Knowledge Management for Small and Medium Contractors

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Summary

Effective knowledge management is increasingly considered as a cornerstone of sustainable business success. Knowledge management systems are strategically valuable for both ensuring consistency and continuous improvement of various aspects such as quality delivery, productivity and competitiveness. The small and medium enterprises (SMEs) in the construction industry are mostly operating under tighter timeframes, narrower profit margins and more constrained resources. Hence the recently commenced SMILE-SMC (Strategic Management with Information Leveraged Excellece for Small and Medium Contractors) project aims to support the information and knowledge management needs of the small and medium contractors in Hong Kong. This paper presents some snapshots on the SMILE-SMC project, and its conceptualized deliverables with some highlights of recent developments.

1   Introduction

Knowledge is a vital and yet volatile resource, especially in the project-based construction industry (Egbu and Botherill, 2001; Love et al, 2003). In recent times, focus on knowledge management (KM) is gaining increasing significance (Charlesraj and Kalidindi, 2003; Koch, 2003). Although the signficance of KM systems are widely accepted and well-received, the concepts and frameworks are still evolving, e.g. the KM definitions are often debated and re-defined (Earl, 2001; Groff and Jones, 2003). Knowedge is an infinite asset as it could be in both explicit and tacit forms. The form of knowledge in explicit formats can be easily preserved and conveniently transferred. Thus transforming the more volatile/perishable tacit knowledge into suitable explicit forms is one of the important tasks of a KM strategy (Markus, 2001; Ahmed et al, 2002; Koskinen, 2003). However, such explict tranformations and integrations could never replace the original tacit knowledge counterpart (Polanyi, 1966). Hence KM systems should constantly update their knowledge and upgrade KM frameworks for relevant application on current requirements.

KM systems are strategically valuable for both ensuring consistency and continuous improvement of various aspects such as quality delivery, productivity and competitiveness. The initial observations of a Hong Kong based research study indicated that most of the construction related KM research focused on knowledge management for large organizations only. Furthermore, it revealed that the small and medium enterprises (SMEs) in the construction industry are mostly operating under far more difficult conditions and constraints than their larger counterparts. Also, the initial observations of SMEs indicate a generic lack of understanding of KM systems and doubts on affordability when comparing purchase or system development costs against the perceived benefits. Although multi-layered subcontracting is increasingly common and small and medium sized construction organizations are significant value contributors, the lower layers of construction supply chains are often ignored. Therefore, this recently commenced SMILE-SMC project aims at developing suitable frameworks for 'Strategic Management with Information Leveraged Excellence' (SMILE) for Small and Medium Contractors (SMCs) in Hong Kong. The SMILE-SMC project targets the development

of a suite of web-based information libraries and KM systems, to be provided for small and medium enterprises (SMEs) in the construction industry. The integrated cluster of specific and/ or 'scaled-down' SMILE-SMC solutions will harness suitable internet and wireless technologies within the SME affordability level. The proposed KM for the SMILE-SMC project aim at establishing structured mechanisms for capturing project-specific and organization-specific knowledge for useful objectives such as (a) reusing, (b) learning, (c) basic (even internal) comparisons; and (d) benchmarking. Furthermore, appropriate constructs will also be formulated for suitably dealing with the sharable and non-sharable components of the business process knowledge. This paper presents (a) a brief background of the SMILE-SMC project development; (b) a snapshot of the KM framework for the SMILE-SMC deliverables; (c) key extracts from the initial needs analysis conducted with the identified 'partner SMCs'; and (d) an indicative listing and examples of the envisaged deliverables.

