INTEGRATING SMCs INTO CONSTRUCTION VALUE CHAINS

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ABSTRACT

Small and medium sized contractors (SMCs) form the backbone of the construction industry, in terms of their number and share in the industry, the workforce they employ, job opportunities they create, and the amount of work they carry out. Therefore, competitiveness of the construction industry, arguably, depends on the efficiency and productivity of the SMCs. Yet they are frequently ignored in attempts towards construction industry development. For example, teamworking in construction projects (e.g. through partnering) are usually mainly considered between clients and main contractors, although these bigger contractors employ SMCs through sub-contracts that are often ‘back-to-back’. Specific inclusion of SMCs into supply/value chain teambuilding exercises will greatly enhance their efficiency and productivity; and the value of their contributions to the project. They will then be able to work more effectively by anticipating and tracking problems, taking faster and better-informed decisions and improving their operations through greater integration and closer cooperation with other members of the project team. These will improve performance levels of SMCs, their profit margins and competitive advantages, which will in turn boost their longer-term development and feed into an enhanced performance-oriented construction industry. These are discussed, conceptualised, and reported upon on the basis of a literature review and a Hong Kong based structured interview survey, stemming from a recently launched R&D project on SMC development.

1. INTRODUCTION

Construction industries worldwide have been pushed and pulled, either explicitly or implicitly, towards a major cultural shift for improved efficiencies through collaborative approaches such as partnering [1-5]. This has been mainly envisaged between the two principal contracting parties: clients and ‘large’ contractors. Practices of such partnering have met with some successes, mainly from a cost saving perspective [6]. Recent trend of such recommendations include ensuring value for money, through: (a) effective procurement in Hong Kong [7] and Australia [8], and (b) integrated teams and Supply Chains [9] and (c) teamworking [10] in UK. The emphasis is thus on maintaining relationships among different project participants and teamworking in the projects. But translating such recommendations and theoretical constructs into common practice may not be easy. Examples from Hong Kong indicate that an emerging readiness of some enlightened project participants for more ‘relational’ approaches must be supported by other key participants – consultants, subcontractors and suppliers, if not the whole supply chain [11-12].

On the other hand, subcontractors, i.e. Small and Medium Contractors (SMCs), carry out major parts of the works, even up to 90% of the total value of the project [13-14]. When expressed in terms of the
number of businesses, number of employees, or amount of payroll, they make up the largest share of the industry. Kaplan [15] reported that 97% of construction firms in the USA have fewer than 20 employees, with annual turnovers of between US$100,000 and US$5,000,000. Moreover, during a 10-year period Fortune 500 companies trimmed 2,000,000 jobs while small businesses created 10,000,000 new jobs. In Hong Kong, the construction industry accounts for 40% of gross domestic fixed capital formation, employs over 9% of the workforce and contributes significantly to the GDP [7]. SMCs form the ‘backbone’ in this sector. The gross value of construction work performed in 2002 by all the registered 19,878 building and civil engineering establishments was Hong Kong Dollar (HK$) 184,801 million, out of which the value of subcontract work rendered by ‘fee-only’ subcontractors was HK$86,102 million i.e. 46.59% [16].

In fact, SMCs form the largest part of the construction supply chain. Such domination of the industry by SMCs has led to industry fragmentation and contributed to larger industry problems, including a lag in the development of new technology, declining profit margins, and inability to implement quality management programs [15]. This clearly points to the fact that any improvement initiative in the construction industry cannot be achieved without improving the performance of the SMCs. This needs well-structured strategies and protocols through which SMCs can increase their competitiveness, improve relationships with other project participants and build integrated teams to ensure value for money in delivering projects.

It is proposed that such strategies should include a holistic conceptual framework that offers a means for improving relationships among various present and potential project participants. It then needs to be equipped with practical protocols, which will be user-friendly to all parties and according to the specific requirements to any localised construction industry. The practice of such protocols will help, in the first instance, reduce widely acknowledged wasted resources and productivity losses generated by the existing rigid contractual paradigm in most construction projects. This will in turn improve the competitiveness of the project participants and relationships among themselves. Such piecemeal improvements in ensuring better value for money by each participant, will collectively feed into the projects and eventually to the whole industry.

This paper briefly discusses the above first need from a value perspective, i.e. a conceptual framework for value chains. It then reports on a recently launched research and development project on the second need, i.e. targeting the development of user-friendly protocols for SMCs.

