ANNEX C

Activity Roadmap for the next 3 to 4 years

PURPOSE

The purpose of this activity roadmap is to :

(i)   paint a picture of the key deliverables for the next three to four years ;

(ii)   identify the goals and key activities to put in place to achieve it ;

(iii)   serve as a platform to identify barriers and enablers to transform the
         construction industry forward

This roadmap is not be perceived as complete nor final. It will continuously evolve
and expanded as more activities and projects are identified as action items over
time. A summary of the goals and activities are listed in Appendix A.

METHODOLOGY OF ROADMAP

The key objective of the roadmap is to provide a framework for IAI (S) and
collaboration partners to formulate action plans that serve the key stakeholders and
their desired end goals. The table below summarised the desired goals of the key
stakeholders. It is important to qualify that the roadmap is mainly conceived in part to
achieve the outcome as laid in the framework of the MOU between BCA and IAI (S).
The MOU is attached as reference in Appendix A.

Stakeholders	Key Drivers For	Desired End Goals
Regulatory Agencies	Development and implementation of infrastructure systems	Transform construction industry to be more competitive enabled by information technology
Industry players	Change in mindset, design practice and process re-engineering	Ability to do more effectively with the use of IT tools and standardisation of processes and information exchange protocol Key productivity gain and competiveness

Solution Providers	Providing advanced cost-effective business solutions	Proliferation of solutions to a wider market base and recognition of solutions as "top" of the class
IHL's	Building up skillsets to manage technological advancements	Laying the foundation to provide the required skillsets for the construction industry

In the roadmap, a number of goals are identified that would lead to the realization of the expected outcome. Following each goal are a number of activities that need to be executed to help achieve the goals. It is expected that the activities identified or to be proposed along the way have to be supported by set of action plans specifying clear targets and tasks owners.

KEY DELIVERABLES FOR THE NEXT THREE TO FOUR YEARS

- Implementation of CORENET e-Plan Check System
- 3D design / drafting guide for CORENET e-Plan Check System
- Incorporation of IFC CS4 Information Model Requirements as Singapore Standard
- Methodology guide and certification criteria for Code Checking View Definition
- Customized CAD packages complying to IFC 2X Code Checking requirements for the architectural and building services
- Creation of design objects library to support the deployment of object-oriented CAD tools to the industry
- Availability of incentives schemes to facilitate the adoption and utilization of object-oriented CAD tools
- Training progtammes for e-Plan Check and object-oriented CAD tools

GOALS

Setting up mode of collaboration between industry, BCA, solution providers and overseas organisations (public and private)

BCA and IAI (S) share many common interests in their pursuit to change the industry for the better. BCA has primarily focus on setting up infrastructural-systems such as CORENET e-Submission and CORENET e-Plan Check system while IAI (S) has focus on defining standards and specifications to facilitate data / information exchange and communication. It augurs well for the industry that the complimentary focus has been reinforced through an MOU signing between BCA and IAI (S) to co-operate on projects and resources.

In the same context, similar mode of collaboration in another form other than MOU could be explored to achieve the same objectives. Examples could be joint projects between CAD vendors, industry partners, IHL's and BCA to test the effectiveness of CAD tools to improve business productivity as well as able to meet the requirements of CORENET e-Plan Check system.

At the academic level, IHL's and BCA can work on projects to provide some form of performance metrics to derive the benefits of industry using advanced tools in their business practices. The performance metrics could form a basis of measurements to benchmark IT best practices among design firms.

BCA and IAI(S) should aim to collaborate with overseas partners, in particular with the Government-linked entities, to gather more "weight" to convince solutions providers that there is a wide market available for their tools if they can comply with Singapore's requirements.

Implementation of projects to provide the impetus to transform the industry

CORENET e-Plan Check system is a major project under the CORENET initiative with the ultimate objective to provide the impetus to gear up the industry towards greater interoperability amongst the construction players through effective deployment of 3D object-based CAD tools. The target completion of CORENET e-

Plan Check system focusing on the architects and M & E engineers is towards end 2003 and end 2004 respectively.

Other projects that may support the same objective include the setup of Design-Objects-Library (DOL) and development of e-Thermal (currently involving TP and Nova & NUS).

A library of design components under the DOL project could be a key enabler to minimise the barrier of getting the industry to adopt object-based solutions. It is hence essential that the industry should provide the scope for such development. IIWG should take the lead and work closely with industry players to establish the requirements for DOL.

Making it a Singapore Standard

One of the means to accelerate the acceptance of any new system is to ensure the system conforms to recognized international standards. This was achieved in October 2002 when the e-Plan Check information model specifications was certified by the International Alliance on Interoperability (IAI) as complying to the Industry Foundation Class (IFC) specifications published by IAI. In fact, through the e-Plan Check project, IAI (Singapore Chapter) succeeded in getting the international body to incorporate the code checking information model requirements as part of the main stream IAI-IFC * specifications. The IAI-IFC international specifications have in turn been recently adopted as an ISO standard.

In May 2003, the e-Plan Check information model requirements would be officially released as part of the IAI-IFC standard. Subsequently, BCA intends to work closely with IAI (S) and SPRING to incorporate the e-Plan Check information model requirements as a Singapore Standard before end of 2006.

