The International Development of Performance-Based Building Codes and Their Impact on the Australian Construction Industry in Offshore Trade

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The International Development of Performance-Based Building Codes and their Impact on the Australian Construction Industry in Offshore Trade

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DECLARATION

I certify that except where due acknowledgment has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and any editorial work, paid or unpaid, carried out by a third party is acknowledged.

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GLOSSARY OF TERMS

Alternative solutions – There is no obligation to adopt any material, component, design factor or construction method. An approval authority may still issue an approval if it differs in whole or in part from the deemed to satisfy provisions described in the BCA if it can be demonstrated that the design complies with the relevant performance requirement.

Assessment methods – Documentary evidence as described in the BCA, verification methods, expert judgements, and comparison to deemed to satisfy.

BCA – Building Code of Australia.

BRANZ – Building Research Association of New Zealand.

Building regulation – A compulsory rule or order contained within a Building Code and governing method of construction of a building or structure.

Building solution – The means of achieving compliance with the performance requirements. BCA96 provides for two methods that can be followed to develop a building solution.

Certification – The act of documenting compliance with prescriptive criteria by an accredited agency external to the approval authority.


Comparison to deemed to satisfy – This method permits comparison to be made between the deemed to satisfy solution and the proposed building solution. If it can be demonstrated to the approval authority that the building solution complies in an equivalent or superior way to a deemed to satisfy provision, then it will be deemed to meet the relevant performance requirement.
CSIRO – Commonwealth Scientific and Industrial Research Organisation (Australia).

**Deemed to satisfy** – These include examples of materials, components, design factors, and construction methods which, if used, will result in compliance with the performance requirements of the BCA.

**Expert judgement** – Where physical criteria are unable to be tested or modelled by calculation, the opinion of a technical expert may be accepted.

**Functional statements** – These set out in general terms how a building could be expected to satisfy the objectives (or community expectations).

**Harmonized standards**\(^1\) – standards on the same subject approved by different standardising bodies that establish interoperability of products, processes and services, of mutual understanding of test results or information provided according to these standards.


**International standards** – standards approved by an international standardising organisation (ISO), generally endorsed by all or a substantial majority of national standards organisations which are members of ISO, and made available to the public\(^2\).

**International Standardizing Organization**\(^3\) – Standardizing organisation whose membership is open to the relevant national body from every country.

**IRCC** – Inter-jurisdictional Regulatory Collaborative Committee.

**ISO** – International Organization for Standardization.


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\(^1\) Wilson (1997)

\(^2\) ibid
Objectives – These are the reasons the community wants a matter regulated. They are primarily expressed in general terms, and usually refer to the need to safeguard people and protect adjoining property.

OECD – Organization for Economic Cooperation and Development.

Performance requirements – These outline a suitable level of performance which must be met by building materials, components, design factors, and construction methods in order for a building to meet the relevant functional statements and, in turn, the relevant objectives.

Regulation – A rule or order prescribing a set of conditions and requirements that have been made mandatory for those under its control, by an authority under a statutory power or provision or legislation.

Standards – Any reference document, item of material or equipment, or technical specification against which characteristics are defined or assessed.

Verification method – Includes calculations using analytical methods or mathematical models; and/or tests using a technical operation either on site or in a laboratory to directly measure one or more performance criteria of a given solution.

WTO – World Trade Organization.

3 ibid
ABSTRACT

The interplay between the forces behind globalisation, the role of organisations promoting trade and prosperity, and the desire for the construction industry to export offshore are not fully understood. This is further complicated by the role of the political economy, global sovereignty versus national boundaries, economic status of a country and community needs. The literature found that ‘one size does not fit all’. Globalisation results in the consideration of global similarities such as standards, harmonisation of laws, international codes and the growth of international organisations. In addition, there is international pressure to adopt ‘performance-based’ designs by members of the World Trade Organization countries in order to promote trade. This research examines the development of performance-based building codes at the international level, its benefits and issues and whether it will achieve a positive impact on trade for the Australian construction industry.