2   Background of SMILE-SMC Project

The construction industry is one of the main pillars of Hong Kong's economy. The Construction Industry Review Committee made several recommendations to improve the efficiency and productivity, and hence competitiveness of the construction industry in Hong Kong (CIRC, 2001). Significant portion of construcion works are done by small and medium contractors. In the current economic and market condition (in Hong Kong), the SMCs are compelled to become 'lean' organisations (Figure 1) by exploring various ways for cutting down costs and maximising revenues. Although leveraging of business through effective usage of information and KM systems could be considered as beneficial for SMCs, the barriers such as resource constraints and lack of suitable 'scaled-down' SMC-level affordable solutions may impose great diffuculties and serious challenges (e.g. Burgess, 2002). Therefore, the Centre for Infrastructure and Construction Industry Development (CICID) at the University of Hong Kong developed a proposal for this project that aims at improving the performance levels and competitiveness of SMCs. The 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 2-year SMILE-SMC project was launched in November 2003. The key objectives of the SMILE-SMC project are:

- 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 Project Deliverables outlined for the SMILE-SMC project include a web-based information library, collaborative information and knowledge management framework, strategic information and knowledge manager (SIKM), templates, newsletters, knowledge-mining/ training workshops, and a self-learning package. Although this project is funded for 2 years, the life-span of the project deliverables should be sustained well beyond this period. The web-based information library is aimed to provide dynamic online support for routine information needs of SMCs that would be helpful for boosting SMCs' business and operations (e.g. information on business opportunities, good practices, innovative approaches, and new technologies). The

'collaborative information and knowledge management framework' will capture relevant SMC strategic information and business process knowledge that could be made readily available. The framework includes data-structures, information-models and knowledge-frameworks, information and knowledge that can be beneficially archived for both organisation-specific use and collaborative external sharing. The 'strategic information and knowledge manager' (SIKM) will be an 'SME-friendly' affordable business and operations support-cum-advisory system for SMCs. This SIKM will be made available in hybrid formats such as downloadable 'add-in' type programs. SIKM solutions will use wireless and web based technologies that incorporate innovative tools for capturing, organising and archiving visual, verbal and textual project data and knowledge components.
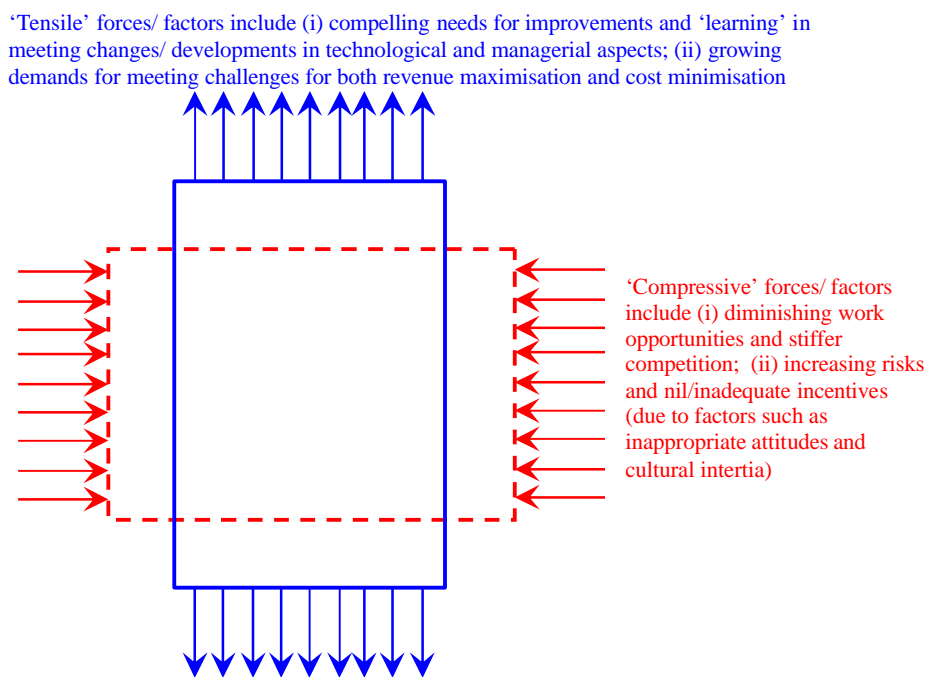
'Tensile' forces/ factors include (i) compelling needs for improvements and 'learning' in meeting changes/ developments in technological and managerial aspects; (ii) growing demands for meeting challenges for both revenue maximisation and cost minimisation

