W102: INFORMATION AND KNOWLEDGE MANAGEMENT IN BUILDING

Meeting held on June 23 and 24, at the Centre for the Built Environment, a joint initiative of the University of Strathclyde and Glasgow Caledonian University

'Quick Feedback Note' prepared by Branka Dimitrijevic, July 2003.

Were present:

Jaime Acevedo-Alvarez (Fraunhofer-Informationszentrum Raum und Bau IRB, Stuttgart, Germany)

Tony Conder (Building Research Association of New Zealand, Wellington, New Zealand)

Colin Davidson (Université de Montreal, Quebec, Canada)

Branka Dimitrijevic (The Centre for the Built Environment, Glasgow, United Kingdom)

Charles Egbu (Glasgow Caledonian University, Glasgow, United Kingdom)

Patrice Godonou (CIB, Rotterdam, Netherlands)

Leif Jonsson (The Danish National Centre for Building Documentation, Copenhagen, Denmark)

Arturas Kaklauskas (Vilnius Gediminas Technical University, Vilnius, Lithuania)

Esra Kurul (Glasgow Caledonian University, Glasgow, United Kingdom)

Francisco Loforte Ribeiro (Universidade Técnica de Lisboa, Lisboa, Portugal)

Peter Matiasovsky (Slovak Academy of Sciences, Bratislava, Slovakia)

Gaye McDermott (CSIRO Manufacturing & Infrastructure Technology, Melbourne, Australia)

Thomas H. Morszeck (Fraunhofer-Informationszentrum Raum und Bau IRB, Stuttgart, Germany)

Jim Smith (University of Melbourne, Melbourne, Australia)

Ron Wakefield (Virginia Polytechnic Institute and State University, Blacksburg, USA)

Ian Wilson (University of Salford, Salford, United Kingdom)

Apologies for absence were received from Prof. Andrea Stracuzzi who could not attend at the last minute, and from other members of the W102 Commission. Pertinent documents were distributed at the start of the meeting.

Opening remarks

Co-coordinators of W102, Dr. Branka Dimitrijevic, who welcomed the delegates in Glasgow, and Prof. Colin Davidson, who proposed the agenda, opened the meeting.

Minutes of the 2002 meeting

Delegates were reminded of the minutes of the W102 meeting in Belgrade, and the minutes were then approved.

Connections with other CIB projects and groups

At the meeting in Belgrade, an informal and ad-hoc connection between W102 and PeBBu was made - for the mutual benefit of both groups. This enabled a route for exchange of information to be established; since then, a flow of information has been continued through Colin Davidson's contributions and Branka Dimitrijevic's participation in the PeBBu Domain 9 meeting in Budapest in March 2003, and through their joint organisation of the PeBBu Domain 9 meeting in Glasgow on 22 June 2003.

Recent communication between W102, TG47 and CIB has clarified the remit of W102 and TG47 respectively concerning information dissemination and innovation brokerage; while TG47 focuses on innovation brokerage in large organisations, W102 is concerned with dissemination of innovation to SMEs and with organizational structures that favour this objective.

Publishing papers presented at W102 meetings from 1999 to date

In order to provide an overview of W102 activities from its first meeting in 1999 to date, it was proposed to publish (electronically) a set of the papers, summaries of discussions and other key documents arising from the meetings held in Montreal in 1999, in Helsinki in 2000, in Melbourne and Auckland in 2001, in Belgrade in 2002, and in Glasgow in 2003.

Matters arising from previous meetings of W102

Among the concerns of W102, the impact of the emerging approach called "performance-based building" is obviously present. This was reflected in the following subjects for discussion:

- Barriers to the communication of performance based information
- Identification of performance based information sources
- Identification of participants (who does what) in the flow of information within the building sector. (Since procurement strategy influences who does what in the information arena flow, it is necessary to collaborate with W92: Procurement Systems).

Other subjects of concern included:

1. Technology Watch:

It was pointed out that whereas large enterprises have in-house services to collect information on new technologies, SMEs do not have the resources to provide themselves with this kind of service. A few examples of technology watch for SMEs were mentioned such as

- PATH.Net website (www.pathnet.org), published by the Partnership for Advancing Technology in Housing (PATH), a public-private initiative dedicated to accelerating the use of technologies that improve the quality, durability, energy efficiency, environmental performance, and affordability of housing in USA. PATH is also involved in publishing information related to the home building in USA through ToolBase website (www.toolbase.org).

