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Research Roadmap
Report for Discussion

Architectural Design and Management

International Council
for Research and Innovation
in Building and Construction

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Preface

Big societal and technological changes are impacting upon building and the built environment and will request a professional transformation for many – if not all – involved practices. For example the on-going shift from extending our building stock to maintaining and improving it and the many innovations in digital technologies are having and will continue to have far reaching impacts upon the process of planning for and designing, constructing and the management and use of our buildings in general and upon the design profession in particular.
There is a need for strengthening the relationships between architectural practices, architectural education and architectural research in support of a required transition of this profession.

Against this this background and based upon the perceived potential contribution to such transformation from research, this report sets an agenda for this transformation oriented research in the area of design of the built environment.
It is hoped that funding agencies for such research, as well as research institutes and universities, will find inspiration in the report to be engaged in the research in general and in particular to aim for international cooperation.

This report is far from a final product. It is meant to be a basis and a stimulus for discussion between experts and stakeholder representatives worldwide. If successful this discussion will result in a next version agenda that truly will be a joint agenda; one that provides a new and stimulating context for international cooperation in this domain in support of doing better and more relevant research.

Wim Bakens
CIB Program Advisor

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Executive Summary

This Research Roadmap aims to establish the principal issues in Architectural Design and Management. It is an advance for architectural research to be organised in this way. It addresses the six themes:

Conceptual Framework
The Roadmap Reference Group considered that currently the interaction between education and practice is not adequately expressed; and architectural and urban contexts are not as coherent as they might be. In addition, cultural context is understated. The last item is especially important when considering a world view. Also, there is little recognition of the different lenses through which they might be viewed. In order to respond to these deficiencies, the initial Conceptual Framework is constructed to represent two poles – Education + Practice and Contexts; and four primary headings of Organisations, Procurement, Processes, and Tools. The concept of the profession as a learning community could be advantageous, especially if it leads to innovative practice. The ultimate aim is the co-creation of knowledge through research and practice.

State of the Art
Architectural research could be categorised in a myriad of ways. Therefore attempts to summarise the landscape are prone to all kinds of difficulties. This is not least because architecture does not take place in isolation or silos. Nevertheless, it is important to summarise where most architectural research takes place, ie Design; Technology and Environment; Cultural Contexts; Communications and Digital Technology; and Management, Practice and Law. The demands have increased on academics to become involved with research; but there is not a great tradition in architectural research. To date, professional organisations have barely engaged with it and there is a lack of an inclusive research agenda.

Future Scenario
There is substantial growth in building construction in some developing countries; but in developed countries, there is a static situation. The demand for houses could continue to struggle to be met, while the demand for commercial property and retail outside capital cities is already declining. This may create an emphasis on re-use. It might even include demolition with the re-assignment of land to non-built uses, such as public space. The main reason for this rapid change is digital technology, which is dramatically affecting the traditional use of buildings. The move from growth to decline of building construction could also happen in developing countries within the next ten years; as they are experiencing the digital revolution at an even faster rate than the developed countries.

Development Strategy
W096 should be established as a research entity, with members of the Commission acting as partners and/or initiators of research fund applications. They could also create synergies with related working commissions to generate multi-disciplinary teams. The Commission and the CIB in general, could be encouraged to connect with schools of architecture, national and international associations; and other research organisations. Architectural practices are increasingly being urged by their associations to engage with research as a means of improving the quality of their building designs. The World Congress could become an even more significant event in terms of specific sessions for developing the future of its working commissions by

presenting available funding streams and acting as a series of trading posts where prospective partners could gather. Dissemination through publications is another vital issue. Academic journal papers remain significant but the CIB could also commence its own publishing house.

Research Contribution

It is becoming apparent that research and innovation is no longer exclusively and academic pursuit. Applied research and practice research are growing in significance. Thus, the demand for research and innovation is increasing for a number of reasons, and architectural research is just part of the mix. There needs to be general lobbying with all the funding sources to recognise increasing demand; and provide greater rather than lesser amounts of funding. The overall picture in Government Structures is one of increasing demand for funding, with a reduction in the number of sources and total sums. Ultimately, all funding originates with National Governments and groups of Governments, such as the European Commission. In the arena of research-based organisations, there could be a proposal for a Built Environment Research Council to run alongside or join the Natural Environment Research Council. CIB could assist this process by presenting the Research Roadmaps as part of the evidence for increased research funding.

Research Agenda

The purpose is to map an agenda for Architectural Research and establish a network of international researchers. The issues relate back to the Conceptual Framework and are categorised under – Organisation, Procurement, Processes and Tools. The contexts are Practice, Education and Pedagogy; and perspectives are Urban and Cultural. The overwhelming objective of the Agenda is to improve the quality of the built environment and the architectural design quality hierarchy is instrumental in this respect. Contributors emphasised the importance of people in architectural research. Communities, demographics and resilience were particularly noted.

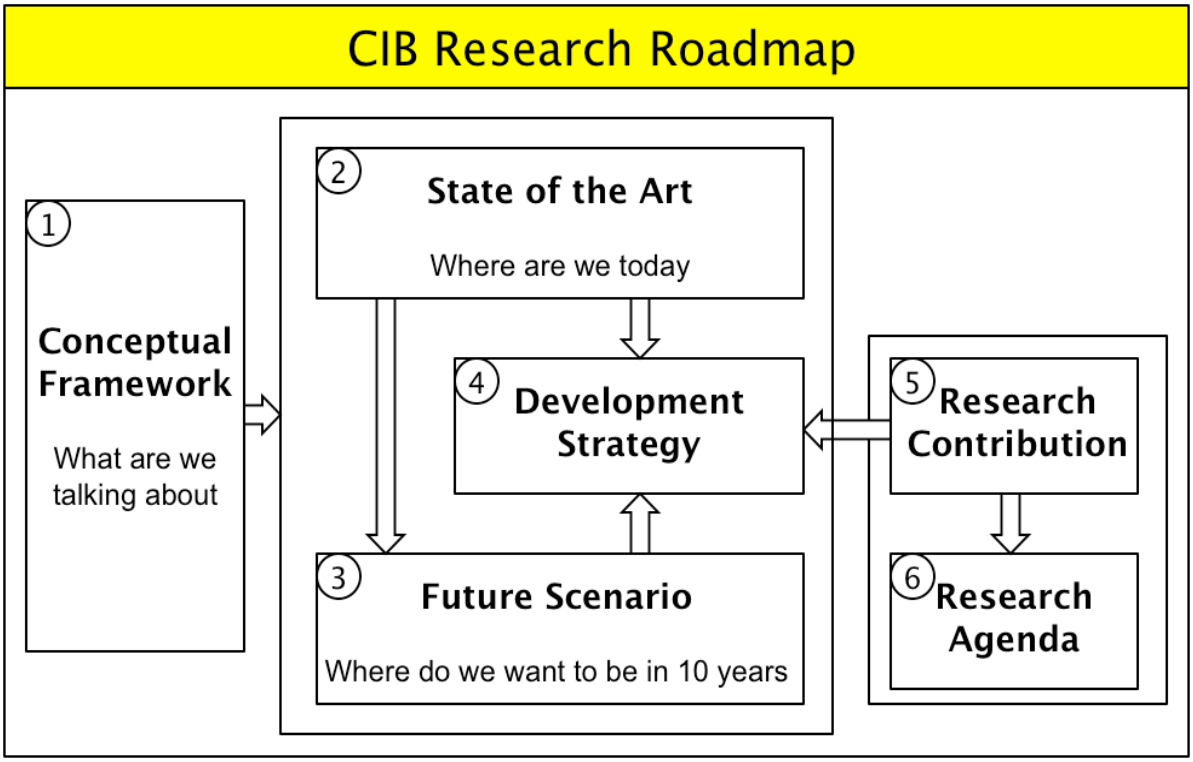
This Research Roadmap is arguably the first coherent presentation of a Conceptual Framework, State of the Art, Future Scenario, Development Strategy, Research Contribution, and Research Agenda for Architectural Design and Management. It sets out the scope for research and innovation and suggests how this may receive more prominence on the international stage.

Introduction

The International Council for Research and Innovation in Building and Construction (CIB) has commenced a process of developing a series of research roadmaps, with the intent of expressing the specifics of all the 50 permanent Working Commissions and temporary Task Groups. The aim is to produce a series of high status and quality publications that can be updated at each triennial CIB World Building Congress. The Council trusts that the Research Roadmap for this Commission will set an agenda for future activities, support the creation of new research and innovation projects, and stimulate knowledge exchange within architectural design and management.

It is envisaged that the roadmaps will provide authoritative guidance for national and international programmes. It will be beneficial for universities, research institutes and practices amongst the CIB membership to use the roadmaps in their communication with funding agencies. There will be added value for funded projects from being part the roadmap methodology, and thus be able to profit from a structured approach. The authority of this CIB Research Roadmap is derived from worldwide contributors, including but not restricted to, the membership of the Commission, and a British Reference Group that met in London.