The literature examines the international development of performance-based building codes as distinct from prescriptive codes which have been identified as restricting innovation and are regarded as trade barriers. The adoption of performance-based building codes is considered in terms of its potential for uniformity and therefore a global tool for trade. Comparison is drawn to the Australian construction industry and its reliance on the domestic economy with international building work being apportioned to mainly larger companies. Consideration is given to whether international codes would improve Australia’s ability to trade offshore.

The research included qualitative research data and an in-depth survey of twelve participants. This was conducted with authorities engaged in the development and promotion of building regulation and performance-based codes. The in-depth interviews were tape-recorded and analysed using inductive methods.

The qualitative research found that the users of performance-based codes are concerned with the general lack of knowledge in the application of the codes, and problems with definitions, their application to developed countries, and concerns with potential litigation.
The construction industries’ core objectives are to expand their markets and increase profit’ which can be achieved without the concept of performance-based codes.

Despite the theory that global standards will achieve trade benefits, most of the respondents mentioned the limitations of performance codes and their expectations for the future. While performance-based building codes may be a driver to trade, their application and use in Australia is limited due to a number of factors. Figures show that Australia represents only a small proportion of total world GDP and at this stage has not embraced an export culture in building and construction. Problems identified by the respondents include a lack of education and training in the use and application of performance codes, definition problems, lack of research and innovation, and a greater reliance on prescriptive options with the ‘deemed to satisfy’ provisions of the building code.

The results suggest that global similarity of performance-based codes between countries should in theory improve trade in the long term. It is concluded that, while performance-based codes may improve trade, there are many other barriers faced by the construction industry when trying to trade offshore. Finally, the interviews suggest that, while Australian building authorities are at the forefront in promoting performance codes, the construction industry is still coming to grips with its potential use.

The research contributes to the currently limited body of knowledge associated with the problems in the use of performance-based building codes and the lack of education in their application. This research proposes a theoretical model based on the qualitative data which could be used by authorities in developing policies in this area. The research will assist with future policy development because it highlights the need to consider the role and function of the users and beneficiaries of performance-based codes and it provides suggestions to assist the construction industry to trade offshore.
CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

This research analyses the impact of globalisation on the construction industry in Australia and the development of international performance-based building codes. The research examines the challenges which globalisation presents to the Australian economy, the government and the construction industry.

The literature review considers the influences and opportunities in trading beyond Australia’s domestic market to the developed and developing international markets. It also involves an assessment of trade barriers for the construction sector, and the role and function of international organisations in managing globalisation issues for the construction sector. This research will examine the development of homogeneous technical standards and a building code that can facilitate improvements for the construction industry. If globalisation drives the demand for one standard, one test, one approval certificate, then there should be an accepted rigour of testing methods to achieve a reduction in the multiplicity of regulations throughout the world.

The matters to be considered include the use of performance-based building codes for the construction industry, issues related to the harmonisation of building laws including the procurement of standard contracts and liability issues. The research will consider the role of various bodies in supporting the acceptance of international performance codes globally. The movement towards performance-based codes has been seen as the removal of non-tariff barriers to trade (Deroukakis 2000).

The evaluative component of the research will unravel some of the misconceptions of the construction industry in their understanding of the use of performance-based building codes and identify the key drivers for trading offshore. The ultimate question is whether the introduction of international performance codes would make any difference to trading offshore. This research evaluates the development of the legislation at a global level and
assesses its impact at the operational level. The need for further research in this area of building construction has been recommended for some time (Ofori 1993).

The conclusion will focus on whether any of the reforms will benefit the Australian construction industry and its ability to operate offshore.

1.2 THE RESEARCH CONTEXT

The research will explore the proposition that prescriptive regulations do not act in the best interests of the Australian construction industry as they act as a barrier to trade. In addition, the development of international performance-based building codes will offer cost efficiencies and more opportunities for Australia to be innovative and to trade offshore.

In considering the implications of this proposition, there will be discussion on:

- international trends to develop uniform building regulations and standard products
- the theory of making regulations
- prescriptive-based versus performance-based building regulations
- the role of international organisations including the World Trade Organization (WTO) in the development of global policies, and
- consideration of uniform standards and the adoption of performance-based building codes.