2. RELATIONALLY INTEGRATED VALUE NETWORKS

‘Relational contracting’ (RC) principles were previously found to justify protocols for reducing ‘transaction costs’ and for providing a platform for ‘joint risk management’, that would in turn yield net benefits to all parties [11, 17]. Relational integration can be achieved to different degrees through more structured RC arrangements such as in ‘partnering’ and ‘alliancing’. The theoretical foundations of RC justify a degree of flexibility, by considering contracts to reflect relationships among stakeholders in the process of projecting their ‘exchange’ (i.e. businesses or contracts) into the future [18], since the terms of such exchange can never be fully defined at the outset. The function of a contract is therefore a ‘dynamic, evolving process’[19]. Since the Hong Kong-based surveys indicated a readiness for such RC approaches, a conceptual model for Relationally Integrated Supply Chains (RISCs) was proposed in the first instance [20-21]. However, while RISCs would provide a definitive step forward, they are not easy to establish, given the inevitable ‘residual’ suspicions between parties pending full transition to a ‘trust’ culture, and the lack of mechanisms for establishing and sustaining RISCs.

Examples include: least success achieved in some important items on implementing the 1998 Egan Report in the UK [22], and a continued reliance on contracts, instead of ‘trust’, even a gradual movement towards more rigid contracts in Japan. It was therefore concluded that the long awaited ‘cultural’ change must penetrate down to deeper levels than ‘broad policy statements’ have reached to-date [23]. In addition, more obstacles to RISCs are expected in the public sector due to accountability concerns. But it is important to mobilise the public sector, since it is usually the largest construction
client and also a trendsetter. Tool-kits such as those proposed by the ECI [24-26] are useful for pointing to potential mechanisms for implementing such integrated working arrangements in acceptable modalities. However, there are no such tool-kits in Hong Kong, although the Government has encouraged its Works Departments to try out ‘partnering’ on some recent projects, while it is already being used by the Mass Transit Railway Corporation and the Housing Authority [27].

Practical measures to trigger attitudinal shifts and improve ‘value for money’ have drawn, for example, on concurrent engineering, lean production, value management and supply chain integration approaches in other industries. The need for the latter is much greater in the construction industry in particular. For example, Green et al. [28] noted barriers arising from its highly fragmented nature, in comparison to the aerospace industry. However, relationship management is merely one part, although important, of supply chain management (SCM) [29]. It was therefore decided to consider the advantages of ‘value management’ inputs into ‘partnering’ or RC type arrangements [30] in the envisaged relational integration, in order to provide a common objective for stakeholders. While some parallels may be drawn with Porter’s [31] conceptualisation of ‘value chains’, and its continued ‘currency’ [32], it was also decided to expand the visualisation of linear supply (or value) chains to reflect the reality of multiple parallel links in ‘value networks’. Vibrant value networks would also be seen to empower better ‘relational integration’ than seemingly sequential end-to-end links in ‘static’ supply chains.

The recent proliferation of short and longer term JVs and other alliances in the construction industry extends these concepts to multi-polar value systems, multi-dimensional supply chains and multiple cultures. The resultant diversity calls for organisational re-design [33], as well as for a common focus e.g. in enabling specific technology transfers [34] and viable general knowledge migration [35] across JVs. A consolidation of the foregoing observations suggests that a high-level ‘value focus’ will facilitate an identification of ‘value streams’ that would be generated from, and strengthened by the various nodes of what may be regarded as a ‘value network’.

Porter [31] conceptualised a firm’s ‘value chain’ as: disaggregating it into strategically relevant activities; embedded in a larger ‘stream of activities’, i.e. value system; and including value chains of other organisations, e.g. of the firm’s suppliers and buyers. Porter’s value chain model was itself aimed at delivering ‘competitive advantage’ to a commercial firm in general. Male [36] describes the conceptualisation of a ‘project value chain’ in construction. The latter draws on ‘value management’ and the more technically focussed ‘value engineering’ approaches to delivering the client’s whole life benefits [30].