The CIB Secretariat has developed the flowchart and commentary below to illustrate how a CIB Research Roadmap could be designed:



1. Conceptual Framework: What are we talking about? The conceptual framework may address questions such as: what are the issues, how do those interrelate, what influences all of this, who are the stakeholders, what are the relevant areas of expertise, what are the characteristics of the most relevant systems, processes and technologies?

2. State of the Art: Where are we today? The Roadmap will describe the state of the art on technology, best practices, differences in parts of the world, perceived problems, challenges, needs for improvement, and the location of the world's leading centres of expertise.

3. Future Scenario: The Roadmap will unfold a vision on where we want to be in the future, e.g. in ten years' time; including stakeholders' opinions on required and envisaged future systems, processes and technologies, preferred future practices and necessary skills.

4. Development Strategy: What is needed in terms of knowledge, information, tools, concepts and applications to enable the respective systems, processes and technologies to develop from where we are today to where we want to be in the future?

5. Research Contribution: How can Research structures contribute to such a development strategy, and what are the requirements for Research to make that contribution?

6. Research Agenda: What is the agenda for research worldwide? What will be relevant areas of science and technology development, required sequences of development, priorities for research, international co-operation within the research community, and interaction between research and practice.

1. Conceptual Framework

Article 46 and the Roadmap Reference Group

The nature of a Roadmap is that it provides different routes, which do not necessarily culminate at the same place (Phaal and Muller 2009). In Europe, the Recognition of Professional Qualifications Directive 2005/36/EU is the central basis for the qualification of architects (European Union 2005). Article 46 provides 11 points to exemplify the requirements. Independently, the Roadmap Reference Group (see appendix A) articulated its priorities, which map onto the Article 46 points, although the Roadmap Focus Group appears to adopt a broader and more embracing stance.

Article 46	***Roadmap Reference Group***
	education
1. Ability to create architectural designs that satisfy both aesthetic and technical requirements	*design processes, quality and its evaluation*
2. Adequate knowledge of the histories and theories of architecture and the related arts, technologies and human sciences	*histories and theories of architecture*
3. Knowledge of the fine arts as an influence on the quality of architectural design	*architecture and the arts*
4. Adequate knowledge of urban design, planning, and the skills involved in the planning process	*urbanism*
5. Understanding the relationship between people and buildings, and between buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale	*urbanism*
6. Understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors	*culture and communities*
7. Understanding of the methods of investigation and preparation of the brief for a design project	*design processes*
8. Understanding of the structural design, construction and engineering problems associated with building design	*technologies*
9. Adequate knowledge of physical problems and technologies, and of the function of buildings, so as to provide them with internal conditions of comfort and protection against the climate	*technologies*
10. The necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations	*practice*
11. Adequate knowledge of the industries, organisations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning	*practice*

Further to Article 46, the Architects Registration Board for the UK, and the Royal Institute of British Architects, which operates both in the UK and overseas, issued their joint framework. The headings are clearly derived from the 11 points. However, three sub-points are identified in each case to encompass aspects that might otherwise be neglected (ARB 2010).

1.0 Ability to create architectural designs that satisfy both aesthetic and technical requirements

1.1 building design projects of diverse scale, complexity, and type in a variety of contexts, using a range of media, and in response to a brief
1.2 constructional and structural systems, the environmental strategies and the regulatory requirements that apply to the design and construction of a comprehensive design project
1.3 conceptual and critical approach to architectural design that integrates and satisfies the aesthetic aspects of a building and the technical requirements of its construction and the needs of the user.

2.0 Adequate knowledge of the histories and theories of architecture and the related arts, technologies and human sciences

2.1 cultural, social and intellectual histories, theories and technologies that influence the design of buildings
2.2 influence of history and theory on the spatial, social, and technological aspects of architecture
2.3 application of appropriate theoretical concepts to design projects, demonstrating a reflective and critical approach

3.0 Knowledge of the fine arts as an influence on the quality of architectural design

3.1 theories, practices and technologies of the arts that influence architectural design
3.2 creative application of the fine arts and their relevance and impact on architecture
3.3 creative application of such work to design projects, in terms of their conceptualisation and representation

4.0 Adequate knowledge of urban design, planning and the skills involved in the planning process.

4.1 theories of urban design and the planning of communities
4.2 influence of the design and development of cities, past and present on the contemporary built environment;
4.3 current planning policy and development control legislation, including social, environmental and economic aspects, and the relevance of these to design development

5.0 Understanding of the relationship between people and buildings, and between buildings and their environment, and the need to relate buildings and the spaces between them to human needs and scale

5.1 needs and aspirations of building users
5.2 impact of buildings on the environment, and the precepts of sustainable design
5.3 how buildings fit into their local context

6.0 Understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors

6.1 nature of professionalism and the duties and responsibilities of architects to clients, building users, constructors, co-professionals and the wider society

6.2 role of the architect within the design team and construction industry, recognising the importance of current methods and trends in the construction of the built environment

6.3 potential impact of building projects on existing and propose communities

7.0 Understanding of the methods of investigation and preparation of the brief for a design project

7.1 critical review of precedents relevant to the function, organisation and technological strategy of design proposals;

7.2 appraisal and preparation building briefs of diverse scales and types, and definition of client and user requirements and their appropriateness to site and context

7.3 contributions of architects and co-professionals to the formulation of the brief, and the methods of investigation used in its preparation

8.0 Understanding of the structural design, constructional and engineering problems associated with building design

8.1 investigation, critical appraisal and selection of alternative structural, constructional and material systems relevant to architectural design

8.2 strategies for building construction, and ability to integrate knowledge of structural principles and construction techniques

8.3 the physical properties and characteristics of building materials, components and systems, and the environmental impact of specification choices

9.0 physical problems and technologies and the function of buildings so as to provide them with internal conditions of comfort and protection against the climate

9.1 principles associated with designing optimum visual, thermal and acoustic environments

9.2 systems for environmental comfort realised within relevant precepts of sustainable design

9.3 strategies for building services, and ability to integrate these in a design project

10.0 The necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations.

10.1 critically examine the financial factors implied in varying building types, constructional systems, and specification choices, and the impact of these on architectural design

10.2 understand the cost control mechanisms which operate during the development of a project

10.3 prepare designs that will meet building users' requirements and comply with UK legislation, appropriate performance standards and health and safety requirements

11.0 Adequate knowledge of the industries, organisations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning.

11.1 the fundamental legal, professional and statutory responsibilities of the architect, and the organisations, regulations and procedures involved in the negotiation and approval of architectural designs, including land law, development control, building regulations and health and safety legislation

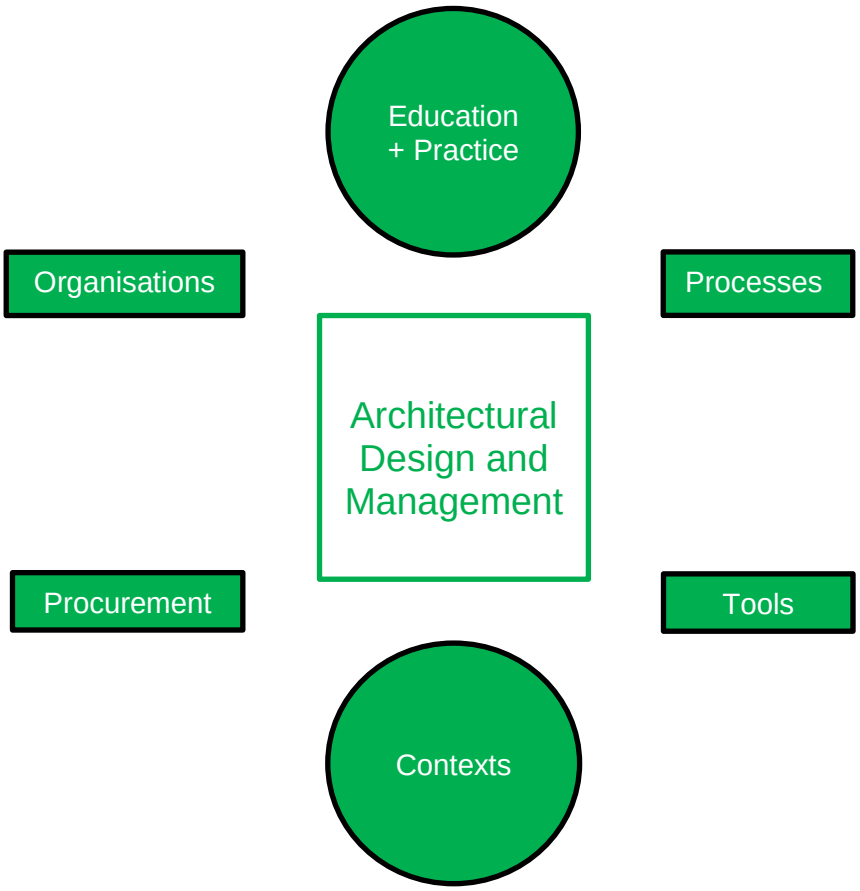
11.2 the professional inter-relationships of individuals and organisations involved in procuring and delivering architectural projects, and how these are defined through contractual and organisational structures

11.3 the basic management theories and business principles related to running both an architect's practice and architectural projects, recognising current and emerging trends in the construction industry.