The role of the Australian construction sector in the international market will also be examined to determine the extent of Australia’s penetration into world markets and to investigate offshore trading opportunities. This section will examine the role of the government in promoting the development of policies for the construction industry to benchmark its effectiveness against a number of variables at the international level.

Conclusions will be drawn about the knowledge and use of performance-based building codes by the industry, identifying persons who are responsible for their implementation.
and the beneficiaries or users. The construction industry and the regulators/authorities will be surveyed through in-depth interviews to ascertain whether performance-based building codes make any difference to trading offshore. Finally, a theoretical model is proposed to assist in the future development of international performance-based building codes, and recommendations are provided to aid the development of further research.

1.3 THE RESEARCH OBJECTIVES AND PROBLEM

There are two research objectives: firstly to investigate the development of performance-based codes at the international level and their benefit in particular as a tool to remove trade barriers; and secondly, to evaluate whether performance-based building codes help Australia’s construction industry to penetrate world markets.

From the research objectives, the key research problem is whether the international development of performance-based codes would assist the Australian construction industry to trade offshore. Therefore the research addressed three underlying research sub-questions:

- What are the perceived benefits and weaknesses of performance-based building codes, in particular as a tool to remove trade barriers?
- How will the international development of performance-based building codes affect the construction industry?
- What are the lessons for Australia?

While regulators are immersed in global reforms, harmonisation and international trade, the construction firms strive to accomplish local construction tasks and are not always successful tenderers in overseas operations. There is also concern over the extent and knowledge in the application and use of performance codes by the industry.

As part of exploring the research problem, the literature review considers:

- the role and function of international organisations which have a part in the development of standards and act as a catalyst for the adoption of performance-based building codes
• whether the removal of non-tariff trade barriers will have a positive effect on Australia’s ability to compete for work beyond its own domestic construction market
• whether the development of international performance-based building codes would enhance Australia’s construction opportunities to penetrate world markets
• the limits of performance-based building codes, their use and application to developed and developing countries.

1.4 JUSTIFICATION FOR THE RESEARCH

The Interjurisdictional Regulatory Review Committee, which is represented by ten developed countries, has made an ongoing commitment to the development of performance-based building codes and their adoption by countries. The issue of performance-based building codes as a catalyst to remove trade barriers has also been considered by Deroukakis (2000), Foliente (2000), IRCC (2004) and CIB TG37 (2004). While their efforts are inspiring there should be further research to determine whether the adoption of performance-based codes will have an impact on the construction sector.

Given that there is a move towards the adoption of performance-based building codes to promote international trade opportunities, what are some of the problems that have been identified? Do the current performance-based building codes provide the right protection to construct safe quality buildings and does the industry know how to use them? This research examines the reasons for regulations and their social objective that building regulations are in place to protect the health and safety of the occupants of a building. Also, building regulations are subject to change based on community perception of appropriate safety levels of building standards. This may occur over a period of time and depend on the economic status of the country and what it regards as important, such as clean water or building safety.

The research also focuses on the maturation of building regulations into a performance-based code. The move away from prescriptive building regulations to a performance-based building code has developed its own momentum in developed countries. The World Trade
Organization (WTO) has also been a catalyst by adopting a policy that encourages the use of performance by all participating countries (WTO 2004), because prescriptive building regulations do not act in the interests of the construction industry as they act as barriers to trade. Performance-based building codes are regarded as an effective way to remove non-tariff barriers to trade, i.e. barriers without a specific monetary value or tax.

The research is justified because in order to gain international recognition at the expense of domestic comprehension of building codes and quality buildings, there needs to be sophisticated and developed arguments. Some of the shortfalls identified in the literature review by international organisations include limited policy research and justified reasoning behind policy formulation. For example, the WTO in the development of the Technical Barriers to Trade Agreement (TBT) has not detailed the meaning and definition for the construction industry in the adoption of performance-based codes. The literature review has found a general lack of information on the weaknesses of performance-based codes. The research is justified because the industry is entitled to question the validity of building regulatory authorities' adopting an ‘offshore trade charter’.

