety Management*. New York, McGraw-Hill Book Company.

Lingard, H. and Rowlinson, S.M. (1991) Safety in Hong Kong's construction Industry, *The Hong Kong Engineer*, **19**, 38–44.

Lingard, H. and Rowlinson, S. (1992) *A Study of the Safety Expenditure Patterns of Hong Kong's Major Contractors*. Department of Surveying, University of Hong Kong, Hong Kong.

Lott, A.J. and Lott, B.E. (1965) Group cohesiveness as interpersonal attraction: a review of relationships with antecedent and consequent variables, *Psychological Bulletin*. **64**, 259–309.

McAfee, R.B. and Winn, A.R. (1989) The use of incentives/feedback to enhance work place safety: a critique of the literature, *Journal of Safety Research*, **20**, 7–19.

McGee, G.W. and Ford, R.C. (1987) Two (or more?) dimensions of organizational commitment: reexamination of the Affective and Continuance Commitment Scales, *Journal of Applied Psychology*, **72**, 638–642.

Mattila, M. and Hyodynmaa, M. (1988) Promoting job safety in building: an experiment on the behaviour analysis approach, *Journal of Occupational Accidents*, **9**, 255–267.

Meyer, J.P. and Allen, N.J. (1984) Testing the 'side bet' theory of organizational commitment: some methodological considerations, *Journal of Applied Psychology*, **69**, 372–378.

Meyer, J.P., Paunonen, S. V., Gellatly, I.R., Goffin, R.D. and Jackson, D.N. (1989) Organizational commitment and job performance: it's the nature of the commitment that counts, *Journal of Applied Psychology*, **74**, 152–156.

Mottaz, C.J. (1988) Determinants of organizational commitment, *Human Relations*, **41**, 467–482.

Mowday, R.T., Steers, R.M. and Porter, L.W. (1979) The measurement of organizational commitment, *Journal of Vocational Behavior*, **14**, 224–247.

Mudrack, P.E. (1989) Defining group cohesiveness: a legacy of confusion, *Small Group Behavior*, **20**, 37–49.

Nasanen, M. and Saari, J. (1987) The effects of positive feedback on housekeeping and accidents at a shipyard, *Journal of Occupational Accidents*, **8**, 237–250.

Piper, W.E., Marrache, M., Lacroix, R., Richardson, A.M. and Jones, B.D. (1983) Cohesion as a basic bond in groups, *Human Relations*, **36**, 93–108.

Porter, L.W., Lawler, E.E. and Hackman, J.R. (1991) Ways groups influence work effectiveness, In Steers, R.M. and Porter, L.W. (eds) *Motivation and Work Behavior*, McGraw Book Co., New York, pp. 119–207.

Randall, D.M., Fedor, D.B. and Longenecker, C.O. (1990) The behavioral expression of organizational commitment, *Journal of Vocational Behavior*, **36**, 210–224.

Reber, R.A., Wallin, J.A. and Chhokar, J.S. (1984) Reducing industrial accidents: a behavioural experiment, *Industrial Relations*, **23**, 119–125.

Seashore, S.E. (1967) Group cohesiveness in the industrial work group, In Faunce, W.A. (ed.) *Readings in Industrial Sociology*, Appleton-Century Crofts, New York, pp. 343–347.

Sheldon, M.E. (1971) Investments and involvements as mechanisms producing commitment, *Administrative Science Quarterly*, **16**, 143–150.

South China Morning Post (1993a) New laws to raise penalties come too late, *South China Morning Post*, **3 June**, 2.

South China Morning Post (1993b) Three plunge to death – accidents trigger call for bamboo scaffolding review, *South China Morning Post*, **14 December**.

South China Morning Post (1994a) Tough new measures for safety on sites, *South China Morning Post*, **31 January**, 3.

South China Morning Post (1994b) Police gagged over deaths of workers on airport project, *South China Morning Post*, **17 May**, 1.

Steers, R.M. (1977) Antecedents and outcomes of organizational commitment, *Administrative Science Quarterly*, **22**, 46–56.

Sunday Morning Post (1989) Work deaths heavy among new arrivals, *Sunday Morning Post*, **2 April**, 3.

Walker, A. and Rowlinson, S.M. (1990) *The Building of Hong Kong*. Hong Kong University Press, Hong Kong.

Walker, A. and Flanagan, R. (1991) *Property and Construction in Asia Pacific*. BSP Professional Books, Oxford.

Wiener, Y. (1982) Commitment in organizations: a normative view, *Academy of Management Review*. 7, 418–428.

Wong, F. (1987) Hand-dug caisson construction in Hong Kong – safety issues & control, *Asian Architect and Contractor*, **November**, 31–33.

Zaccaro, S.J. and Dobbins, G.H. (1989) Contrasting group and organizational commitment: evidence for differences among multilevel attachments, *Journal of Organizational Behavior*, **10**, 267–273.

Zohar, D. (1980) Promoting the use of personal protective equipment by behaviour modification techniques, *Journal of Safety Research*, **12**, 78–85.

Appendix
The measurement instrument
Affective commitment to main contractor

	Strongly disagree	Moderately disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Moderately agree	Strongly agree
1. I feel very little loyalty to (main contractor's company name) **R**	1	2	3	4	5	6	7
2. I find that my values and the values of (main contractor's company name) are very similar	1	2	3	4	5	6	7
3. (Main contractor's company name) really inspires the best in me in the way of job performance	1	2	3	4	5	6	7
4. Right now, I do not feel 'emotionally' attached to (main contractor's company name) **R**	1	2	3	4	5	6	7
5. I do not feel like 'part of the family' working with (main contractor's company name) **R**	1	2	3	4	5	6	7
6. I really feel as if (main contractor's company name)'s problems are my own	1	2	3	4	5	6	7
7. Right now, (main contractor's company name) has a great deal of personal meaning for me	1	2	3	4	5	6	7

R denotes items which will be reverse scored.

Affective commitment to group

	Strongly disagree	Moderately disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Moderately agree	Strongly agree
1. I feel little loyalty to my work group **R**	1	2	3	4	5	6	7
2. I find that my values and the values of my work group are very similar	1	2	3	4	5	6	7
3. This work group really inspires the best in me in the way of job performance	1	2	3	4	5	6	7
4. Right now, I do not feel 'emotionally' attached to this work group **R**	1	2	3	4	5	6	7
5. I do not feel like 'part of the family' working in this work group **R**	1	2	3	4	5	6	7
6. I really feel as if this work group's problems are my own	1	2	3	4	5	6	7
7. Right now, this work group has a great deal of personal meaning for me	1	2	3	4	5	6	7

R denotes items which will be reverse scored.