- A service provided by the French Confederation of Artisans and Small Enterprises in the Building Industry (CAPEB), which has a service for its members using MINITEL.

- It was noted that there is a potential question of liability in providing information in such a way; this can be a problem in the USA.

- There was agreement that W102 should aim to catalogue these types of services and the groups which provide them. Examples of relevant groups and projects mentioned at the meeting in Glasgow, are as follows:
  - European Association of Urban Planners (URBA CD-Rom)
  - Association of architectural librarians
  - eConstruct project (www.econstruct.org), which is developing a new communication technology based upon XML or eXtensible Mark-up Language (called Building and Construction eXtensible Mark-up Language - bcXML) that will better support the needs of the European building and construction industry.

Delegates agreed that W102 should provide recommendations, and suggest tools and models for providing information on new technologies to SMEs. An on-going research on Information Technology for SMEs, led by Glasgow Caledonian University, aims to define a model for providing information to SMEs in response to the SMEs' capability to access information. Outcomes of this research will be important to the W102 work in this area.

Delegates also agreed that W102 should prepare a paper on providing information on new technologies to SMEs. In the discussion, it was pointed out that it was important not only to "push" the information to the industry, but also to explore what information the industry actually required. This approach should be suggested to existing providers of information.

Technology watch should also include adequate packaging of information. It is important to focus on the quality of information and filter out incomplete or unreliable information. Branka Dimitrijevic will prepare the structure for a W102 paper - which will be distributed to W102 members for completion according to their own information.

Packaging information in a more accessible way

Dr Ian Wilson presented an EU funded project (undertaken by France, Finland, Germany, Netherlands, Slovenia, and UK), entitled Inter-Connecting Construction

Industry (ICCI), published on http://icci.vtt.fi/. The project aims to build a cluster upon six IST projects related to ICT in construction to:

- Improve harmonisation and coherency of RTD

- Benefit efficiency in IST projectsAssist knowledge transfer to industryReduce time to market of exploitation

The six IST projects are as follows:

- OSMOS - IST-1999-10491: Open System for Inter-enterprise Information Management in Dynamic Virtual Environments

- eConstruct - IST-1999-10303: Electronic Business in the Building and Construction Industry: Preparing for the new InternetDiversity - IST-1999-13365: Distributed Virtual Workspace for Enhancing Communication within the Construction Industry

- ISTforCE - IST-1999-11508: Intelligent Services and Tools for Concurrent EngineeringeLEGAL - IST-1999-20570: Specifying Legal Terms of Contract in ICT Environment

- GLOBEMEN - IST-1999-60002: Global Engineering and Manufacturing in Enterprise Networks

This concerted initiative aims to:

- Harmonise results from past and ongoing RTD projects

- Provide useful background information in the form of industry and R&D recommendations that will:

    – help promote the Construction industry,

    – improve general practices and adoption of ICT, and

    – provide useful sources of information to funding bodies and governmental organisations to shape and define future agenda and strategies for the sector.

In discussion, the relationship between ICCI and the six projects was further explained by pointing out that each of these six projects had its own dissemination route, and that the aim of ICCI was to package the information from these projects in a more accessible way.

Information and knowledge management for learning organizations

Senge's proposals that the "most successful corporations of the 1990s will be something called the learning organization" and that "the ability to learn faster than your competitors may be the only sustainable competitive advantage"[1] triggered the development of a blueprint tool that provides managers with a better understanding of

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[1]   Senge, P.M. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. Century, London.

how a learning organization can be nurtured. This blueprint, explained in the paper "Nurturing a learning organization in construction", was presented by Jim Smith on behalf of a team, which also included Peter Love and David Edwards. The theoretical framework for the blueprint draws upon the proposal proffered by Nesan and Holt[2] that total quality management (TQM) should form an integral part of a construction organization's fabric so that new knowledge naturally transpires continuous refinement of quality.