The need for further research into understanding the construction industry was highlighted by Ofòri (1993 p. 182), who argued a need to 'conceptualise the construction industry and to develop a sound consumer theoretical framework for its analysis to provide a basis for research'. Ofòri (1993) advocated the establishment of an international body devoted solely to construction industry development. He also argued the need for a global discussion group and an international referenced journal. At this stage there is no journal on building regulations and codes.

In conclusion this research contributes towards the current lack of knowledge in relation to the effect of globalisation, the development of international trade policies and the impact on the construction industry.
1.5 RESEARCH METHODS

The research methods include semi-structured in-depth interviews with persons engaged in the development of international policy and conformity with performance-based building codes including interviews with representatives of Australian and international organisations.

The research design reviews the current thinking on the implementation of performance-based building codes. The literature review provided the foundation for developing qualitative interview questions on the factors that will influence the development of performance-based building codes.

The qualitative selection for the research is designed to assist the process of theory later in the research. Sarantakos (1995) has also identified that developing theory begins with reality where the concepts are developed during the research process.

Particular reference will be drawn to the establishment of performance-based codes as a set of international documents to promote offshore trading opportunities and improve the competitiveness of the construction industry. The research will enhance knowledge and understanding of those issues, test their validity and further expand the ideas.

The research highlights the views of various approval authorities involved with the development of performance-based building codes and the benefit or disadvantages of international standards for building legislation and regulatory reform, and investigates how these authorities will implement the regulatory reform to enable international consistency for the adoption of performance-based building codes.

The research method is discussed in detail in Chapter 4. Based on the reasoning described, the most appropriate research method was to interview international spokespersons from the organisations responsible for the development and adoption of performance-based building codes. These committee members have an impact in the development of international building regulations. The research questions revealed the issues and
problems discussed in the literature and identified problems with the practical implementation of performance-based building codes. Other interviewees included representatives from building authorities in Australia who had been undertaking work in an international arena. In addition to the interview of regulatory organisations, this research included interviews with Australian construction companies who design and build offshore, and design engineers who have used of performance-based codes. Further information on the selection of the interviewees is discussed in Chapter 3 and Chapter 4.

The in-depth interviews involved a total of 12 participants. These interviews were about one to two hours in duration, and non-confidential, with participants completing the specified RMIT non-confidential interview form. There was only one anonymous interviewee. Transcripts and a summary of discussions were presented to interviewees for approval before their incorporation into the research.

1.6 STRUCTURE OF THE THESIS

The research project is structured into six chapters. Chapter 1 provides the introduction and justification for the research. The literature review is included in Chapter 2 with a general introduction on globalisation and standardisation theory and practice, which forms the basis of global regulation theory. The development of these principles is expanded to cover international trade barriers and international organisations responsible for the development of policy and literature on broader legislative principles of building law and harmonisation. The next section analyses regulation reform for the building and construction industry, including barriers to trade and the development of regulations, and the regulation reform agenda in Australia. This is followed by an assessment of the movements away from prescriptive building regulations to performance-based building regulations. This section draws out the key themes and illustrates the relationship that has emerged between performance-based codes, the difference between qualitative and quantitative codes and their conformity with regard to the international trade agenda.

The literature review concludes by assessing the Australian construction industry and how it is performing offshore. This has been undertaken to contrast the philosophy of the
Building Code of Australia to promote performance and trade with the actual performance of the Australian construction industry compared with its international counterparts. From the factual information presented, the researcher has developed Chapter 3 on the trends in the Australian building industry and the use of performance-based codes to provide further evidence and support for the research.

Chapter 4 provides the research method and the role of peak organisations. The research method is explained in further detail, and precedes the qualitative analysis of the responses. Chapter 5 presents the discussion of the research findings, identifies the key issues from the literature review and proposes a theoretical model for the future development of international policies on performance-based building codes. Chapter 6 concludes the thesis and makes recommendations for further research.
CHAPTER 2 LITERATURE REVIEW: GLOBALISATION AND THE DEVELOPMENT OF PERFORMANCE-BASED BUILDING CODES

2.1 INTRODUCTION

The building and construction industry is an important barometer of economic success of any country and therefore plays an important part in global economic development. The notion of globalisation has encouraged the formulation of policy, establishment of international organisations and consideration of the uniformity or standardisation of building laws. European countries have been the first to consider finding the similarities between laws to assist in common legal principles, commonly referred to in the literature as harmonisation, and to accommodate the free movement of goods, services and products.