'Compressive' forces/ factors include (i) diminishing work opportunities and stiffer competition; (ii) increasing risks and nil/inadequate incentives (due to factors such as inappropriate attitudes and cultural intertia)

Figure 1: Current pressures towards 'leaner' small and medium contractors

3   SMILE knowledge-mining and knowledge management frameworks

The knowledge-mining strategies and the basic KM framework for the SMILE-SMC project are portrayed in Figure 2.

The KM action strategies include mechanisms for creating and capturing, corroborating, collaborating, sorting and analysing, organising and securing purposes. The facilitating arrangements made for achieving those project objectives include collaborations with trade associations (e.g. Hong Kong Contractors Association, Hong Kong General Building Contractors Association), exploring for top-down support from clients and client-advisory bodies such as the PCICB (Provisional Construction Industry Co-ordination Board), and seeking advice from overseas experiences.

Inter-organisational Information Management	Intra-organisational Information and Knowledge Management

Intrinsic elements required include:
- Participation
- Trust
- Integration
- Selective sharing or securing
- Joint problem solving
- Complete representation
- Cohesive collectiveness
- Understanding

Extrinsic facilitating mechanisms include:
- Templates, scorecards & measures
- Training arrangements
- Integrated collaborative software systems (e.g. web based platforms, databases)
- Meetings and discussions
- Benchmarking clubs

SMILE knowledge management framework and tools cover knowledge capturing, creating, filtering, sorting, securing and archiving (e.g. with lessons learned - failures/ success stories)

The knowledge acquisition strategies in the development stage could be adopted in the implementation stage as well for any further developments

SMILE knowledge-mining arrangements in developing the project deliverables include discussions, meetings, correspondence, interviews, surveys, discussion forums, workshops

Preliminary knowledge mining

- Literature review
- Basic Web searches
- Correspondence/ discussions/ meetings with SMILE team (including 14 partner SMCs)
- Correspondence/ discussions/ meetings with others (such as local/ overseas advisors and collaborators)
- Initial visits to partner SMC organisations and semi-structured interview for initial needs analysis
- Developing, pilot testing and fine-tuning a survey questionnaire from active interactions with SMILE team