A consolidation of the above concepts, along with the experience of formulating viable RISCs led to the conceptualisation of relationally integrated value networks (RIVANs) as a further step forward. More importantly, RIVANs were expected to introduce the unifying ingredient of a common value focus, whose absence may have retarded the progress of previous supply chain integration endeavours. This conceptualisation of RIVANs was further justified by the call in the UK for 20% of construction projects by value to ‘be undertaken by integrating teams and supply chains’ by 2004, with an increase to 50% by 2007 [9]. A research study has been just launched to develop and integrate these concepts into a visualisation of ‘value networks’ beginning with the basic framework in Fig. 1 and proceeding into more detailed analyses and tools. Each of the double/ triple arrows represents a series of relationships e.g. between the many contractors and sub-contractors. The potential relational integration is expected to be mobilised by providing viable frameworks and user-friendly tools for co-operative learning alliances that will promote mutual trust and sustainable relationships [37], as well as rapid knowledge building and consequential performance improvements. This is discussed in the following section with special reference to the SMCs, the largest ‘shareholder’ in the industry.

3. SMILE-SMC PROJECT

Like other countries, and as has been outlined in the introduction section, SMCs form the ‘backbone’ of Hong Kong’s construction industry. In order to improve their efficiency, productivity, and
competitiveness, and as a part of the above conceptualisation, a research and development (R&D) project was launched in November 2003. The ‘Strategic Management with Information Leveraged Excellence’ for ‘Small and Medium Contractors’ (i.e. SMILE-SMC) project is funded by the SME Development Fund, of the Trade and Industry Department, Government of the Hong Kong Special Administrative Region. The emphasis is to mobilise and utilise some already available systems and tools relevant to particular needs of SMCs, in order to provide affordable integrated solutions to their problems. The aim of the project is to empower their continuous improvement by providing a user-friendly framework and innovative tools for continuous improvement in boosting productivity, quality and image, through strategic information and knowledge management. The key objectives of the project are as follows:

- to identify, consolidate, and develop good practices, critical success factors and appropriate benchmarks for SMCs.
- to develop a comprehensive framework and innovative tools for enhancing SMC competitiveness through structured modelling, knowledge capture, information management, collaborative team working and benchmarking mechanisms.
- to develop a SMC-friendly web-based ‘strategic information and knowledge manager’ to empower improved productivity, quality, safety and other critical performance aspects.
- to implement (on a ‘pilot run’ basis in at least three SMCs), test and refine the above framework and tools.

The key tasks in this SMILE–SMC project include establishing the core problem areas (including knowledge gaps, information bottlenecks, and communication and co-ordination barriers), developing a strategic information and knowledge management framework, formulating viable and affordable solutions for SMCs, and testing, validating, implementing and refining the developed SMILE–SMC solutions. These solutions will be structured in strategic management frameworks and convenient e-tools. Faster and affordable implementation strategies will be designed to build-up from typical (current) SMC resources (e.g. by scaling-up of the commonly used software with add-ins/ plug-ins). Internet and wireless technologies (e.g. for developing suitable e-tools with relational databases and exchangeable objects) will be harnessed in providing an integrated cluster of performance improvement solutions.

Dissemination will include periodical SMILE reports and e-bulletins and also mobilise the present dissemination mechanisms and networks of relevant construction, trade and other professional

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**Notes:**
1. Each contracting party (e.g. a ‘consultant’) will have its own network, which is not necessarily the same as others.
2. A particular category of contracting party may have relationships among themselves (e.g. consultants with consultants).
3. Client may also have relationships with other clients for some projects.
4. At a broader industry level: a centralised databank (with relevant information on all potential partners) can be maintained by large clients. Authorised parties may enter and search for their potential partners.

**Figure 1. Basic Framework of a Relationally Integrated Value Network (RIVAN)**

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Dissemination will include periodical SMILE reports and e-bulletins and also mobilise the present dissemination mechanisms and networks of relevant construction, trade and other professional
associations in order to trigger and accelerate the ‘culture shift’ that will help maximize SMC benefits from the project deliverables. The web-based information library and the ‘strategic information and knowledge manager’ modules will be made available to the users in a multitude of flexible formats, including both freely/openly available and subscription based services. These would also incorporate both company-specific and shared-use modules, which may for example, be accessed for self-evaluation or sector-wide benchmarking. Training workshop packages and SMC-friendly self-learning packages will also be developed in order to maximise wider acceptance and earlier usage.