This thesis considers the international regulatory processes that create harmonisation of policy and building codes for the construction industry. This focus extends to the international development of standards, the theoretical principles of harmonisation in relation to building laws, the principles for regulation, the gradual replacement of prescriptive to performance-based codes and the impact of trade barriers. Consideration is given to the question of the benefit of performance-based codes and their ability to remove trade barriers (Hart 1998, IRCC 1998, Foliente 2000, Deroukakis 2000). The research considers the development of international policies for the adoption of performance-based codes and whether they will have a benefit to the building and construction industry in Australia. Comparison is drawn between those who created the policies and codes (regulators) and the final users or beneficiaries of the policy (industry and regulatees). Given the importance of the building and construction industry to the economy, the research question is whether performance-based codes would improve Australia’s potential to trade offshore.

The thesis provides the background to the globalisation movement and the effect it has had on the development of policy at the international level. The following is a literature review of selected material which defines globalisation, its influence and the manner in which
international organisations have created policies to respond to a more common environment. Figure 1 below provides a vital guide to the development of the research. Globalisation is referred to as an introduction and the push that influences the development of policies at more specific levels, in particular the development of standards and the use of the term harmonisation when referring to commonality of principles (Uff & Jefford 1995, Helps 1997, Odams de Zylva 1997, Tieder 1998). The World Trade Organisation was set up in response to establishing global rules of trade between nations. This has had a direct effect on the construction industry and the need for building regulations to transfer between countries rather than be a barrier to trade.

**Figure 1  An explanatory guide to the literature review**
Another key area for investigation is the rationale for regulations and the development of regulation theory and consequent regulation reform. This research forms the core for the consideration of international building principles and standards. It covers the need for regulations to respond to public health-and-safety standards under the public interest model (Ogus 1994, Baldwin & Cave 1999). More specifically the research examines the development of performance-based codes as a means of achieving an international tool for building regulations. Prescriptive codes are generally regarded as a non-tariff barrier to trade (Deroukakis 2000, Foliente 2000, WTO 2004).

Towards the final analysis the researcher identifies the competitiveness of the Australian construction industry and, if the policies for the adoption of performance-based codes are effective, then the opportunities for increased investment offshore will be greatly enhanced.

2.2 GLOBALISATION AND THE DEVELOPMENT OF INTERNATIONAL STANDARDS

Several key movements have been identified by various authors in the literature and they derive their relevance from the economic field of trade policy and the movement of products. This background provides the foundation to comprehend the research project. Globalisation has developed from the movement of three key institutions, the International Monetary Fund, the World Bank and the World Trade Organization (WTO) (Acqaah 1986, Sen 2001, Stiglitz 2002). The IMF and the World Bank both originated in WWII as the result of a UN Monetary and Financial Conference at Bretton Woods, New Hampshire in July 1944 as part of an effort to finance and rebuild Europe after the devastation of WWII. Stiglitz (2002) has argued that the original conception of the IMF was based on recognition that markets often did not work well and there was a belief that there was a need for collective action at the global level for economic stability.

After the WWII international agreements were set in place to stabilise capitalism, governments were left with the responsibility of managing their own economies to achieve
economic growth. Trade between nations expanded rapidly as tariffs and quotas were reduced through multilateral agreements. The period following the 1960s was seen as the 'golden age of trade', where internationalisation of a country was measured in terms of export shares and market penetration (OECD 1992). The next phase, foreign investment, began in the 1970s when the United States began unilaterally to unravel the agreements, but economic growth slowed and inflation rose sharply. Byrne and Rodway (1998) found that, during the 1970s and 1980s Britain, United States and Australia started to embrace economic rationalism, characterised by deregulation, privatisation and globalisation of free markets.