The Roadmap Reference Group considered that a great number of issues had become evident in the expansion to the sub-points. However, it felt that the interaction between Education and Practice had not been adequately expressed; and although the architectural and urban contexts were mentioned, they were perhaps not as coherent as they might be; the cultural context was understated. The last item is especially important when considering a world view. There was also a notion that the issues derived from article 46 appeared rather static. They seemed to be about understanding the current situation rather than seeking improvements and alternatives. Also, there was no recognition of the different lenses through which they might be viewed, such as demographics and resilience (Groat and Wang 2013).

Initial Framework

Thus the initial Conceptual Framework is represented by two poles – Education + Practice and Contexts, and four primary headings of Organisations, Procurement, Processes, and Tools.



Education + Practice

There is a constant debate about education in terms of its priorities and the extent to which both other disciplines and practice could be involved in the architecture education process. The studio culture has been at the core (Webster 2008) but university executives are questioning its justification as political philosophies and university economics continue to increase the number of students. Also, the location of architecture programmes is often questioned – they could be associated with art and design, built environment disciplines or technology and engineering (Williams, Ostwald and Askland 2011). The integration of education and practice through research was proposed by a significant number of the respondents and this remains an objective. Practice-based research was also proposed (Samuel 2017). This needs considerable further research, particularly as the Roadmap Reference Group noted that there is a danger of the imperatives of practice dominating the research. There is also debate about what constitutes research in practice as each design is an individual construct. It may be difficult to determine how the research has influenced a design. However, it does open-up the possibilities for interdisciplinary research. The concept of the profession as a learning community could be advantageous, especially if it leads to innovative practice (Fraser 2014). The ultimate aim is the co-creation of knowledge through research and practice.

Contexts

These are perceived in different dimensions, and the three dimensions identified by the Roadmap Reference Group are architectural, urban and cultural. The architectural dimension focuses on the project and predominantly building design and management. The primary elements are bounded by the process and the product, each of which should be a major theme for architectural research (Dyrssen 2011). Urbanism ranges from specific urban designs to the social, economic, political and environmental frameworks that shape towns and cities (Carmona 2014). The world is becoming increasingly urbanised and this requires particular research attention. This could include the form, size and distribution of future settlements that satisfy the needs of their communities; with particular respect to the composition and change in populations. Thirdly, there is the major issue of how the cultural context, humanities and the arts contribute to design and development (Ingold 2013). There may be a celebration of different cultures around the world and how the resulting architectural and urban design is influenced. However, this is set against a background of increasing globalisation with all its threats and promises (Sklair 2010). The arguments range from the homogenising of world cultures through electronic media, which is having a similar effect on built environments; to the opportunities in the modernisation of cultures to enable them to respond to 21st Century demands.

Organisations

The style and arrangements of organisations have fundamental effects on architectural design, urban and rural environments, communities; as well as employers and employees in the organisations themselves (Chappell and Dunn 2015). There is a strong clamour for multi-disciplinary practice, but it appears that most remain as separate disciplines. It may be that multi-disciplinary approaches require economies of scale to operate, while the vast majority of architectural studios are small scale. Integrated Design and Delivery Solutions (IDDS) claim that bringing the design and construction phases together into one organisation is always beneficial; but the evidence is almost exclusively related to performance attributes and economic

benefits. There is also a case that distinctive organisations offer greater professional integrity. Other industries are often highlighted in terms of bringing design and manufacture together. Yet, the nature of the individual project in the built environment is a distinctive arrangement that is unlike designs in other industries. In these cases, once a design is refined, it is produced multiples of times. Thus research is necessary to determine the effects of various types of organisations on the quality of contributions to the built environments. One theme could be the correlation between the type of organisation and award-winning designs. Alternative practice styles for resilience could be investigated eg architect as entrepreneur, architect as developer, or partnerships with others such as developers. The composition of organisations in the 21st Century could be studied in terms of the spectrum of hierarchy and democracy in a context where all the architects are similarly qualified. There is also diversity and equality, in which there have been criticisms of the architecture profession. Gender, demography and supporting diverse career paths without discrimination, are all worth researching.

Procurement

There has been substantial criticism of traditional procurement but perhaps its advantages have not been sufficiently explored (CIOB 2010). Neither have new procurement systems have escaped criticism, especially for delivering a lack of design quality. The new systems have also created significant complexity as they have spawned numerous variations, limiting market opportunity through increased specialisation. In particular, it is limiting the prospects for younger practices. Without increasing complexity, there could be an opening for increasing diversity in the architectural profession. Some researchers have suggest that building information management (BIM) has the potential to restore the central role in building procurement that architect feel they have lost. One of the objectives may be to rationalise the number of systems into a small group of well-understood methods (Walker and Hampson 2003). This could be enhanced by specifying systems for particular types of projects. Possibly, there could be a generation of procurement that emphasises design quality; linked to architectural and urban design. There is considerable research that could be undertaken into procurement and design processes; and much has been published about industrial design but architecture and urban design has been comparatively neglected.

Processes

There was an underlying theme in the Roadmap Reference Group, of improving the built environment. This is mostly achieved through research to inform the processes in enhancing design quality (Carmona et al 2017). The objectives can be expressed in terms of a design quality hierarchy, which leads to quality evaluation. The processes of creating architecture and urban design can be examined in a variety of contexts; ranging from expanding globalised capitalism to shrinking cities with poor marginalized urban communities. Approaches can be tested from an international perspective through the use of networks. In this way, world-wide views on the processes that generate architecture and urban design can be comparatively analysed (Emmitt et al 2009). The interface between organisation and process, in terms of the culture affecting ways of working, is regarded as a critical issue. In particular, designers' behaviour in design, communication and collaboration within different technological, cultural or organisational environments is emphasised as an important research area. This may also be set against the relationship between sectors – ie between public,

private and NGOs at international, national, regional and local levels. Crowd sourcing for ideas has been evident in other creative disciplines but the potential is yet to be explored in architectural design. In addition, co-creative design could be investigated with disciplines such as the arts, industrial design, software design and engineering design. While sustainability may have morphed into resilience, there is still scope for examining the perspectives of sustainable development. User feedback has been employed only tentatively in the past, together with measurable and limited post-occupancy evaluation. It is now understood that the qualitative is just as valuable and the quantitative and that they should stand together in these kinds of appraisals. Finally, there is still research to be undertaken in energy efficiency, carbon footprinting, climate change etc.

Tools

The advantages of virtual reality, building information modelling and building information management for design integration, clash detection and data retrieval are well documented (Nisztuk and Myszkowski 2018). However, there are also concerns about the casual adoption of component libraries; and the danger of unqualified and poorly qualified staff these tools. Design quality evaluation is becoming a major issue. The appraisal of existing design quality tools and development of new ones is a major research area; together with the impact of digital design tools on people and processes. The involvement of communities in decision-making processes has had a chequered history. Further research into public engagement tools may assist (Jenkins and Forsyth 2009). Social maps, collating oral testimonies, re-photographing spaces, etc. are tools that should help to define social and urban issues, by co-creating knowledge, which can then be used to inform design decisions. Augmented reality in the representation, perception and understanding of architectural design, could reveal it as a set of dynamic spaces that can be experienced. Mobile technologies can be developed to provide interaction between augmented reality and building information management to monitor onsite construction progress and predict possible clashes. Interoperability between digital tools is an important element throughout design and construction. Big data and city modelling are starting to be incorporated to support urban design and planning (Charlton *et al.* 2015); and parametric modelling is a tool to support architectural design exploration from early stage of design. There also needs to be critical reflection on success factors related to both traditional and digital tools in architectural design.

2. State of the Art

This component charts the national and international societies, associations, institutes, and unions for architects and architecture related to CIB members. It notes that a number of these organisations have existing research agendas, and sets out the research themes from one of them as an example, from which generic themes may be derived. International research centres will be explored before identifying synergies between architectural design and management, and other CIB working commissions and task groups.