The project requires the collection of many diversified, e.g. inter-project, inter-organisational, and organisation-specific, data from SMCs. These include identification of their day-to-day business activities, problems encountered and potential areas for improvement. Therefore, close collaboration and active participation from some enlightened and ‘pioneer’ SMCs or ‘Partner Contractors’ (PCs) was felt essential for this R&D project. These PCs will supply required data relating to their companies, assist collecting data from various sub- and trade-contractors who work with/under them, attend the monthly meetings with the research team, provide suggestions in developing the SMILE-SMC system and take part in its validation and dissemination. As such, this interactive R&D project was launched with five PCs from the civil and building sector and two potential PCs from Electrical and Mechanical (E&M) sector. However, given the scale of the project, it was felt necessary to increase the number of PCs to 15, so that at least 10 PCs are available at any given time during the two-year period of the project. In addition to this, the Hong Kong General Building Contractors Association, an association of SMCs in building sector, has already promised to cooperate in this project. The list of other such present and potential collaboration includes the Hong Kong Construction Association, Federation of Electrical and Mechanical Contractors, Bar-Bending Contractors Association, and Scaffolders Merchants Association.

4. SMC NEEDS ANALYSIS

A pilot ‘needs analysis’ survey was launched among the PCs immediately after inception of the project. In order to address the basic specific needs of the SMCs and as a start up trigger to wide-ranging data collection, a questionnaire was formulated based on a brainstorming session of the core research team. The questionnaire contained both closed and open-ended questions, and was improved with feedback from three PCs. Data was then collected from seven PCs using this questionnaire, in semi-structured in-depth interviews held with at least director-level personnel. Six of the PCs are engaged in building and civil engineering works, while and one specialises building services. All the seven PCs work as main contractors in small and medium sized projects and as subcontractors in large projects. Their annual turnover varies from HK$1-2.5 million to over HK$ One billion. Five of the seven PCs interviewed have employees of 10-30, while the other two PCs have more than 50 employees as a result of their recent business expansions. Including this two, four PCs consider that they are operating at optimal level, whereas the other three are operating at some sub-optimal level. Although this sample is from the start-up pilot survey of an ongoing project exercise, the results may taken to be considered as reasonably ‘representative’ of the diverse range of SMCs, at least in terms of their size, annual turnover and operating level. The following describes a brief cross-section of consolidated responses of the questions asked.

Table 1 shows the level of importance of various useful information that SMCs like to get from a public website dedicated to SMCs and for improving their business/organisational and project performance levels. Although all the items are seen as important in general, information on business opportunities in Hong Kong is seen to be the most important to SMCs. On the other hand, they have mixed perceptions on information from overseas sources, on best practices in project management and health, safety and environmental issues. Those may be different and may not be suitable in the local context. The interviewees also added some ‘other’ information items in which they were interested, as shown in the third column of Table 1. They mentioned that these items are at least ‘important’, if not very important.
The single most common barrier to obtaining the above information, as expressed by the PCs, is that they do not know where to get such information. This was related to the general lack of sources of such information. There are no appropriate publications. It is difficult to extract useful information from broad, sparse and general sources, which is also expensive to some SMCs. In addition to this, some companies do not reveal their information. Also some available information lacks accuracy/authenticity, and they therefore do not feel confident in using those.

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Importance level</th>
<th>Others added by PCs *</th>
</tr>
</thead>
<tbody>
<tr>
<td>New construction technologies</td>
<td>I=6, N=1</td>
<td>Indices of labour rate, material price and material availability; court cases for claims, rights/responsibilities for subcontractors (SCs), claims and insurances related to self-employed SCs/labourers, claims on compensation of labourers’ wages/injuries; and reasons of failure in SMC projects.</td>
</tr>
<tr>
<td>New information/ communication technologies</td>
<td>V=1, I=4, N=2</td>
<td></td>
</tr>
<tr>
<td>Business opportunities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Hong Kong</td>
<td>V=5, I=2</td>
<td></td>
</tr>
<tr>
<td>(b) Mainland China</td>
<td>V=1, I=4, M=1, N=1</td>
<td></td>
</tr>
<tr>
<td>Critical success factors</td>
<td>V=2, I=4, M=1</td>
<td></td>
</tr>
<tr>
<td>Performance Indicators – to compare with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) other companies</td>
<td>V=4, I=1, M=1, N=1</td>
<td></td>
</tr>
<tr>
<td>(b) past and present projects</td>
<td>V=4, I=2, M=1</td>
<td></td>
</tr>
<tr>
<td>Best practices for benchmarking</td>
<td>V=2, I=4, M=1</td>
<td></td>
</tr>
<tr>
<td>Best practices in health, safety &amp; envir. issues:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) from Hong Kong</td>
<td>V=2, I=5</td>
<td></td>
</tr>
<tr>
<td>(b) from overseas</td>
<td>V=1, I=4, M=1, N=1</td>
<td></td>
</tr>
<tr>
<td>Best practices in Project Management:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) from Hong Kong</td>
<td>V=2, I=4, M=1</td>
<td></td>
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<tr>
<td>(b) from overseas</td>
<td>V=1, I=4, M=1, N=1</td>
<td></td>
</tr>
<tr>
<td>Case studies of successes/ failures in SMC projects &amp; organisations</td>
<td>V=3, I=4</td>
<td></td>
</tr>
</tbody>
</table>