In 1992 the Organisation for Economic Cooperation and Development summarised the major policy issues for the international construction industry as:

- Barriers to trade in services. Trade construction services were limited by non-tariff barriers in both OECD and non-OECD countries. Greater harmonisation and liberalisation of national policies affecting services through the OECD Codes of Liberalisation and the GATT negotiations enhanced trade and fair competition in construction and other service sectors.
- Export subsidies, in the form of interest rate subsidies on export financing and mixed credits. It was noted that they were distorting trade in construction and other services.

Globalisation as a phenomenon has been described by Friedman (2000) as the sun rising which cannot be stopped as a force. Globalisation has also been referred to as a moving glacier: ‘In spite of these concepts, globalization seems to push on, glacier-like, flattening the obstacles in its path’ (Lodge 1995 p. 16).

In 2001 the OECD described globalisation as:

… not a single phenomenon. It has become a catch-all concept to describe a range of trends and forces changing the face of the world in which we live. While some are not new – trade

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4 Established in 1948. GATT’s rules applied only to trade in goods. The GATT regime reflected that trade represented only a small percentage of economic activity for most of the principal players. It was a set of rules that regulated a modest flow of trade among a set of linked but still largely independent economies. (Hart 1998)
liberalisation, for example, has been under way since 1945 – clearly the face of change is accelerating. As an economic phenomenon, globalisation is manifested in a shift from a world of distinct national economies to a global economy in which production is internationalised and financial capital flows freely and instantly between countries… (OECD 2001 p.3).

In a broader sense globalisation means that economic development has the capacity to bridge across the world (Friedman 2000). A number of processes are required for this to occur, including the integration of currency and financial markets, integration of production, trade and capital, and global governance that can influence national, economic, social and environmental policies. The literature encapsulates the concept of globalisation in terms of economic, social, cultural and political forces (Friedman 2000, Keil 1998, Gettler 1998, Lodge 1995). A common view is that globalisation has essentially stemmed from the growth of the information technology industry and the rapid movement of information sharing on the World Wide Web. It has become an adopted norm in our lifestyles through our communications industry, in particular world media, information technology through the Web, and market trading (Friedman 2000, Stiglitz 2002). It revolutionised business, where borders are being erased. It has provided the foundation for the construction industry to review trade opportunities outside their usual domestic economies.

Moran and Riesenberger (1994) surveyed senior executives of leading companies to determine attitudes to contemporary thinking and the environmental forces on globalisation. They identified 12 environmental forces showing a particularly significant degree of importance. The results suggest the following ranking:

- Global sourcing (raw materials and components)
- New and evolving markets
- Economies of scale
- Trend towards homogeneous demand for services and products
- Lowered global transportation costs
- Government interaction: non-tariff barriers, customs and taxes
- Increased telecommunications at a reduced cost
Trends towards homogeneous technical standards
• Competition from non-domestic competitors
• Increased risks arising from volatility in exchange rates
• Trend of customers evolving from domestic only to global strategies
• Increased pace of global technological change.

The existence of these general environmental forces will intensify the globalisation of business in the future (Moran & Riesenberger 1994). The forces of most relevance to this research include: the trend towards the homogeneous demand for products and services in terms of standard compliant products for the building industry, non-tariff barriers, and trends towards homogeneous technical standards such as a move to universal standards of building regulations.

Many of the reforms which occurred throughout Europe have a bearing on the way in which Australia is to operate globally. Santamaria stated that: ‘Globalisation is the process of opening up the economy of the entire planet to multinational corporations, without demanding of them any commensurate social or moral responsibility’ (Byrne & Rodway 1998 p.19). Further, he noted that like Marxism of the forties and fifties its ideology is simply a ‘cover’ for obtaining power.

For any government, including Australia, attracting foreign direct investment is as important as finding new export markets. D. Argus, then head of National Australia Bank, stated:

We have no choice about whether we wanted to be part of the process…. Globalisation involved the blurring of national economic boundaries in trade, capital, technology flows, government economic policies and corporate growth strategies (Gettler 1998 p. 2).