Focused knowledge mining

- Extended Literature review
- Extended Web based knowledge mining
- Regular meetings with SMILE team members
- Correspondence/ discussions/ meetings with others (such as local/ overseas advisors and collaborators)
- Questionnaire survey (targeting a broad sample of small and medium contractors)
- Purposive visiting of the partner SMC organisations for business process analysis and modeling the SMILE-SMC solutions (that include focused follow-up interviews and relevant correspondence)
- Correspondence/ discussions/ meetings with others (such as advisors and collaborators of local/ overseas)
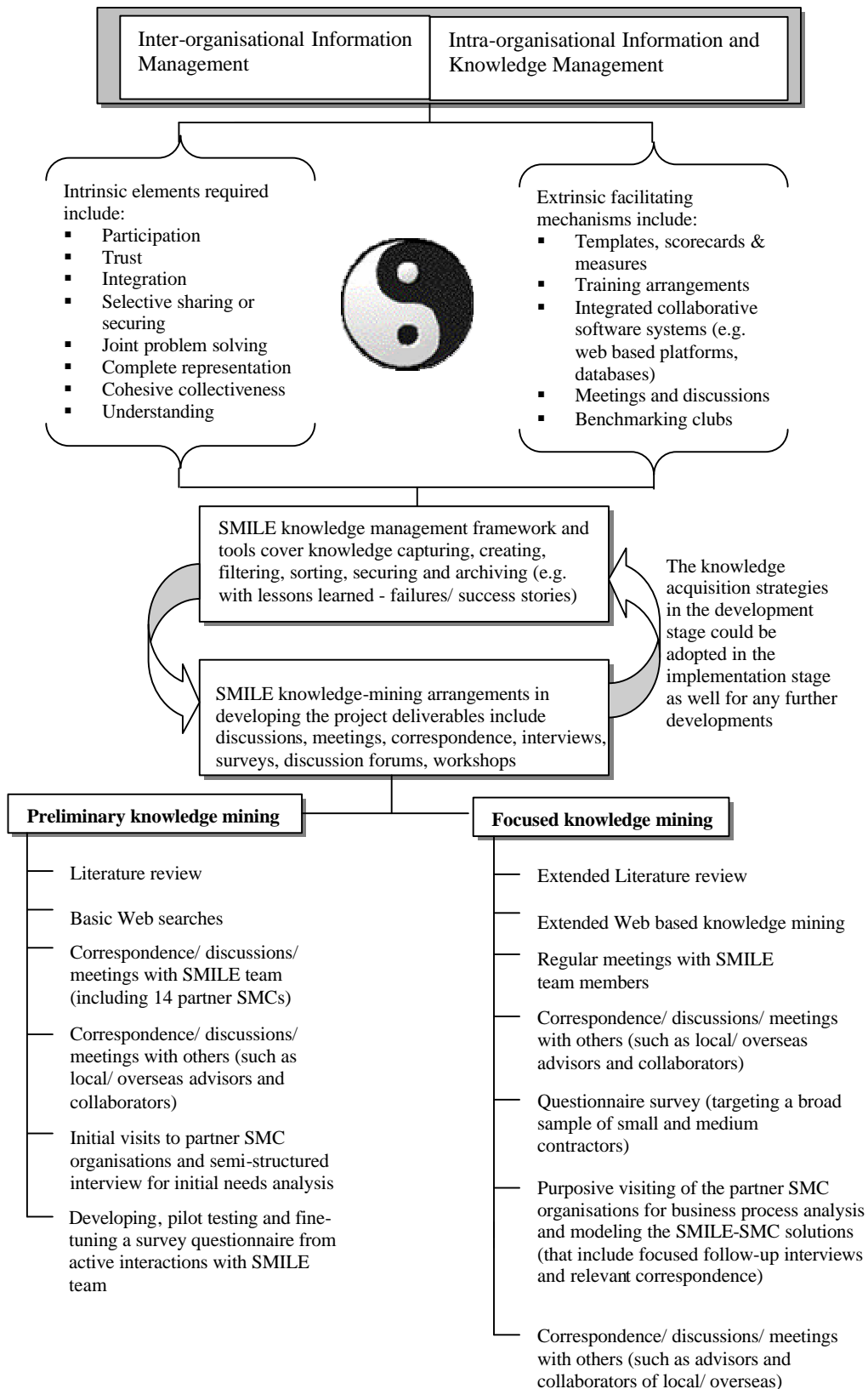
Figure 2 Knowledge management framework for development and implementation stages of the SMILE-SMC project