Architectural education developed in Schools alongside Fine Art. It was late to move into university structures and when it did, there was still a strong emphasis on practice. As well as a requirement for part-time educators from practice, full-time members of staff were actually encouraged to engage in their own architectural businesses (Comunian, Gilmore and Jacobi 2015). By the second half of the 20th Century, emerging architectural research was fragmented. Those involved in History and Theory tended to write books and chapters; whereas funded research projects mainly resulted from small technical groups in the Schools. These were generally focussed on building science, the growing concern with energy, and latterly digital technology leading to building information management. This continued a dominant positivist doctrine in research.

At the end of the 20th Century, the expansion of universities affected state financing and dramatically changed the situation in three ways:

- Exclusivity of contract made it difficult for academics to develop outside businesses
- Research Assessment Exercises introduced selective research funding rather than the block grant in a number of countries
- There became a need to demonstrate an appropriate level of academic endeavour. As school teachers earnt postgraduate qualifications and occasionally doctorates, universities needed to show that their staff were highly qualified. It was quite rare for architecture academics to hold PhDs, but it has now become a basic requirement.

As a result of the above issues, the demands increased on academics to become involved with research; but as demonstrated, there was not a great tradition in architectural research. The professional organisations had barely engaged with it and there was a lack of an inclusive research agenda. In the 21st Century, academics from practice tried to re-orientate their position by generating practice-based research, although its validity is still much contested (Till 2004). In all built environment education, the project is perceived as a unifying activity. This is clearly related to the project as focus of design and construction in practice. On many educational programmes, multidisciplinary or interdisciplinary projects are used to enable students to experience working in teams of different disciplines as preparation for practice. The fundamentals of research are analysis, synthesis, application and testing. Architectural design projects are subject to all of these stages. While there is more permanency in the products – ie drawings, models, and even actual structures and buildings; the research process is not really evident in the product, and aspects such as methodology cannot be appreciated. So there needs to be well-considered records of the decision-making during the development of designs. An original contribution to

knowledge demands that design projects exceed the knowledge base that could be expected in practice. There is much debate about contribution to knowledge, with practitioners asserting that originality is integral to all architectural design. However, the standards are more demanding than those implied by such an assertion. The creation and interpretation of new knowledge, through original research or other advanced scholarship should be of a quality to satisfy peer review; extend the forefront of the discipline and merit publication. Recording the current state of knowledge, and what is being added to it; together with a rigorous and justifiable methodology are essential. Often hypotheses are tested and the work generates academic publications. Due to the debate about what constitutes originality, this level of activity can be difficult to prove unless accompanied by a convincing thesis. As stated above, the product is insufficient to demonstrate the research – the process needs to be recorded in terms of methodology and decision-making, in order to determine what happened and why; and to enable replication and generic applicability. The deliberations within academia and practice about contribution to knowledge can impede the application of projects as higher level research. An alternative strategy has been to associate practice with teaching-only contracts and create a division between teaching and research (Shin *et al.* 2014). Another aspect that has hampered the development of research in Architecture has been association with funders. It always appears on the edge of research council agendas – never feeling at the centre of physical sciences, socio-economic priorities, or arts and humanities (AHRC, ESRC, EPSRC 2018). Nevertheless, architectural research has spread out from the positivist origins to incorporate behavioural, community and user studies. In addition urban issues have developed, especially in various manifestations of urban design.
Professional institutes, associations and societies are now starting to recognise the role of research, and this is evident in the following national groups:

National Societies, Associations, Institutes and Unions

Albania	Albanian Union of Architects and Urban Planners	http://www.unioniiarkitekteve.org/
Australia	Australian Institute of Architects	http://architecture.com.au/
Belgium	Flanders Architecture Institute	https://www.vai.be/en
Brazil	Instituto de Arquitetos do Brasil	
Brunai	Institution of Surveyors, Engineers and Architects	http://www.puja-brunei.org/
Bulgaria	Association of Architects and Engineers Consultants	http://bacea-bg.org/en
Canada	The Royal Architectural Institute of Canada	https://www.raic.org/
China	China Architecture Design and Research Group	http://en.cadreg.com/index.asp

Costa Rice	Federal Association of Engineers and Architects	http://www.cfia.or.cr/
Czech	Czech Chamber of Architects	https://www.cka.cz/
Denmark	Danish Association of Architects	https://www.arkitektforeningen.dk/
Ethiopia	Association of Ethiopian Architects	http://associationofethiopianarchitects.org/
Finland	Finnish Association of Architects	https://www.safa.fi/eng/
France	National Council of the Order of Architects	http://www.architectes.org/
Germany	The Association of German Architects	https://bda-bund.de/
Ghana	Ghana Institute of Architects	http://gia.org.gh/
Greece	Hellenic Institute of Architecture	http://www.heliarch.gr/
Hong Kong	The Hong Kong Institute of Architects	http://www.hkia.net/
Hungary	Association of Hungarian Engineers and Architects	http://tmsz.org
India	Indian Institute of Architects	https://indianinstituteofarchitects.com/
Indonesia	Indonesian Institute of Architects	http://www.iai.or.id/
Iran	Society of Iranian Architects and Planners	http://www.siap.org/
Ireland	The Royal Institute of Architects of Ireland	https://www.riai.ie/
Jamaica	Jamaican Institute of Architects	http://jamaicanarchitects.com/
Japan	Japan Institute of Architects	http://www.jia.or.jp/
Kenya	The Architectural Association of Kenya	http://www.aak.or.ke/
Korea	The Korea Institute of Registered Architects	http://www.kira.or.kr
Latvia	Latvian Architects Union	http://www.latarh.lv/
Malaysia	Malaysian Institute of Architects	http://www.pam.org.my/
Mongolia	The Union of Mongolian Architects	http://www.uma.org.mn/
Nepal	Society of Nepalese Architects	http://sona.org.np/

Netherlands	Royal Institute of Dutch Architects	http://www.dutcharchitects.org/
New Zealand	New Zealand Institute of Architects	https://www.nzia.co.nz/
Nigeria	The Nigerian Institute of Architects	https://nia.ng/
Norway	Norwegian Architects Association	https://www.arkitektur.no/
Pakistan	Institute of Architects Pakistan	http://iap.com.pk/
Singapore	Singapore Institute of Architects	http://www.sia.org.sg/
South Africa	South African Institute of Architects	http://saia.org.za/
Sri Lanka	Sri Lanka Institute of Architects	https://www.slia.lk/
Sweden	Swedish Association of Architects	https://www.arkitekt.se/
Switzerland	The Swiss Society of Engineers and Architects	http://www.sia.ch/en/the-sia/
Tanzania	Architects Association of Tanzania	http://aat.archi/
Thailand	Association of Siamese Architects	http://asa.or.th/
Trinidad	Trinidad and Tobago Institute of Architects	http://ttia-architects.org/
Turkey	Chamber of Architects of Turkey	http://www.mimarlarodasi.org.tr/
Uganda	Uganda Society of Architects	http://architects.ug/
UK	Royal Institute of British Architects	https://www.architecture.com/
USA	American Institute of Architects	https://www.aia.org/
Zambia	Zambia Institute of Architects	http://zia.org.zm/

International Associations

Countries not list listed often have their own associations but act through the following international groups:

International Union of Architects	http://www.uia-architectes.org/
Association of Enterprise Architects	https://www.globalaea.org/
Commonwealth Association of Architects	http://www.comarchitect.org/commonwealth/
Architects Council of Europe	https://www.ace-cae.eu/
African Union of Architects	http://m.auaarchitects.org/
Organisation of Arab Architects	http://www.arabarchitect.org/
Royal Institute of British Architects International	https://www.architecture.com/my-local-riba/riba-international
American Institute of Architects International	https://www.aia.org/pages/21906-international-associate-membership

Research Organisations

Africa Research Institute	https://www.africaresearchinstitute.org/newsite/?s=Architecture
Architectural Research European Network	http://www.arena-architecture.eu/
Building Research Information Knowledgebase	https://www.brikbase.org/
Drawing Research Network	http://www.drawing-research-network.org.uk/
European Architectural History Network	https://eahn.org/

As an example of the kinds of research themes being identified by national and international associations, a summary of the Royal Institute of British Architects themes is set out below:

RIBA Research Themes

History and Theory

- Historical research of direct relevance to a project, e.g. conservation plans and reports
- Cultural studies relating to architecture, professionalism and the built environment
- Histories of construction, science and technology
- Historical and/or theoretical research on place, space and urban planning
- History and/or theory of practice and praxis, including professionalism, architectural education, procurement and non-design aspects of architectural practice

Design and Technical

- Design quality
- Computational Design and BIM
- Spatial integration
- Sustainability, low carbon solutions and/or 'systems' performance
- Materials, detailing and construction methods
- Project management

Cities and Community

- The role of the architect and architecture in social, cultural and economic sustainability
- Analysis and contextual studies of architecture in the cityscape
- Community engagement
- Health, wellbeing and sustainability in the city