The paper proposes that management in construction organizations need to recognize that practicing TQM as a philosophy (i.e. continuous improvement) as well as a set of learning techniques (i.e., the Plan-Do-Act-Check Cycle), will lead to continuous change and learning. Organizations operating in the industry must recognize the need to learn and to reduce the incidence of those activities that do not add value to operations and customers. A TQM philosophy provides a framework for organizations to develop a fully shared, even synergistic understanding of information, experiences and goals of all individuals within the organization so that change can be consciously and proactively managed.

In the discussion, it was pointed out that most of the knowledge was held by the "field" people, and that not all managers were experienced. In addition, learning should not be based only on in-house experience but on external knowledge from the industry associations. It was also suggested that there is a significant link between learning organizations and re-engineering of the building process – learning process can take place within a group of companies that work on one project. However, commercial value of information can be an issue in sharing information.

Communication links in information management for performance approach

Colin Davidson presented a case study, which illustrates procedures used in information management for Performance Based Building. His presentation, entitled "Using the performance approach successfully: the School Construction Systems Development (SCSD) Project, California, USA, 1961-1967", began by demonstrating that there is a decisive relationship between procurement, innovation and the performance approach. After project initiation and strategic procurement decisions, the scope for innovation is implied by the functional program and, of course, by the budget and the place it reserves for innovation and experimentation – if required. The client will determine how much can be spent on innovation. The next step will be to choose the appropriate level of innovation from the spectrum of currently available technology and highly innovative technology. Designers will develop an adequate design strategy.

The case under study, organized around an aggregated market for over twenty schools, indicated differences between the communication links within the procurement organization in a traditional and in a performance-based approach. In traditional procurement, strong communication links are established between building owner,

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[2] Nesan, Jawhar-L., and Holt, G.D. (1999). *Empowerment in Construction: The Way Forward for Performance Improvement*. Somerset Research Studies Press Ltd, Hertfordshire, UK

building designers and general contractor, and weak links between manufacturers/suppliers, between manufacturers/suppliers and the designer and between manufacturers/suppliers general contractor. In performance based procurement (in the conditions of the SCSD project), the "systems organizer", an additional participant in the procurement process, creates strong links with manufacturers as well. In addition, stronger links are built between the manufacturers who collaborate in the innovation process.

The search for innovation requires the establishment of stronger information links between the client and official bodies which deal with planning issues, legal matters, fire prevention, state regulations, financial and technical matters. Procedures used to develop user requirements start with the study and analysis of user requirements, prognosis of requirement changes over time, and analysis of environmental implications. This step is completed with a draft of user requirements, which is distributed for comments to architects, other professionals, users and client. Their suggestions are included in writing the final performance specifications. Procedures used in the development of performance documents are illustrated in Figure 1.
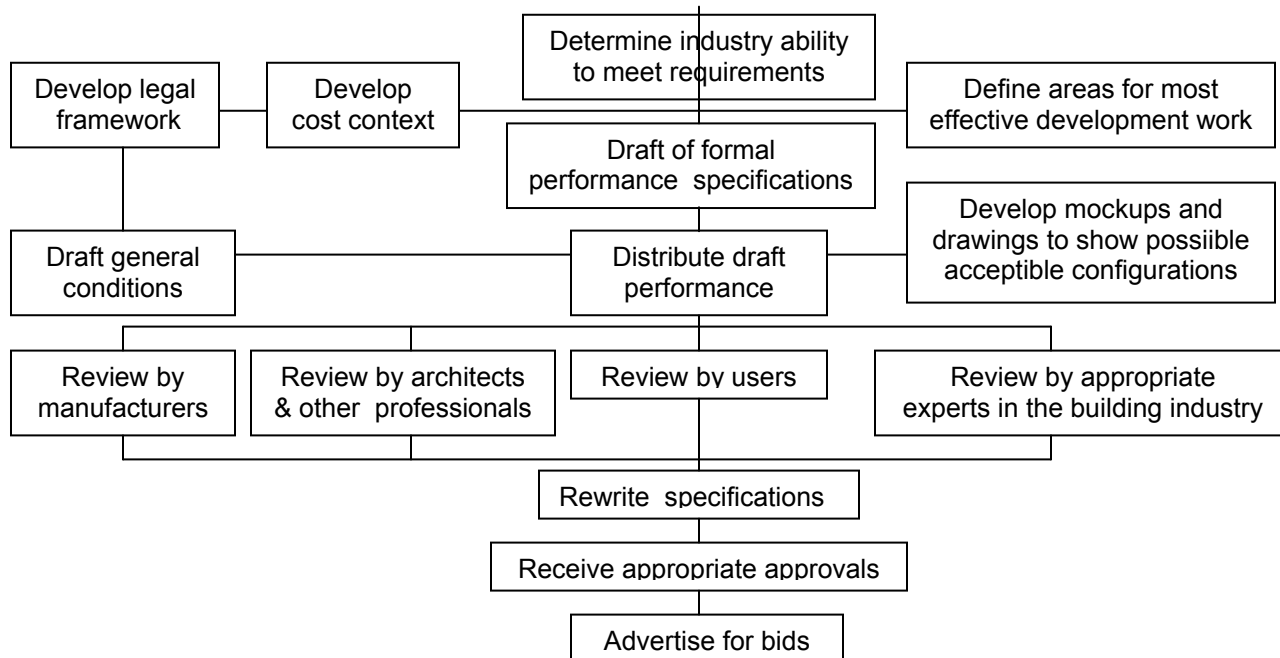