The development of a SMILE-SMC KM framework and solutions involves two stages of knowledge-mining activities. The preliminary knowledge-mining from various sources include literature review, brainstorming dicussions and correspondence with experts and experienced persons, an initial needs analysis that focused on acquirng knowledge on the basic requirements of the project deliverables. The focused knowledge-mining exercise aims to acquire specific knowledge on problems and barriers, and lessons from failures and success. In addition to extracting the required knowledge with the cooperation of 14 partner contractors (who participate in this study on a voluntary basis), a questionnaire survey targeting a large population of small and medium contractors (in Hong Kong) is also being carried out. Furthermore, a number of meetings and workshops (e.g. with representation from SMCs and other experts) are also planned. A series of comprehensive business process analyses will be conducted with the voluntary partner SMCs for modelling and developing the information and knowledge management solutions in specific areas of concern. Once the the models and prototype systems are developed, they will be tested and validated within these participating SMC organisations. Guidelines for the implemenation of such refined solutions (as detailed in Section 6) in SMCs will be made available later (on a membership basis). Such solutions may comprise of platforms or formats for inter-organisational information management and intra-organisational information and knowledge management. The intrinsic elements required include active participation, mutual trust, standardisation and integration, selective sharing and securing, joint problem-solving, representation and collectiveness, enhanced understanding. The extrinsic mechanisms that could facilitate such KM fundamentals include structured templates, scorecards and measures, training, ICT (information and communication technology) software systems, routine meetings/ discussions and organised correspondence. From a synergistic perspective, the intrinsic and extrinsic aspects could be considered together (as complementary) in the implementation phase, and a similar approach may be used for any further developments.

4 Key extracts from initial needs analysis with SMCs

The initial needs analysis was focused on identifying the knowledge gaps, information bottlenecks, and communication problems and coordination barriers in SMC organisations. A semi-structured questionnaire was initially developed and it was pilot tested internally within the research team. Then it was piloted externally with 3 partner contractors to further fine-tune the initial needs analysis and a semi-structured interview protocol (see Appendix I) was developed. Later the initial needs analysis was conducted in 14 partner contractor organisations.

The key summary of consolidated viewpoints from the initial needs analysis are as follows:
- In SMC organizations, the site level operations such as progress monitoring and photo transmissions could be better facilitated by using Personal Digital Assistant (PDA) applications – if SMC level affordable solutions could be developed.
- SMCs could not afford to expend sufficient resources to either launch their own extensive search for business opportunities or conduct a reasonable market research for every aspect. Although they are already constrained by stiff competitions, cut-throat prices, and diminishing business opportunities (e.g. in the recent economic recession period in Hong Kong), they somehow endeavour to keep their business status by sacrificing markup levels or affecting their quality performance. Hence, pooling of business opportunities related information (e.g. tender notices from different clients) and market information (e.g. material sources, prices) in a single 'searchable' repository will be very useful for the SMCs
- Information on both local and overseas best practices on construction related aspects such as new materials, construction technologies, health, safety and environmental issues will be very useful to improve the knowledge of SMCs that would in turn improve their productivity and quality performance.

- In addition, other information that will be very useful to improve the competitiveness of SMCs include codes of practices, regulations and information related to topics such as employee compensation and insurance. Such information should be easily accessible e.g. from a single web page with hyperlinks and searching facilities.
- Discussion forums are generally welcomed. Some of the proposed discussion topics are: safety at construction sites, legal issues, the impact of enforcement of MPF (Mandatory Provident Fund) regulations on the construction industry.
- Most of the SMCs prefer usage of both traditional (e.g. face-to-face) and modern (e.g. web-based, wireless, mobile communication technologies) communication formats.
- Focused case studies on specific aspects could be useful. But it is doubtful that SMCs may be comfortable enough to participate in such case studies and allocate scarce resources for providing data/information.
- SMCs need user-friendly affordable information management platforms for both intra-organisational information flow and inter-organisational information exchanges.
- Similarly such 'scaled-down' knowledge management solutions will help in the capturing/ storing and extract useful information from previous experiences e.g. for more systematic estimating and successful tendering, for tracking and minimising wastages, rework items, etc.
- Suitable training arrangements to SMCs at strategic, operational and tactical levels (e.g. on how to use PDAs efficiently, possibly with special formats/ forms) are important

Furthermore, the observations from the above-mentioned initial needs analysis interviews are further reinforced through several brainstorming discussions (e.g. in 15 research team meetings and 5 team meetings with partner contractors that were conducted in the 6 months since the start of this project). Thus, the initial needs analysis identified the following potential business/ work processes for improvements:

(1) facilitating general team interactions using web based communication platforms for various objectives such as better supply chain managment, enhanced communications and relationships (with subcontractors, suppliers, foreman and workers, etc.), improved communications with clients/ consultants, and better administration

(2) supporting company-specific and business related issues – such as business intelligence (e.g. market opportunities), financial matters (e.g. investment decisions, cash flow problems), estimating and tendering aspects (e.g. with guides, standard formats), contractual issues (e.g. variations/ change orders, claims), and legal issues

(3) supporting procurement, sourcing, management and training needs – such as subcontractor/ supplier selection, subcontractor/ supplier management, and training of managers/ workers

(4) facilitating site level transactions (e.g. inspection, supervison and monitoring) through various information and communication technologies such as web based, wireless, and mobile communication devices (e.g. PDA, pocket PC, wireless LAN and 3G mobile phones)

5 Envisaged SMILE-SMC System Services

During the development phase, the SMILE-SMC services will be freely available to all the 'partner' SMCs who contribute to the system development. Later during the implementation phase, the SMILE-SMC services will be available on a membership enrolment basis. During the initial implementation period (i.e. within the project funding period), the membership and SMILE-SMC services will be available as 'free' to Hong Kong SMCs. After the funding period, the SMILE-SMC services will be made available upon collection of a nominal subscription fee to cover costs for maintaining services and any needed minor developments. The presently projected services from the SMILE-SMC project are under the broad headings of (a) inter-organisational information exchange, (b) inter-organisational discussion forum, (c)

Intra-organisational information and knowledge flows, (d) performance improvement module, and (e) benchmarking club. However, it has been noted by both overseas advisors and team members that all of the following services can not be developed during this project. Therefore, the following may be considered to be a 'wish-list'. This will provide the framework for future development and examples of items that may be identified during the forthcoming 'focused knowledge-mining' exercise. Thus only some of the following items will be prioritised and developed in detail during the funding period.

5.1   Inter-organisational information exchange

5.1.1 Comprehensive information library
This web-based information library could include information on business opportunities, general construction industry information on current regulation, procedures, etc. In addition to specific data/information/knowledge mining for this library, suitable dynamic hyperlinks will also be provided to relevant information sources (e.g. tendering notices from clients' webpages).

5.1.2 Web-based 'Wanted' zone
In this 'wanted' section, the registered users could post their current 'needs' for their business operations, e.g. searching for potential subcontractors, suppliers, consultants and main contractors. Such postings would provide basic details regarding the posting persons (e.g. SMILE User Number) and any unscrupulous users will be strictly removed from SMILE membership. The postings will have a fixed time validity and later they will be either archived or deleted.

5.1.3 Web-based 'Available' zone
In this 'available' section, the registered users could post their current 'available' items e.g. resources, capacities, 'extra' materials that may otherwise dumped or disposed as waste. Similar to the above-mentioned 'wanted' section, this section also will provide basic details regarding the posting persons and the postings will have a limited time validity.

5.2   Inter-organisational discussion forum
The registered users of SMILE-SMC services could have a web-based platform to discuss their experiences on various issues such as safety, quality, estimating approaches, construction techniques, financial issues, regulations (e.g. employment regulations), insurance related issues, contractual matters, claims and disputes management, and other legal issues. The discussions will be grouped topic-wise and may be even moderated if necessary and possible in the future. Specialist consultants (e.g. legal experts) may possibly be hired based on the demands and such services could be provided on a 'restricted' basis (that require some special fees to meet additional expenses).

5.3   Intra-organisational information and knowledge flows
This may be developed to help the registered SMCs to organise and manage the most important and most frequent sets of information flows (as prioritised based on the 'focused knowledge-mining'), to and from (a) construction sites (at various levels such as foreman and supervisor), (b) site offices, (c) head offices (e.g.with Contract Managers), (d) supply chains (e.g. subcontractors and suppliers) and (e) other external organisations (e.g. clients, consultants and main contractors). Suitable web-based and mobile communication platforms and formats could be developed by SMILE to increase the efficiency and value of such prioritised flows. This module will be organisation-specific and deals with non-sharable information.