Learning from Projects

- The briefing, design, and/or construction processes
- Project use/user interaction
- Building Performance and Post-occupancy Evaluation
- Organisational performance

Strategy

Information Structuring

- Terminology
- OECD skill sets

Knowledge Management

- Aligning education and research – research-led criteria

Process

- Ethics – especially practitioners
- Insurance and Risk – arrangements to permit different kinds of practice and new alliances

(Martindale and Tait 2016)

International Council for Research and Innovation in Building and Construction
CIB has currently established 35 Working Commissions. It is the nature of the breadth of Architectural Design and Management that it relates to numbers of these Commissions. However, there are clear synergies with the following twelve:

W69 Residential Studies
Housing – residential buildings – have been the most vulnerable objects of architecture at all ages, albeit the most abundant in evidences of cultural identities
W86 Building Pathology
The systematic treatment of building defects, their causes, their consequences and their remedies
W089 Education in the Built Environment
High quality academic debate about the way knowledge is generated, codified, taught and learnt to promote stronger links between research, scholarship, teaching and practice
W092 Procurement Systems
The social, economic and legal aspects of contractual arrangements, appointment systems and tendering procedures used in relation to construction projects
W101 Spatial Planning and Infrastructure Development
Cities and built environment for social inclusion; informal cities; theoretical approaches to planning and development; spatial survey and assessment for sustainable development
W102 Information and Knowledge Management in Building
The flow of information, by which research results can be usefully translated into innovation and further adapted to provide the knowledge-base for best practice
W104 Open Building Implementation
Design of the built environment that supports both stability - in respect to long term community interests; and change - in respect to individual preferences
W110 Informal Settlements and Affordable Housing
The creation of sustainable livelihoods incorporating residents' participation, and how stakeholders can transfer technology to assist communities to develop the settlement; physically, socially and economically
W111 Usability of Workplaces
The promotion, development and sharing of methods, processes and techniques for the evaluation of the built environment in use
W116 Smart and Sustainable Built Environment
The identification, collection, creation, discussion, evaluation and dissemination of information and knowledge on strategies and best practices for developing smart and sustainable buildings and infrastructure
W118 Clients and Users in Construction
The definition of clients and users, identification of procurement and management strategies, classification methods for engaging users in decision-making processes, and development of appropriate guidance material
W122 Public Private Partnership
Financial models, risk allocation and management, transparency and accountability, public policy and private-public sector behaviour, project evaluation, contractual structure and performance indicators
For more information on the CIB Commissions, please consult the website https://www.cibworld.nl

Main Themes in Research

Architectural research is organised and categorised in a myriad of ways. Therefore attempts to summarise the landscape are prone to all kinds of difficulties. Not least because architectural research does not take place in isolation or silos, and cause and effect scenarios through interdisciplinary activity are evident in many research projects. Nevertheless, it is important to attempt a summary of where most architectural research takes place:

Design

As the key activity in Architecture, design forms the first category. It is about the process and products of design (Yaneva 2016). However, it must be acknowledged that different disciplines have their own perceptions of what is meant by design, and how it is undertaken (Carlgren, Rauth and Elmquist 2016).

It has connections and overlaps with all the other categories.

Technology and Environment

These categories often appear together but arguably they are distinctive separately. The first relates to building construction, the use of materials, process of assembly and structural principles (Canas-Guerrero *et al.* 2014). The second has been a growing area in recent years. Originally, it was about heat, light and sound but has now moved into a more holistic arena with human well-being (Hanc, McAndrew and Ucci 2018); sustainable built and natural environment; and climate change (CABE 2007). In addition, there are considerations about the impact on design of legislation, codes of practice, and health and safety, both during construction and occupation of a project.

Cultural Context

This section includes the tradition research areas of history and theory of architecture (Roth 2018); the history of ideas (Daglioglu 2015), and the related disciplines of art, cultural and landscape studies (Courage 2017). The overlap with design lies in the spatial, aesthetic, and social qualities of design, but within the scope of the wider built and natural environment. The context also involves the study of specific architects and their seminal buildings. This category may be a little too inclusive, as it contains the influences of the contemporary built environment; urban design; the design of cities, past and present societies; and wider global issues.

Communication and Digital Technology

In the past, research in communication was quite limited. The focus was on the visual, verbal and written, through media such as sketching, drawing and modelling (Jackson 2006). The expansion has occurred through the huge growth of digital and electronic techniques. Some is within the critical appraisal of design. However, the major development has been in virtual reality, building information modelling (Gokuc and Arditi 2017), and even three-dimensional printing (Mathur 2016).

Management, Practice and Law

This category includes the appraisal of working practices, the principles of business, and management of the practice and the project (Emmitt 2014). It involves the great development of procurement systems, changes in the framework of the construction industry, and the legal implications (Wevill 2013). A major aspect is the processes by which buildings are designed and constructed in the context of professional practice (Bryant *et al.* 2018).

3. Future Scenario

There is likely to be substantial growth in building construction in some developing countries; but in developed countries, there may be a fall. The demand for houses could continue to struggle to be met, while the demand for commercial property and retail outside capital cities is already declining. This may create an emphasis on re-use. It might even include demolition with the re-assignment of land to non-built uses, such as public space. The main reason for this rapid change is digital technology, which is dramatically affecting the traditional use of buildings. The move from growth to decline of building construction could happen in developing countries within the next ten years; as they are experiencing the digital revolution at an even faster rate than the developed countries.

Thus, there will be considerable challenges related to the conceptual framework:

Education + Practice
The objective over the next ten years will be the integration of education and practice through research. Yet, there is a danger that the imperatives of practice may dominate research and adversely affect education. Any change to the pattern of architectural education therefore needs to be very carefully assessed. Research in practice should be defined, and a structure devised for the process. The concept of the profession as a learning community should be enacted, especially if it leads to innovative practice. The ultimate aim remains the co-creation of knowledge through research and practice.

Contexts
The three dimensions identified by the Roadmap Reference Group are architectural, urban and cultural. The architectural dimension focuses on the project. In future, the nature of the project may change, with a lowering of demand for commercial building and an uneven demand for houses. Urbanism may become more significant and social, economic, political and environmental frameworks need to become established to help shape towns and cities. In the cultural dimension, the 20th Century ideal of *think global and act local* will be increasingly significant over the next ten years. It will be important to continue to celebrate different cultures around the world, while embracing the opportunities provided by global electronic media.

Organisations
In ten years, research should have been completed on the contribution of various types of organisations to enhance the quality of the built environment. One theme could be the correlation between the type of organisation and award-winning designs. Alternative practice styles for resilience will have been investigated eg architect as entrepreneur, architect as developer, or partnerships with others such as developers. Also, there should be work on the types of organisation and functions in the context of declining demand for new building. Gender, demography and supporting diverse career paths without discrimination, will have been researched and strategies put in place.

Procurement
Over the next decade, there should be a consolidation of procurement methods with greater clarity when each might be used. This would include traditional procurement, as well as the more recent forms. There should be a re-emphasis on the quality of the

built environment in procurement; as well as a specific recognition of procurement for re-use. In ten years, Building Information Management (BIM) should have reached maturity, and there will be recommendations on where it would be most effectively employed, rather than the notion that it will be a panacea.

Processes

World-wide views on the processes that generate architecture and urban design will have been comparatively analysed. The interface between organisation and process, in terms of the culture affecting ways of working, will have been regarded as a critical issue. This will be set against the changing relationship between sectors – ie between public, private and NGOs at international, national, regional and local levels. There will be the outcome of research into sustainable development. It is hoped that user feedback will be routinely fed-back into the design process, but increasingly, there may be a divergence between the owners and users of property.

Tools

To date, there has been a general enthusiasm for the new digital tools. The next ten years are an opportunity to re-appraise. It is hoped that there will be critical reflection on success factors related to both traditional and digital tools in architectural design. Interoperability between digital tools will become an even more important element throughout design, construction and re-use. Further research into public engagement tools may assist greater community involvement. Social maps, collating oral testimonies, re-photographing spaces, etc. are tools that should help to define social and urban issues, by co-creating knowledge, which can then be used to inform design decisions.

4. Development Strategy

Research Infrastructure

The first part of enacting the Future Scenario is research infrastructure development. W096 should be established as a research entity, with members of the commission acting as partners and/or initiators of research fund applications. They could also establish synergies with related working commissions to generate multi-disciplinary teams. The commission and the CIB in general, could be encouraged to connect with schools of architecture, national and international associations; and other research organisations. Architectural practices are increasingly being urged by their associations to engage with research as a means of improving the quality of their building designs. Universities are becoming increasingly unwilling to fund conference attendance. The World Congress could therefore become an even more significant event in terms of an opportunity for academics and practitioners from different countries to meet in person. The Congress could have specific sessions for developing the future of its working commissions by presenting available funding streams and acting as a series of trading posts where prospective partners could gather. Dissemination through publications is another vital issue. Academic journal papers remain significant but the CIB could also commence its own publishing house. The second part is to consider how the specific themes might be developed.