Figure 1. Procedures used in the development of performance documents

The performance specifications were then used as the basis for a competition between manufacturers, who competed for manufacture and install contracts for the extensive program of schools. Here, a high degree of innovation was required (to improve upon the inadequate quality of previous schools in California); a well-organized market provided the financial basis for manufacturers (in this case) to assume the risks and costs of innovation.

The case study also showed procedures used to determine successful bidders and the procedures used in the design and construction of SCSD schools. In addition, the

performance approach was illustrated with schematics of lighting performance requirements, acoustic performance requirements, hygrothermal performance requirements, spatial flexibility performance requirements, adaptability performance requirements, and also showed the winning solutions that met these requirements.

In the discussion, the role of procurement and the ensuing organizational design in determining flow of information and establishing links between participants in the procurement process was pointed out. From this, it follows that W102 should establish closer links with CIB commission W92 on Construction Procurement.

Knowledge management through case-base reasoning (CBR) approach

In the paper entitled "Can experience based cases support business processes in the construction supply chains?" Francisco Loforte Ribeiro outlined case-base reasoning (CBR) as a problem-solving paradigm that is able to utilise the specific knowledge of previously-experienced, concrete problem situations. In CBR systems, knowledge is embodied in a library of cases. Each case typically contains a description of the problem, plus a solution and/or the outcome.

CBR systems fall into three categories[3]: *task-based*, *enterprise-based* and *web-based*. Typically, *task-based* implementations have addressed applications goals based only on the constraints imposed by the reasoning task itself. Recently, there has been an increasing trend to incorporate CBR into enterprise applications to leverage corporate knowledge assets [4],[5]. CBR *web-based* applications are taking advantage of the recent developments in knowledge representation and sharing on the world-wide-web [6],[7]; However, integrating CBR implementations with enterprise systems imposes standardisation constraints.

Thus, the *enterprise-based* framework combines process-specific knowledge with models of general domain knowledge and with lessons that were learned during practical application of the knowledge. With this approach, the CBR framework, besides acquiring experience cases, should also acquire domain and process knowledge. Cases should be structured as business process packages in an experience base (EB), which is an organisation's memory for relevant process knowledge and lessons learned.

The CBR framework must operate in conjunction with enterprise database systems and be integrated within the corporate Intranet to allow people to share the EB resources. The enterprise CBR framework consists of five components: CBR engine, Experience base maintainer, Web server, Interface to legacy systems and a General-purpose browser.

At the core of the framework are the CBR engine and the EB. The CBR engine should have the capability to reason over multiple local case bases. Commercial tools available for the CBR engine include the CASEADVISOR and RECALL. The Experience Maintainer module is critical for the EB maintenance over time including extracting, updating and revising cases. The proposed framework can be integrated within an enterprise information technology environment and implemented using a commercial CBR tool.