5.4   Performance improvement module

This includes possible models and formats (including forms and flow-charts) with (fictitious) examples, based on which SMILE members can endeavour to improve their own business processes, e.g. in supplier sourcing, subcontractor selection, materials management and stock optimisation, subcontractor management, internal subcontractor rating, productivity monitoring (through key performance indicators) and enhancement, knowledge capture, consolidation, retrieval and reuse.

5.5   Benchmarking club

This could provide 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. A pre-condition for this service will be to disclose some of their own information, in order to get information from others.

6   Conclusions and further discussions on current status

Recent changes such as technological developments and tough economic conditions are some of the compelling forces driving SMCs to become more 'lean' and 'agile'. The SMILE-SMC deliverables should enhance SMC competitiveness by helping them in (a) delivering good quality, (b) increasing productivity, (c) reducing costs, time and wastage, (d) boosting goodwill and image, (e) establishing good communications and relationships, (f) enhancing personnel, document, information and knowledge management for anticipating and tracking problems, taking faster and better-informed decisions and forecasting future needs. The envisaged SMILE-SMC services/ facilities – such as inter-organisational discussion forum, benchmarking club, facilitating mechanisms for standardising and improving operational styles through integrated lean and agile approaches – should improve SMC performance levels, profit margins and competitive advantages. It is reiterated that only some of the items will be selected from those broadly identified in the present 'wish-list'. While the framework will be developed to accommodate future additions and expansions, what is envisaged at the end of the project funding period (in December 2005) is the framework and a set of working modules that would be developed according to the prioritised items chosen after the ongoing 'focused knowledge-mining' phase.

Currently the project is 25% into its programme. The initial knowledge-mining has been completed on schedule. A questionnaire survey has commenced to fine-tune the requirements and prioritise the needs, as consolidated in the initial needs analysis. The SMILE survey targeting a bigger population of SMCs in Hong Kong has been launched through various channels (e.g. through different trade associations) and in convenient (e.g. postal/ faxed/ web based) formats. Furthermore, extensive focused interviews with voluntary partner contractor organizations will be conducted for business process analysis on specific operations. In addition, there will be a SMILE development workshop (in end June 2004) that will further develop ideas for the most important SMILE-SMC deliverables. Once the pilot models and prototypes for specific solutions are initially developed, they will be tested with the cooperation of voluntary partner contractors and their feedback will synergistically feed into the development of the impementation platform. Within the active project funding period the project deliverables (including basic training) will be freely available to all registered SMCs as possible . After the 2-year funding period, the SMILE-SMC solutions will be made available through a subscription based service by collecting some nominal subscription fees to cover costs. In case of any future demands, further upgrades and training could be organized by the CICID (Centre for Infrastructure and Construction Industry Development) or by another

designated body (e.g. government linked body) who may be invited to take over the future operations, including training.

7 Acknowledgements

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Appendix I : Pilot Interview Questionnaire

Q1. (a) What is the most useful *information* that you would like to see on a public web site dedicated to SMCs, for improving your business/ organisational and project performance level?

Level of Importance: *V – Very important, I- important, NI – Not important, NS – Not sure*

Information Type	Level of Importance (V, I, NI or NS)	Remarks *
1. New construction technologies		
2. New information/ communication technologies		
3. Business opportunities (a) Hong Kong (b) Mainland China		
4. Critical success factors		
5. Useful 'Performance Indicators' (measures), in order to compare performance (e.g. productivity/output rates): (a) with other companies (b) with past and present projects		
6. Best practices for benchmarking (e.g. in making the above comparisons)		
7. Best practices in Health, Safety & Environmental issues (a) from Hong Kong (b) from overseas		
8. Best practices in Project Management (a) from Hong Kong (b) from overseas		
9. Case studies of successes / failures in SMC projects & SMC organizations		
10. Others (please specify):		

* Please add why V, I, NI or NS. Also, add any specific areas e.g. in items 1, 8, 9, etc.