The acceptance of IAI-IFC as an ISO standard is a major milestone in standardizing CAD data exchange format. As the single largest application designed to IAI-IFC specifications, the e-Plan Check project has generated considerable interests in

USA, UK and China. Government bodies from these countries have begun to pursue similar pilot implementation projects following Singapore's footstep.

Build up local expertise in IFC-based implementations

To support the industry in IFC-based implementations, it is imperative to develop core competency to provide technical assistance and training. Through the IFC 2X2 Code Checking View Certification Workshop in Oct 2003, the Technical and Assistant Technical Coordinators of IAI (S) would gain some knowledge in terms of certifying IFC-based solutions to a certain degree of acceptance benchmark. This would be good start to lay the foundation for the grooming of local expertise to be able to support full-scale deployment of IFC-based solutions. The core team should comprise of IAI (S)'s technical team as well as members from the local CAD community and IHL's. The team identified should form the core group of IIWG as well. As part of the nurturing process, IIWG should work towards holding technical dialogue sessions with the key industry players on a regular basis to share and exchange ideas. In the longer term, IIWG should be able to create a knowledge-based repository of technical literature and successful case studies pertaining to IFC-based implementations.

Advancing the use of object-oriented CAD tools

One of the critical measures of success for the activities undertaken in the roadmap is the number of industry uptake for 3D object-based CAD tools. Hence steps have to be put in place to ensure that 3D-object based CAD tools are made available to the industry as early as possible. It is also important to be able to show that the solutions provided is able to change business work processes in a positive way.

The impending implementation of CORENET e-Plan Check system has provided a target for CAD vendors to ensure that their solutions is capable of complying to the e-Plan Check information requirements. BCA, IAI (S) have to work in close collaboration with the CAD vendors to expedite the customisation of their solutions to comply with e-Plan Check requirements and to provide cost-effective productivity tool to the industry. The customised solutions has to be tested with pilot industry

sites to ensure that the solutions provided is able to yield business benefits over the construction life cycle.

Basic criterias such to narrow down suitable solutions ./ applications for customisation and pilot testing should include the following :

- the building data model can be exported directly / indirectly to e-Plan Check system ;
- demonstrate data interoperable capability across different software platforms ;
- strong presence of local technical support
- solutions provided can be offered at attractive end-users prices

To help gear up the use of object-oriented CAD, BCA and IAI (S) will work jointly to deliver a 3D design / drafting guide to facilitate the industry in migrating to another level.

Recognition of technical excellence

It is important to recognise firms and solution providers that made the leap forward in the use and development of advanced technology respectively.
Such organisations should be recognised in public events and their experiences being shared across the industry to encourage more followers. BCA and IAI (S) can consider jointly organise an annual event to award rewarding firms with a recognition of technical excellence and good IT design practice.

Gearing Up Industry Awareness and Adoption

A series of training sessions on the use of advanced CAD tools, organised by BCA jointly with selected CAD vendors, should be kick-off in the year 2004. In addition, at least two seminars or workshops a year should be conducted to keep the industry abreast with the latest development and benefits of using object-oriented applications in business. In addition, relevant materials such as implementation guide for firms should be made easily available.

APPENDIX A

Goals	Activity	2003				2004				2005				2006			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Setting up mode of collaboration between industry, BCA and solution providers	MOU signing between BCA and IAI (S)		■														
	Co-funding of joint projects			■	■	■	■	■	■	■	■	■	■	■	■	■	■
Implementation of projects to provide the impetus to transform	Completion of CORENET e-Plan Check - IBP				■												
	Completion of CORENET e-Plan Check - IBS								■								
	Development of DOL			■	■	■	■	■	■								
	Development of e-Thermal			■	■	■	■	■	■								
Making it a Singapore Standard * Oct 2003 - World Standard Day	Completion of CAS specifications		■														
	Prepare e-Plan Check IM as a Singapore Standard									■	■	■	■	■	■	■	■
	Incorporate e-Plan Check IM as a Singapore Standard																■
	Incorporate Information Exchange and Documentation At Handing / Taking Over of Completed Building Projects as a Singapore Standard				■												
	Incorporate Costruction Electronic Measurement System as a Singapore Standard				■												
Build up local technical expertise to support implementation of IFC-based solutions	The 1st Stage Certification Workshop on Code Checking View of IFC2x				■												
	The 2nd Stage Certification Workshop on Code Checking View of IFC2x						■										
	Creation of knowledge-based repository of technical literature in IAI (S) web-stie									■	■	■	■	■	■	■	■
Advancing the use of object-oriented CAD tools	Collaboration with CAD vendors on projects			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Pilot sites testing for IBP					■	■	■	■								
	Establishing IFC-based applications for building services			■	■	■	■										
	Pilot sites testing for IBS									■	■	■	■				
	Collaboration with CAD vendors to provide attractive pricing for objected-oriented CAD tools					■	■	■	■	■	■	■	■	■	■	■	■
	Development of 3D design / drafting essentials						■	■	■								

Goals	Activity	2003				2004				2005				2006			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Recognition of technical excellence	Set up methodology for benchmarking best practices				■	■	■										
	Search for best practices in the industry						■	■	■	■	■	■	■	■	■	■	■
	BCA-IAI recognition of best practices							■				■					■
Gearing up industry awareness and adoption	Development of local implementation guide							■	■								
	IFC/CORENET Promotion Seminar with vendors and IHL				■		■		■		■		■		■		■