In the ensuing discussion, delegates asked whether there was any research in Portugal on how companies presently use their knowledge. Francisco Loforte Ribeiro answered

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[3] Sengupta A., Wilson, D.C. and Leak D.B. (1999). "Constructing and Transforming CBR Implementations: Techniques for Corporate Memory Management". *Proceedings of the IJCAI-99 Workshop on Automating the Construction of Case Based Reasoners*, Sweden.

[4] Weber, R., Aha, D., Muñoz-Ávila, H., Breslow, L. (2001). *Active Delivery for Lessons Learned Systems*.
http://www.aic.navy.mil/~aha/papers/EWCBR00_weber_et_al.doc.

[5] Kitano, H. and Shimazu, H, (1996). "The Experience sharing architecture: A case study in corporate wide case-based software quality control". In *Case-Based Reasoning: Experiences, Lessons, and Future Directions*: AAAI Press, 1996.

[6] Gardingen, D. and Watson, I. (1998). "A web based case-based reasoning system for HVAC sales support". In *Applications & Innovations in Expert Systems VI*. Springer Verlag.

[7] Doyle, M., Ferrario M., Hayes, C., Cunningham, P., and Smyth, B. (1998). "CBR net: smart technology over a network". *Technical Report TCD-CS-1998-07*, Trinity College Dublin.

that restructuring of the industry was on-going and that they were looking to gain competitive advantage through better knowledge management by using different IT tools.

A question was raised on how different teams working on different projects affect the context and thus the utility of the case studies as a basis for the experience base. The answer was that companies try to maintain stable teams in order to keep the knowledge in the company. Another delegate pointed out that there might be a risk of preventing innovation by using only previous knowledge. Francisco Loforte Ribeiro answered that the database does not have to be prescriptive but rather an experience base. Stored checklists are ways of managing risk. Another comment was that CBR might be a pretty blunt tool, and that benchmarking might be a more appropriate method of pointing to good knowledge and to successes. However, another comment was that construction industry often learns through examples of errors. A question was asked about validation procedures and who decides what should be in database. Francisco Loforte Ribeiro answered that procedures should be put in place to select valuable knowledge.

- The discussion outlined other issues relevant to knowledge management such astime pertinence of knowledge in the construction industry in a short-term span of projects

- project manager's role in managing knowledge and different cultures of organisations involved in projects

- how to tackle a cultural issue in a virtual organisation around a project

- how does the knowledge transform – does its value diminish or improve

- difficulties of access to information as a major source of conflict and loss of productivity.

Concerning knowledge management issues, Charles Egbu asked what areas of knowledge management should W102 engage in, expressing his doubts that IT can deal with capturing wisdom. Colin Davidson replied that W102 should focus not only on information and knowledge management within organisations, but also on information and knowledge sharing between enterprises.

Approaches to providing information to the construction industry

Colin Davidson's presentation on the Centre international du bâtiment à Montréal (Cibât) (www.cibat.qc.ca), whose objective is to facilitate access to information on building, building products and building requirements, informed delegates about a Canadian approach to providing information to the construction industry. One of Cibât's concerns is to facilitate finding answers to questions asked on the Internet[8]. Three facets have been addressed:

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[8] Note the distinction between "providing answers to questions" and "providing references to sources of information".

- What sorts of questions people in the construction industry ask? It has been observed that there is a lot of contextual information that accompanies the actual questions.

- Development of a tool to search for answers to these questions. Around 500 sites containing information pertinent to architecture, civil engineering and construction have been identified. A procedure has been developed to extract fragmentary answers from these sites.

- Condense the fragmentary answers into natural language-correct paragraphs. A strategy for developing this facet has been worked out.