Notes:  
V – Very important, I - important, M - May or may not be important, N – Not important.

* All these items are, at least, ‘important’.

Table 1. Importance levels of various types of information on a public website dedicated to SMCs

This is also reflected in Table 2, where the PCs have placed comparatively higher importance on various topics that they like to know and discuss on the planned SMILE-SMC website. Interestingly, the highest concern and interest of the SMCs is seen to be on supply chain management. In addition, they have added many ‘other’ interesting items to know about and discuss, as shown in the third column of Table 2. These items are, at least, ‘important’ to the SMCs, if not very important.

<table>
<thead>
<tr>
<th>Topics for discussion forum</th>
<th>Importance level</th>
<th>‘Other’ items added by PCs *</th>
</tr>
</thead>
<tbody>
<tr>
<td>General project management</td>
<td>V=2, I=5</td>
<td>Skills/techniques, facility management, construction industry related political issues, business development policies between Hong Kong &amp; China govs., govt. planning, technical problems, market information, trend of contract prices, general payment status, records of Labour Department about compensation claims by labours’, business opportunities, legal issues, insurance regulations, self-employment issues, general government policies.</td>
</tr>
<tr>
<td>Supply chain management</td>
<td>V=3, I=4</td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>I=6, M=1</td>
<td></td>
</tr>
<tr>
<td>Estimating</td>
<td>V=1, I=5, M=1</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>I=5, M=1, N=1</td>
<td></td>
</tr>
<tr>
<td>Value management</td>
<td>V=1, I=5, M=1</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>I=6, N=1</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>I=6, N=1</td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>V=1, I=5, M=1</td>
<td></td>
</tr>
<tr>
<td>China opportunities</td>
<td>I=7</td>
<td></td>
</tr>
</tbody>
</table>

Notes:  
V – Very important, I - important, M - May or may not be important, N – Not important.

Table 2. Importance levels of various topics for discussion forum on SMILE-SMC website

In terms of ‘easy-to-use communication channel(s) for their business process improvement’, the PCs suggested a wide range of options. While some of the options may not be applicable to all projects,
those are helpful in decision-making and time and cost reductions. Those include: (1) using PDAs and through the proposed SMILE-SMC website, to fill up different forms that are used for inspection and monitoring purposes, and to provide an FTP server for faster transfer of photos and documents; (2) in order to facilitate inspection and decision-making, to capture and send photos from site to office using a PDA or digital video camera; (3) using PDA, notebook computer or mobile phone, to retrieve drawings and documents at site; (4) mobile phone to take video photographs and transmit through SMS, using 3G technologies; (5) to preserve documents on the Internet for circulation/consultation by all related parties and electronically communicate among various parties, (6) to electronically manage purchase orders, invoices, contract information, payments to subcontractors and suppliers, collection of materials and labour resources, project management on site, supply chain management, etc.; (7) to provide some important and frequently used documents in Chinese with appropriate interfaces; and (8) to use web camera for monitoring purposes from office.

In contrast to the above, it was observed that PCs predominantly use, as well as prefer, traditional and already practised ‘methods for communicating/ disseminating’ their information. Although the uses of various methods differ considerably among individuals, the average highest practised method for communication is telephone and pager services (42%). The benefit of this method is that one can easily/ directly pass the information to the appropriate person without wasting any time. Some information needs more clarification, while some others need explanations on the job/ at work sites – the necessity for face-to-face discussions (26%). Some other information does not need any explanation and only faxing (20%) ensures faster transfer, e.g. quotations. Mail/ postal services (7%) and emails (8%) are used at very low scales. The indicative most preferred method is the telephone and pager services (29%), although of reduced use. But the preferred requirement for face-to-face discussions (25%) is almost the same. An increased use of emails (13%) and a web-based platform (from 2% to 18%), and decreased use of fax (from 20% to 5%) is expected. SMCs are gradually expected to start use video conferencing (4%) and PDA/ wireless systems (2%), with a consequential decrease in the already insignificant usage of mail/ postal method (from 7% to 4%).