Themes

Design

The first aspect is that increased formalised interaction with schools of architecture, national and international associations, other research organisations and W096 members would be advantageous in addressing the future scenario. Architectural practices are being urged to engage with research by their associations. Thus practice-based research in architectural and urban design may become significant. This could involve practices investing in research and joining academics in applications for funding. The objective is to co-create knowledge by integrating education and practice through research. This will help the profession to act as a learning community but care is needed to ensure that practice does not dominate education. There may be a change in the nature of design services. The possible reduction in demand for new buildings may move the design emphasis to urban design, especially with the potential for the re-assignment of land to non-built uses, such as public space. These methods may be especially valuable in developing countries, due to the unpredictability in the rapid intervention of digital technology.

Technology and Environment

Traditional research in technology has tended to be in materials and based in a laboratory. This approach remains valid in the development of standards but recent building failures have indicated that research into composite construction insitu, may play a greater role in the next ten years. Funding may continue through research councils and governments, but other sources could also be needed. Manufacturers have a responsibility but the use of world-wide networks to seek less expensive materials than can be achieved in some national supply chains, is complicating accountability. Another proposal could be that the contractors should instigate the research for their construction. However, this introduces a number of difficulties. First is the timescale – contractors would have insufficient time to sponsor research after

their appointment. Secondly, the cost of any research by contractors would be an additional cost to the projects. In addition, it raises questions about who is responsible for the specification. There is also a clear relationship with procurement, which is considered under Management, Practice and Law. With the internal environment, there has been considerable research into energy conservation. Yet, this is generating discord with individual users in terms of human comfort. Post occupancy evaluation and user feedback is required to investigate these matters but it is unclear who would fund them, whereas there are numbers of sources for funding energy conservation. Arguably, the relationship of inside and outside, and the comfort of external spaces will create increased research activity. In particular, studies into optimum microclimate will invariably be necessary. This may involve regional and local government in funding research into the public realm. Nevertheless, it should be recognised that in many countries, regional and local government is subject to substantial budget cuts.

Cultural Contexts

As countries throughout the world are increasingly accessible, knowledge of different cultures and their complexities offer substantial research opportunities. Architectural and urban design will be boosted by the application of cultural influences; which can be analysed through social, economic, political and environmental perspectives. The United Nations has emphasised that quality of life depends on these perspectives. The desire for community and an aspiration for more liveable neighbourhoods could, in part, be derived from culturally significant buildings. At the same time, encouraging design with cultural influences, could meet the diversity of needs and expectations of communities. An architecture and urban design based on cultural context will construct social settings. This can enable a local constellation of ideas to contribute to the legacy of a place. Involved in urban culture are: sustainable tourism, heritage and conservation, the arts, city beautiful – a planned city of culture, and the intercultural city with multiple communities. Social justice is the basis of culture with inclusivity avoiding exclusion of certain groups of people. This should be accompanied by access to resources, economic opportunities, and the right to shelter, education, health care, physical and social mobility. These matters could be explored through national associations and research organisations. The concept of thinking global through international research of different cultures around the world, and acting locally will enhance the culture of people and places.

Communications and Digital Technology

Architectural practices who are looking beyond the drafting and visualization solutions offered by digital technology are finding that they are changing work practices in the course of this interaction. An emerging generation of graduates who understand how digital technologies can be applied to architectural design, as well as anticipating future applications, may be crucial in the development of architectural practice, and its re-structuring in the digital era. Arguably, some of the biggest opportunities for digital technologies can be found in the design of external spaces, as it is even more difficult to evaluate proposals for external spaces than those for buildings. In addition to modelling the external spaces themselves, there are now developing technologies that can simulate a range of environmental conditions generated by the designs and may be investigated through virtual models. Research can establish how digital

technology affects the built environment, and offer clear definitions of what it is. This could include online shopping and workplace flexibility. It may also involve some aspects of leisure – perhaps not theatre or gallery, but possibly cinema. So, it would be helpful to have a clear image of what constitutes centres, which could be city or neighbourhood scale, so that there is an identifiable focus. Its activities could then be recorded and how the balance of these activities could be affected by increased digital technology. By contrast, there is recognition that the increased use of electronic communication has actually enhanced the need for people to meet together in person. There is some very interesting literature about events in city centres and the use of public space. Observations on the use of public spaces could bring this concept to life. An additional perspective could be the way that electronic effects can produce exciting features in cities for the enjoyment of people assembling there. It also opens up the way for community involvement through public engagement tools. Finally, there is an opportunity to re-appraise digital tools, and particularly the comparison between traditional and digital tools. One point could be how and where to employ building information management to make it most effective.

Management, Practice and Law

Architectural practice will not remain static, and alternative practice styles will be necessary to ensure resilience. Gender, demography, and diverse career paths in particular, will specifically need to be taken into account. This may necessitate funding through national associations; for whom research into management could be an innovation. Procurement is evolving into a major research area. This is due to a move away from traditional procurement to a variety of new forms. This has generated considerable fragmentation. Thus, consolidation of methods could be a focus of attention; with the intent of re-emphasising quality in the built environment. Such work would be appropriate for co-operation with other commissions, and notably W092. Further co-operation will harness world-wide views on the processes that generate architecture and urban design. The context in many countries is the changing relationship between sectors, ie public, private and NGOs at international, national, regional and local levels. Sustainable development has been on research agendas for a number of years; yet there is much to be done. There are various interpretations that would benefit from classification, and construction of a taxonomy. This work could lead to research fund applications with W096 members and other commissions.

5. Research Contribution

The contribution from research structures to the Development Strategy falls into a number of different categories:

Research-based Organisations
As the only world-wide organisation for research and innovation in the built environment, CIB has a considerable role in lobbying for specific research funding. The Research Roadmaps offer evidence for where the effort could be placed. CIB itself could apply for research funding to co-ordinate the Roadmaps and chart the potential interaction between the Working Commissions. This could create core groups within CIB. One of the objectives of the World Building Congress could be to formalise relationships between particular Commissions and develop embryonic consortia for funding applications. Members of W096 could also form groups for applications, established in co-operation with the Schools of Architecture. Most countries throughout the world have established Research Organisations such as Building Research Establishment (UK), The Council for Scientific and Industrial Research (CSIR Built Environment, South Africa), and The Sustainable Built Environment Research Centre (Australia). Some are sponsored by their national governments, whereas others are self-supporting through their own funding applications. CIB already liaises with a number of these Organisations but the Roadmaps provide openings for more direct relationships. They tend to focus on technological issues but could be part of a broader arrangement that combines them with cultural and managerial matters. In this respect, Architecture is a difficult discipline to define. This is exemplified by the way it moves position within universities; sometimes appearing in Arts Faculties, or Engineering or Environment or Design. National Research Councils in many countries are similarly arranged. In the UK, they are the Engineering and Physical Sciences Research Council, Economic and Social Research Council, Arts and Humanities, and Natural Environment Research Council. While increasingly they are involved with multi-disciplinary and inter-disciplinary research, the Councils maintain primary interest in their original constituencies. Architecture does not fit neatly into any of these constituencies. The themes of Design; Technology and Environment; Cultural Contexts; Communications and Digital Technology; and Management Practice and Law encompass a considerable scope of topics. Also, there is no Research Council that is centred on Management. Perhaps, there could be suggestions for a proposal for a Built Environment Research Council to run alongside or join the Natural Environment Research Council. Trusts and Charities are an additional source of funding, where the proposal does not fit the Research Council descriptors.

Governmental Structures
The European Commission operates a number of funding programmes. Some are regionally-based, such as Interreg North Sea Region, where all the participants are required to be based in those regions. The major funding stream currently, is Horizon 2020. This is for large-scale proposals that involve numbers of partners. The minimum number of countries is generally four, but in many applications the number can be in the teens, and the participants can be double that figure. As well as universities, they can include research institutes and organisations, companies and particularly small and medium-sized enterprises, non-governmental organisations,

charities and local authorities. Often the calls are for innovation action, which means that demonstration projects are required. In principle, funding is for those in European countries but partners in countries throughout the world can be included where it can be justified. National Governments have been a traditional source of research funding. This varies in quantity between different nations and is dependent on the economic prosperity of the country. In some nations, Governments have delegated all funding to research councils or their equivalents. Regional and Local Governments have also funded research at a sub-national level. These sources are less beneficial for international co-operation as promoted by CIB. Nevertheless, it can be useful pump-priming funding that enables projects to be developed for subsequent international applications. In some parts of the world, sub-national Government does not have this kind of capability. In other parts, the balance between National and Local Government is changing in favour of National Government. In addition, some places are experiencing a reduction in the public sector, with more activities being undertaken by the private sector. The overall picture is one of increasing demand for funding, with a reduction in the number of sources and total sums.