Tony Conder informed delegates about the work of the Building Research Association of New Zealand (BRANZ) (www.branz.org.nz). The Building Research Association of New Zealand Incorporated (BRANZ Inc.) is an industry association, wholly owned and governed by the New Zealand building and construction industry. The BRANZ Inc. Board is made up of nominees from a wide range of industry organisations. BRANZ was established as an incorporated society in 1969, and began operating in 1970. BRANZ's aim was to deliver new knowledge required by the industry. In the early days it was set up as a partnership between the building and construction sector and Government. At this time, one third of the Board members were appointed through Government. BRANZ was funded by the Building Research Levy (imposed at the request of the industry) and by a direct Government grant. BRANZ's partnership with Government ended in the 1980s, at which time the Government grant also ceased. Today the Government has no direct involvement with the appointment of the BRANZ Inc. Board. Apart from providing advisory help lines for the industry and for the public, BRANZ provides specialised help lines (e.g. for roofing, steel, wood products etc.) The resources which enable the association to pursue this goal are:

- the Building Research Levy (collected under the Building Research Levy Act 1969),

- one third ownership of Construction Information Ltd, and

- 100% ownership of BRANZ Ltd.

BRANZ has accredited advisers, and it produces good practice guides. BRANZ Limited provides innovative and creative solutions to the building and construction industry by offering independent and confidential:

- Testing / Consulting

- Research

- Publications

- Product Appraisal.

Tony Conder brought a few recent BRANZ publications to show to delegates.

An Australian approach to providing information to the construction industry was explained by Gaye McDermott who works at the Commonwealth Scientific and

Industrial Research Organisation (CSIRO) (www.csiro.au). CSIRO is one of the world's largest and most diverse research organisations with 6500 staff who are involved in research related to agribusiness, energy and transport, environment and natural resources, information and communication services, manufacturing, mineral resources, and health.

CSIRO Manufacturing & Infrastructure Technology (CMIT) (www.cmit.csiro.au) was formed in July 2002 through the integration of the CSIRO divisions of Building, Construction & Engineering and Manufacturing Science & Technology. Now one of CSIRO's largest divisions, CMIT has a turnover of over $70 million, with more than 500 specialist staff (350 in research) and laboratories in four states, placed to serve the needs of manufacturing and infrastructure industries.

The division's science is organised around five core capabilities:

- Elaborately Transformed Metals — creating innovative alloys, processes and products.

- Novel Materials & Processes — design and development of innovative materials, processes & systems.

- Complex Systems Integration — creating technologies to manage elaborate systems.

- Sustainable Built Environment — enhancing whole-of-life performance of built assets and infrastructure.

- Energy & Thermofluids Engineering — improving systems involving complex flows of energy, heat and fluids.

CSIRO produces a diverse range of publications, scientific papers and technical reports. CSIRO Publishing publishes research journals, books, magazines and CD-ROMs. "Innovation" is an online built environment and manufacturing magazine showcasing new technology, products and services. CSIRO Manufacturing & Infrastructure Technology offers a broad range of research, products and services as outlined in extensive range of brochures

Research agenda in knowledge management for the construction industry

Charles Egbu's paper "Knowledge management and intellectual capital in the construction industry: an agenda for research" has two primary aims: (i) to raise some awareness of the significant and yet complex areas of knowledge management (KM) and intellectual capital (IC) in a construction industry context, and (ii) by taking a socio-behavioural perspective, to posit areas of future research for up and coming - as well as established - researchers.

Important areas of research for the future include: the investigation of how knowledge is shared across construction supply chains; a need to investigate how effective business cases can be made for knowledge management in organisations; investigation of the

challenges associated with benefit measurement of KM and IC, and the impact of KM and IC on incremental and radical innovations in projects and in the wider organisational context. The paper argues that appropriate and robust research methodologies need to be considered when investigating the areas of knowledge management and intellectual capital. Such methodologies should pay due cognisance to the complex and inter-dependent nature of the variables at play. With the paucity of empirical studies that exist, there is ample scope for research on KM and IC.

Knowledge management is defined as the 'creation of a thriving work and learning environment that fosters the continuous creation, aggregation, use and re-use of both organisational and personal knowledge in the pursuit of new business or organisational value' [9]. Charles Egbu points out that IC was neatly defined at the ICM Gathering in 1995 as "knowledge that can be converted into profit"[10].

Further on, Charles Egbu concludes that it is apparent that the construction industry is dependent on key knowledge assets and resources for its activities. Much of this knowledge is embedded in its people and processes. Effective knowledge management practices would not only enable the organisations to make use of the knowledge embedded in its staff and processes but also facilitate the expansion of the company's knowledge-base through knowledge creation.