SMCs frequently visit websites of government departments and other private clients mainly for business opportunities. They do so also for the information on different standards, codes of practice, technical circulars, laws and regulations. For some of them, the list includes local universities, local/ foreign professional bodies for information on training/ CPD courses, new products/ materials, cost data, and industry news, as well as newsletters and publications mainly from local professional bodies. As indicated by the PCs interviewed, SMCs use the Internet for their work related and project-specific information, particularly the websites of respective clients. They felt the necessity of an SMC-specific source of information, from/ through which they can collect almost all of their necessary information. They use commercial search engines such as Yahoo! for searching materials, suppliers or other supplies. However, there is no Internet facility at most of the working sites. Most of the PCs do not have their own websites either.

5. CONCEPTUALISATION OF SMC STRATEGIES AND WAY FORWARD

SMCs in Hong Kong are operating, in the recent years, in an industry environment of cutthroat price competition, less work/ available contracts, new technologies and materials, and an increased number of new initiatives. An organisation alone cannot address these external issues by itself, since those are externally based and need external adjustments. Instead, organisations need to adjust and improve their internal factors to adapt to a given external environment, in order to improve their competitiveness and survive, i.e. to maintain current operating activities, as well as to ensure future success [38-39]. These are organisation specific, and can be addressed through internal organisational or cultural changes alone. As such, based on the outcomes of the pilot survey as summarised above, the ‘best value’ focus integration concept (figure 1) and feedback from the PCs in three monthly meetings up to now, the overall preliminary strategies for SMC improvement measures and business goals have been proposed as shown in Figures 2 and 3 respectively. Necessary changes and improvements of these preliminary conceptualisations will be made during the course of the project.
In order to enhance cooperation/integration as shown in figure 2 and achieve business goals as shown in figure 3, it has been decided to provide SMILE-SMC services under five different segments. Under the webmaster administered ‘inter-organisational information exchange’ section, SMILE member companies will get access to a comprehensive information library, where they may seek business opportunities. They will be able to post their ‘current needs’ for various projects, e.g. searching for potential subcontractors, suppliers and main contractors. They will be able to discuss, consult, advice various issues such as safety, quality, and construction techniques; planning/financial/contractual and insurance related issues; and potential claims and other legal issues. Obviously, such issues are part of the exchangeable information arising out from various factors shown in figure 3. The SMILE webmaster will not moderate/intervene in the ‘inter-organisational discussion forum’ section, which will comprise the second segment.

A generic module will also be developed for the ‘intra-organisational information and knowledge flow’ section. SMILE members will be able to organise and manage their most important and most frequent sets of information flows, to and from (a) construction sites (at various levels such as foreman and supervisor) (b) site offices, (c) SMC head offices (e.g. Contracts Manager) (d) supply chains (e.g. subcontractors and suppliers) and (e) other external organisations (e.g. clients and main contractors). Specific information will be collected using separate questionnaire surveys of SMCs, as well as in-depth interviews/semi case studies of the PCs, in order to develop this module, and the fourth section – ‘performance improvement module’.

The latter will include possible models and formats with (fictitious) examples, based on which SMILE members will be able to carry out their own business processes, e.g. in supplier sourcing, subcontractor selection, materials management and stock optimisation, subcontractor management, even internal subcontractor rating; productivity monitoring (through key performance indicators) and enhancement, knowledge capture, consolidation, retrieval and re-use. These two sections/modules consist of organisation-specific and non-exchangeable information.

The fifth and last section will be provided with some benchmarking formats for those SMILE members who wish to compare some of their practices and performance levels for mutual improvement. This may be in a small group mode, or one-to-one basis. But the pre-condition for this service will be to disclose their own information, in order to get information from others.

Although the initial focus of the project is to improve the competitiveness of SMCs mainly in building and civil works categories, sub-sector specific models and e-tools will be developed for SMCs in the E&M category who undertake building services and other E&M works. Furthermore, a separate module for maintenance works may be developed, depending on the time and resource available to this project. Thus, the overall framework and general concepts in management models and e-tools developed for this project could be intelligently transplanted to other SMEs, with suitable extensions and adaptations.

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6. REFERENCES


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