Practice

It is becoming apparent that research and innovation is no longer exclusively and academic pursuit. Applied research and practice research are growing in significance. International Associations include the International Union, as well as Commonwealth, European, African and Arabic Associations. Countries that do not have their own associations are generally affiliated to an international one. They do not tend to fund research but act as repositories for publications and are therefore useful as agencies for dissemination. In addition there are numerous National Societies, Associations, Institutes and Unions, and they are now starting to recognise the role of research and innovation. Some are beginning to establish their own research priorities and are making demands on their members in this respect. They state that members should undertake research into a number of aspects of their design projects. It could be viewed as an extension to the programmes of Continuous Professional Development. Research funding by National Associations has been for relatively small amounts and not particularly well structured. Especially if demands are to be made on members, Associations' roles made need to be developed. However, it unlikely that the Associations will be able to fund sufficient practice research themselves. Larger Architectural Practices are already engaging external consultancies to assist with limited research. Yet, this is presenting them with considerable costs and beyond smaller Practices. In some cases, Practices are working with their local universities with Government sponsored arrangements, such as Knowledge Transfer Partnerships. Alternatively, Regionally organised National Associations are planning applications with their universities. Nevertheless, they will be in competition with all the other applicants.

Thus, the demand for research and innovation is increasing for a number of reasons, and architectural research is just part of the mix. There needs to be general lobbying with all the funding sources to recognise the increasing demand; and provide greater rather than lesser amounts of funding. Ultimately, all funding originates with National Governments and groups of Governments, such as the European Commission. CIB

could assist this process by presenting the Research Roadmaps as part of the evidence for more research funding. Within the setting of support for the research

agenda, Architectural Research requires clearer and more targeted funding streams. In many cases, the scale of the calls creates overcomplicated arrangements and it is argued that greater participation and more effective results could be achieved by reducing the size and expenditure of each project. For example, Horizon 2020 is nearing the end of its period of operation. In constructing its replacement, consideration for smaller projects may be appropriate.

6. Research Agenda

Purpose
To map an agenda for Architectural Research and establish a network of international researchers to:

- facilitate partnerships for authoring academic journal papers and developing research funding bids
- fund research with practices – in which practices do not need to make high financial/time commitments
- investigate the way that design research might be funded and given legitimacy both through industry and government partners
- expand dissemination activities to maximise impact and reach
- define and guide impact generation from research activities and output

Issues
Organisations
Investigate different styles of organisation, including:

- separate disciplines and multi-disciplinary practices
- integration or separation of different professionals
- composition of organisations
- debates regarding the amalgamation of the design and construction phases within one organisation or whether distinction between the phases offers more professional integrity
- the effect of different types of organisation on quality of products
- the correlation between organisational types, vision statements and award winning designs
- Alternative practice models for economic resilience of a practice - including architect as entrepreneur - as developer - as partner with developer
- composition of organisations – is creativity impeded by strictly hierarchical practices. What should be the level of democracy in well-structured organisations?
- Does integration or separation of professionals produce high quality and effective products
- diversity and equity: achieving greater representation in gender and demography in the building industry and creating an environment that supports diverse career paths without discrimination

Award Winning Practices	Vision Statement
A	Designing buildings is a way of thinking: a way of life. The creation of **form** and **space** that is **memorable** and **inspirational**
B	We design **bold**, contemporary, **imaginative** buildings that are fit for purpose, accessible and **loved** by the people who use them
C	An **inspirational**, practical and resilient public architecture
D	We believe in: using our brains, in listening, in **research**, in collaboration, in **innovation**
E	We simply love design...and we love to share our **enthusiasm** by creating great working relationships and buildings of **excellence** and **enduring quality**
F	We listen, challenge and **innovate** in our quest for **excellence**

Non-award Winning Practices	Vision Statement
1	Developing our services and products to the benefit of our current and future customers
2	We focus on achieving a balance between commercial insight and design excellence, recognising the positive benefits this combination has within all sectors we work
3	Provide a "one stop" service of multi-disciplinary construction professions required to design, manage and administer large scale construction projects
4	We produce buildings that are practical, versatile, lively and inclusive.
5	Our experienced multi-disciplinary design service complements our wide range of construction consultancy services by providing holistic design solutions that reflect an understanding of the full project lifecycle
6	No statement

Procurement

- new procurement systems – criticism for lack of architectural design quality
- rationalising procurement systems
- selecting appropriate procurement systems for particular types of projects
- Processes
- architectural design process
- – different types of design

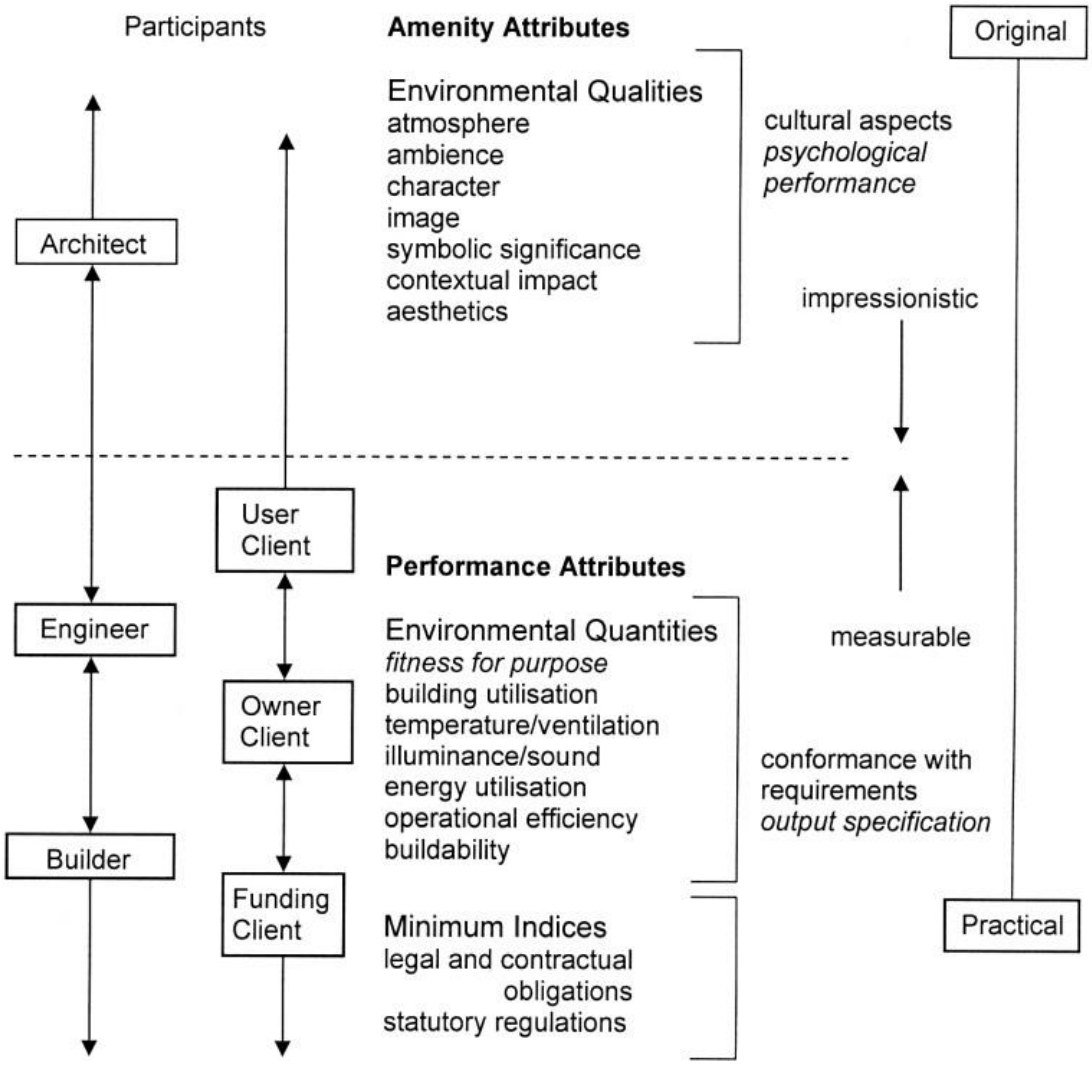
Engineering Design	Architectural Design
• Prescriptive	• Descriptive
• Rational	• Intuitive
• Linear	• Cyclic
• Algorithmic	• Heuristic
• Theoretical	• Empirical
• Problem focused	• Solution focussed

Research is needed as to how to maintain performance attainment while also achieving amenity objectives

- can a design based procurement method be introduced?
- could BIM has the potential to restore the central role in building procurement most architects seem to feel that they have lost?
- procurement systems - how younger practices in architecture can be given more opportunities; and to create a greater diversity within the architecture profession