In a paradoxical sort of way, the context specificity of knowledge within the construction industry might be considered as an obstacle to making use of existing knowledge in the organisations, because the majority of the players in the construction industry regard each project to be unique. Even so, some of the processes to be completed and the problems to be resolved are repeatable. In this context, exploiting knowledge and IC, which already exist in organisations, by establishing "feedback-loops" into the organisational knowledge base, makes business sense.

The next part of the paper indicates research that is being conducted at the Glasgow Caledonian University to explore a host of knowledge management issues. One of the studies involves the investigation and documentation of how knowledge assets in the construction industry can be "packaged" and used to exploit the opportunities presented by E-business to improve organisational performance and competitive advantage. Another study considers the role of human resources (HR) management in knowledge management in organisations. It proposes to develop a prototype 'applicator' that attempts to measure the relative impact of HR issues on knowledge management performance in organisations - and how they contribute to organisational process improvements.

A research study is also underway to investigate the role of knowledge management in improving the management of Healthcare Acquired Infections (HAIs), together with how

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[9] Cross, R. (1998). "Managing for Knowledge: managing for growth." *Knowledge Management* 1(3):9-13.

[10] Sullivan. P, (2000). *Value-Driven Intellectual Capital; How to convert Intangible Corporate Assets into Market Value*, http://www.sveiby.com/articles/icmmovement.htm cited 3/3/2003

knowledge (including professional knowledge) is being shared and transferred amongst key functionaries involved in HAI management. This study also considers the role of 'hard' and 'soft' facilities' management issues in the context of HAIs. Another study aims to improve knowledge creation, transfer within and between organisations in the context of glass recycling. It will track and analyse how different users with differing perspectives and differing applications contexts access, map, and use knowledge on glass recycling. The outcome will be an analysis of the feasibility to systematically discriminate knowledge according to user needs profiles whilst preserving the resilience and comprehensiveness needed to confidently map knowledge across complex real world sustainability issues. Another study is exploring the role of 'knowledge management officers/specialists' in organisations; their competencies, training needs and contributions to organisations. Finally, another study is looking into the role of knowledge management in SMEs and the relevance of information technology in this regard.

The areas of knowledge management and intellectual capital, which the authors propose as needing urgent research attention include such issues as the importance of making a business case of KM, the role of KM and IC on organisational innovations, and the role of HR in effective KM. It should be stated, however, that the research areas, albeit needing urgent attention, are not documented in relative order of importance. The importance attached to any particular area will be dependent on many contexts, including the needs of individual organisations and research interests of a given researcher. As KM becomes increasingly practiced in organisations and the cost for implementation increases, this should provide added impetus for concerted efforts to be levelled at making a strong business case for KM.

CIB Student Chapter at W102 meeting

On behalf of CIB Student Chapter of the School of Built & Natural Environment, Glasgow Caledonian University and the Department of Civil Engineering, University of StrathclydeMichael Tong gave a presentation on its evolution, activities and events, and emergent potential. The committee was officially inaugurated at a meeting on 12 February 2003. Contacts with other researchers are initiated through newsletter, CNBR network, website http://www.sbne.gcal.ac.uk/cib/, targeted e-mails, and direct contact. The Chapter has provided members an insight into the process of how to identify, create and operate events and activities that are fundamental to the development of academic collaboration and forming a community of practice (CoP). The main aim was to establish collaborative research at international, national and at local levels:

- Participation and organisation of conferences (Salford, Hong Kong Symposium, PRoBE)

- Collaboration with international chapters

- Workshops/seminars

- Inter-departmental joint research

The CIB Student Chapter has allowed members to combine their individual expertise, actively promote inter-departmental joint research and creating a "learning" environment. Joint conference papers, incorporating a combination of "hard" & "soft" issues are being developed as a result. Chapter provided members with a good framework to organise research activities and events. It aims to establish a research database of all International Student Chapter members indicating their fields of expertise and contact details, and to develop a discussion forum to share resources. Lessons learned from this phase are related to better awareness of the "big picture" and how individual researchers fit in; operational problems; better understanding of limitations; and a more hierarchic approach required. Initial phase provided a good foundation for the challenges ahead, and developed an appetite to establish stronger links with national and international chapters. The Chapter plans to develop the international Chapter network through the better utilisation of Knowledge Management. Reasons for focusing on knowledge management have been outlined as follows:

- The capacity to innovate depends considerably on the knowledge and expertise of its members

- Only a fraction of this knowledge available is actually being utilised

- The diverse nature of postgraduate research provides a competitive edge in terms of knowledge generation.