(b) What are the common barriers to obtaining the above information? (Please list out on a separate page)

Q2. If there is a SMILE-SMC discussion forum on a website for the Construction Industry:
(a) What topics would you like to be included in the discussion forum?
(b) Why you suggest these particular topic(s) and

(c) The level of importance in each topic on the same scale in question 1 (i.e. V, I, NI or NS)

Q3. Which business process would you like to be *facilitated / enhanced / automated* on the web, or through other 'easy to use' communication formats/ channels?
Kindly also give reasons in favour of your preferred mode of communication over others.
   (Note: more than one process is expected to be discussed. Additional page(s) may be annexed to explain these).

Q4. Information can be (a) *proprietary* or (b) *open* – if it can be shared /exchanged among others. For information that can be shared among others (e.g. contractors, sub-contractors and business partners), what are the approximate *percentage allocations* of the current and preferred methods of communication / dissemination?

Methods of dissemination	% now	% preferred	Why preferred *
1. Face-to-face			
2. Telephone (including mobile /pagers)			
3. Fax			
4. Mail/ Postal			
5. E-mails			
6. Video-conferencing			
7. Web-based platform (e.g. intranet / extranet)			
8. PDA / wireless			
9. Others - please specify:			
Total			

* E.g. Fast, smooth, efficient, effective, etc.

Q5. (a) Do your company staff often use the Internet to obtain work-related information? Yes / No
(b) If the answer in Q5(a) is yes, is it more often for project–specific work e.g. for materials purchases for a specific project (as against general information for the organisation e.g. looking for new work opportunities)? Yes / No
(c) If the answer in Q5(a) is no, how does your company staff often obtain work-related information? Kindly give reasons for such practices.
(d) Do most of your work sites have internet facilities? Yes / No
(e) Does your company have its own website? Yes / No
(f) Kindly provide your perceptions on how on-site Internet facilities do (or would potentially) improve work-related information flow.

Q6. (a) What are your most frequently visited work-related web sites? (List the most frequent site first)

Sl. No.	Web site	Purpose
1		
2		
3		
4		
5		

(b) What are your most frequently used/read work-related newsletters/journals/periodicals?
(List the most frequent journals first)

SL. No.	Newsletters/Journals/Periodicals	Purpose
1		
2		
3		
4		
5		

Q7. (a) What is the size of your company (in terms of number of 'direct' employees)?
Please tick one. (i) 1 – 10 (ii) 11 – 20 (iii) 21 – 30 (iv) 31 – 40 (v) 41 – 50
(vi) 51 – 100 (vii) >100
If the response is (vii), please provide the number of employees of your company … …
(b) What, according to your perception, is an optimal/target No. of employees for your organisation?

Q8. (a) Approximate annual turnover of your company in million (M) HK dollars:
(i) less than 1M (ii) 1 – 2.5 M (iii) 2.5+ – 5.0 M (iv) 5.0+ – 25.0 M
(v) 25.0+ – 50.0 M (vi) 50.0+ -100 M (vii) 100+ - 500 M (viii) 500+ - 1,000 M (ix) over 1 billion
(b) What, according to your perception, is an optimal/target annual turnover for your organisation?

Q9. What are your major areas of business operation? (you may tick more than one)
Building works ( ) Building services ( ) Foundation works ( ) Site Formation ( )
Geotechnical works ( ) Repairs/Maintenance ( ) Addition and Alteration ( )
Civil Works ( ) Others (please specify):

Q10. (a) Any other suggestions and comments to improve the usefulness, quality and range of items to be provided for SMCs on a web-based information system and a dynamic knowledge base?
(b) Can you suggest any other persons and/or 'small/ medium' contractors (including your sub-contractors) who may have useful suggestions for the above?