Processes

- interpretations of Sustainability and Sustainable Development
- materials and construction
- energy efficiency, carbon footprints etc.
- architectural design quality hierarchy



- testing approaches in other locations, use of networks
- the interface of process and organisation as a critical issue
- research informing design quality
- the process of architecture and urban design, in the context of globalised capitalism or shrinking cities with poor marginalized urban communities
- The relationship between sectors - relationships between public, private and NGOs at international, national, regional and local levels
- Designers' behaviour in design, communication and collaboration within different technological, cultural or organisational environments
- crowd sourcing and collective design via the internet for other design disciplines such as industrial design, software design, engineering design etc. yet the potential for architectural design has not been adequately explored

Tools

- advantages of VR and BIM for design integration, clash detection etc.,
- but concerns about the casual adoption of component libraries; and the danger of unqualified and poorly qualified staff using them.
- Appraisal of existing design quality tools and development of new ones

Ref	Statement	Output Specification Requirements (checklist)	Y	Criteria for Quality Assessment
SECTION 5: Communal Spaces				
5.01	**Arrangement** Communal spaces are rationally and logically arranged within the building and minimise unnecessary long journeys for the users (Housing Corporation 2007) (CABE 2009) (HCA 2009)	Public amenities accessed from the main entrance Alternatively, may be accessed directly from outside with an internal door through to the main entrance area, if the layout and security arrangements permit	Y	1. Grouping as overall strategy (Alexander 1977) 2. Travel distances from the furthest apartment (Littlefield 2008) 3. Access to external spaces whilst maintaining security (Newman 1973)
5.02	**Communal Subspaces** Internal communal subspaces are rationally and logically arranged (Hanson 2001) (CABE 2005, 2008) (CSIP 2008)	Appropriate number of DDA compliant toilets provided within40m of communal spaces and close to main entrance. Baby changing facilities also provided (A minimum of 2 WC's and an assisted bathroom need to be located within communal facilities (12 – 15m²)	Y	1. Sufficient number and size of communal spaces (Alexander 1977) (Hertzberger 1998) 2. Subspaces are logically arranged (Alexander 1977) 3. Subspaces sufficiently adaptable to change of use and user capacity 4. Sufficient and appropriately located storage
5.03	**Composition** composed to promote excitement, delight and comfort (CIC 2003) (Housing LIN 2008) (CABE 2009)	Communal living areas shall be sensitively designed to create inviting environments and shall incorporate focal points	Y	1. Different volumes are offered to create spatial variety (Brown 2001) 2. Maximise views and natural light (Pollock et al 2007) 3. Encourage local community integration and use by family and friends

- the impact of digital design tools on people and processes

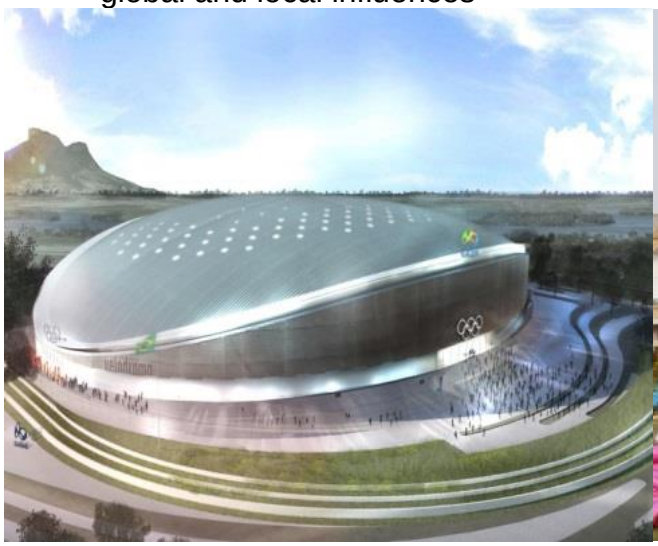
- incorporation of communities in the decision making process, introducing a variety of public engagement tools

- development Strategy: social maps, collating oral testimonies, re-photographing spaces, etc. These tools should help us to define social and urban issues, by co-creating knowledge, which will be then used to inform design decisions. augmented reality in the representation/perception and understanding of architectural design as a set of dynamic spaces that can be experienced
- BIM/AR/Mobile technologies: interaction of AR and BIM to monitor onsite construction progress and predict possible clashes
- big data and city modelling to support urban design and planning
- parametric modelling as a tool to support architectural design exploration from early stage of design. Interoperability between digital tools is an important element
- drawing and thinking in architectural design

Contexts

Practice

- Analysis of different status in architectural practice, such as the privileged and the professional
- starchitects and communities
- global and local influences



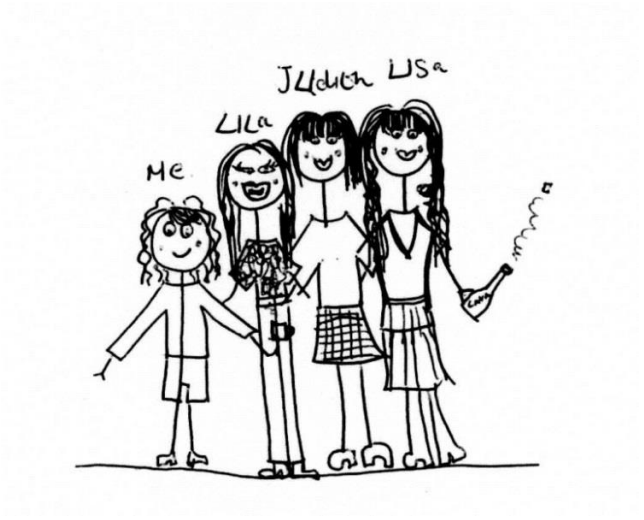
- practice-based and interdisciplinary research in support of launching urban development projects
- evidence-based practices – can post-occupancy evaluation studies become routine? – can the profession become a learning community?
- innovative practice and practices, future practices
- research and practice. Co-creation of knowledge, which will influence the development of design solutions
- to develop more practice-based research to develop and deliver research by design methodologies in schools of architecture
- practice-education think tank to identify priorities
- the culture of architectural practices
- future practice scenarios could build upon existing expertise

Education

- architecture and the built environment and greater association with Schools of Architecture
- teaching of critical and creative thought
- the potential of collaboration between practice and academia
- Interdisciplinary activity as part of the education for the production and dissemination of knowledge
- architectural education and studio pedagogy - to build greater connections to practice
- the location of architecture – is the base in art and design or built environment or technology and engineering?

Pedagogy

- the nature of architectural education
- studio culture
- the concept of the project



Urban

- how can a multidisciplinary research on architecture, urban spaces, and resiliency contribute systematically to the urban development practice?
- social sustainability of cities - using new digital ways to understand cities – including designing and managing cities based on quantitative and qualitative data
- livable cities (W101) with digital information and scenarios for future cities - urbanity and the city as experiential phenomena
- the impact of devolution second tier cities across Europe
- ‘identity’ - ‘place’ and ‘place attachment’ at the urban design and architectural levels. What are the future concepts of home and workplace and their identities?

Cultural

- how the cultural context, humanities and the arts contribute to the development of a critical and research led practice
- cultural impact on design and spatial cognition has been a recent focus with international collaboration in design and construction
- art and architecture
- changing demographics

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Appendix A: Reference Group

Professor Bob Giddings (Chair): Joint Co-ordinator W096
Associate Professor Silvio Melhado: Joint Co-ordinator W096
Dr Saul Golden: University of Ulster
Professor Karim Hadjri: University of Sheffield
Professor Ben Medjdoub: Nottingham Trent University
Professor Andre Viljoen: University of Brighton
Professor Peter Walker: University of Salford
Mr Ian Wroot: Liverpool John Moores University

Appendix B: Contributors

Professor Annmarie Adams: McGill University
Mr Branislav Antonic: University of Belgrade
Professor Michael Chapman: University of Newcastle NSW
Associate Professor Philip Crowther: Queensland University of Technology
Professor Harry Edelman: Tampere University of Technology W096
Professor Ning Gu: South Australia University
Associate Professor Iva Kovacic: Vien TU W096
Dr Tarja Makelainen: VTT Finland
Professor Alan Penn: University College London
Associate Professor Matthijs Prins : Delft TU W096
Professor Flora Samuel: Reading University
Professor Guven Arif Sargin: METU University
Dr Robert Smidt III: Loughborough University
Mr Roger Tyrrell: Portsmouth University
Professor Patricia Tzortzopoulos: Huddersfield University W096
Dr Derya Yorgancioglu: Istanbul Kemerburgaz University

CIB General Secretariat
Van der Burgh weg 1
2628 CD Delft
The Netherlands
E-mail: secretariat@cibworld.nl
www.cibworld.nl

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