Other students involved in the Chapter informed delegates about their research projects in Knowledge Management. Delegates appreciated very much students' participation at W102 meeting and welcomed the emerging potential of younger generation of researchers.

Example of knowledge transfer to SMEs in the West of Scotland

Branka Dimitrijevic gave a presentation on "Knowledge transfer to SMEs in the West of Scotland through the Centre for the Built Environment (CBE)", a joint initiative of the University of Strathclyde and Glasgow Caledonian University, partly funded by the European Regional Development Fund. This 3-year project started in June 2002. CBE is based in the Lighthouse, the Centre for Architecture, and it collaborates with the Lighthouse. The project objectives are as follows:

- Knowledge transfer between academia and the construction industry SMEs

- Integration with the regional business and development partnerships and initiatives

- Integration with the environmental and equal opportunities programmes.

CBE's activities to date include
- Lunchtime seminars

- Lifelong learning programmes

- Conferences

- Collaboration in knowledge transfer

- Connecting with the business support agencies, environmental organisations and equal opportunities associations

- Support for industry/academic research projects

- Publicity and attracting sponsorship

- Monitoring CBE's impact

- Identifying the construction industry needs in CPD

CBE lunchtime series started in November 2002. To date it has attracted around 450 delegates from 185 organisations. CBE collaborated in the delivery of MSc Construction Innovation and preparation of MSc Matching Section Programme. It has facilitated advice/consultancy to 56 organisations, and establishing 22 new links between academia and industry through one research project. CBE has been actively involved in activities of W102 and Performance Based Building. Apart from organizing meeting of these two groups in Glasgow, it has supported organization of one international conference organised by the Lighthouse and one conference organised by the Institute of Value Management.

CBE publishes quarterly newsletter CyBEr news. CBE's report from the international conference "Revaluing Construction – The International Agenda", (held in Manchester, United Kingdom, in February 2003) was published in CyBEr News. CBE collaborates with other knowledge transfer initiatives, other university research units, and organizations. CBE engages with the business support agencies through networking meetings, with environmental organizations (e.g. Scottish Natural Heritage) and equal opportunity associations (e.g. Disability Rights Commission and Commission for Racial Equality) by providing a platform for their seminars.

CBE engages in preparing research proposals and in facilitating contact between academia and the construction industry organizations interested in academic/industry research. CBE publicizes its activities through its newsletter distributed to 2,000 clients and e-mail to over 1,500 clients. CBE website will be redesigned and active by September 2003. CBE has undertaken a survey in the construction industry CPD needs which will inform its future programme. In the next period CBE plans to focus on

- Supporting bespoke consultancy/advice for SMEs

- Adding value for SMEs in lifelong learning programmes

- Developing short courses to meet SME's needs for CPD

- Supporting academic/industry research projects

- Redesigning, updating and publishing CBE's website

- Publishing database of expertise in the built environment sector in Scotland on CBE website

- Expanding collaboration with environmental, equal opportunities, and business support agencies

- Identifying opportunities for participation in FP6**Action points**

The meeting was concluded by reiterating future tasks of W102 as follows:

- Communication of performance based information

- Cataloguing providers of technology watch

- Publishing information on W102 since 1999 to date

- Establishing closer links with W92 and PeBBu Domain 9

- Continuing links with UICB.

Next meeting
Next meeting of W102 will be held at Ryerson University, Toronto, Canada just before the CIB Congress from 2-7 May 2004.

Closing the meeting

Delegates thanked Colin Davidson for his valuable work in establishing and running W102 and developing its activities to date. After the meeting in Glasgow, Branka Dimitrijevic will be the coordinator of W102.