The issue for Australia was how to attract foreign investment and secure global strategies. Australian regulators and the construction industry were looking at ways to increase their export potential (DISR 1998).
Over the past decade, globalisation has had a direct impact on the development of policies for technical standards in a number of fields including uniform building codes. At a global summit on performance-based building codes held in Washington DC Witt (2003)\(^5\) stated:

Internationally, performance-based building codes are improving our world in a number of ways…. They are increasing trade across borders, fostering innovation and strengthening our ability to share experiences of working with communities (Witt 2003 p. 1).

This statement clarifies the position of the regulators and acknowledges the relationship between the use of performance codes and increasing trade across borders and has become the catalyst for multinational organisations such as the Interjurisdictional Regulatory Collaboration Committee. It also supports the assumption that trade will increase if performance codes are adopted.

One consequence of globalisation is the ability for countries to be more like each other (Lange 1999). In the construction industry this is sought through the adoption of similar building codes and standards to improve trade between countries. The growing acceptance of globalisation directly affects the reason for countries examining more uniform building standards and documentation. The extent of the adoption of these changes and their relevance will be developed in this research.

New technology and improved communication networks have encouraged the rapid spread of information especially in the developed countries. The need to be part of a global economy has increasingly dominated the markets seeking to increase their export potential (Lodge 1995, Pietroforte 1997, Raftery \textit{et al}. 1998). Since a company or organisation can no longer rely on merely its domestic market and must seek opportunities outside its boundaries (Ofori 1993, Crosthwaite 1998, DISR 1999). The issue of cross-cultural boundary partnership and commitment was supported by Pietroforte (1997), who noted how American and Italian construction companies were competing more effectively in global markets and enhancing each other’s corporate capabilities. Khoon (1991) also

\(^5\) James Lee Witt is the CEO of the International Codes Council 2003
highlighted the role of the Singapore construction industry and its competitive strategies for markets abroad.

Firms have embraced intricate international networks of research, production and information. In the 1990s the world’s corporations looked to all nations to gain advantages in production, marketing and research. However, internationalisation of industrial activities has created economic imbalances and governments have tried to reorient industrial and trade policies and to adapt national and international economic rules to cope with the changing patterns of globalisation (Berry & Rafferty 1999). The difficulty for governments is their domain to protect domestic borders as they have little influence beyond national boundaries.

Australia, like other countries, is strongly influenced by global change, in particular the economic expansion in terms of the nature and strategies of transnational corporations, the expansion of world trade, and the emergence of a global system of banking and finance (Fagan & Weber 1999).

Hart (1998) has identified that the driving forces of globalisation are investment and technology but that trade has become the focus with much of the conflict being paid out in the field of trade policy. The key principle underpinning performance-based codes is to facilitate trade, by comparison to previous building regulations which were designed to promote public health and building safety (IRCC 1998).

Sutherland⁶ (1998c) suggested that the intensification of economic interdependence after WWII has been both a cause and a consequence of growth. He argued that a new world economy was emerging that we now would refer to it as ‘globalisation’. This was through increased trade and capital flows, which have generated gains in productivity and efficiency that are spurring growth and creating millions of jobs in advanced industrial countries.

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⁶ Sutherland in 1998 was the Chairman of Goldman Sachs International and Chairman of the Overseas Development Council
Sutherland (1998c) further noted that the political structure of the world economy is changing, and there is a need to consider key international problems such as poverty. Also, there has been an emergence of non-state actors, where some private firms have become rivals to national governments.

In seeking competition for investment, global firms have claimed that various regulatory requirements stand in their way of making favourable investment decisions (Hart 1998). This was the catalyst for governments to assess their regulatory powers. He identified that in the competition of investment, governments must work with global firms and consider the various regulatory requirements that stand in the way of favourable investment decisions. Hart (1998) stated:

“The challenge, therefore, is to find a way to recapture the democratic control over the market but in a manner geared to the growing reality of commerce within integrated global economy rather than fading reality of trade among a group of interlinked national economies’” (Hart 1998 p. 6)

The breadth of globalisation emerging at one end of the pendulum is seen as an area of free trade and the growth of transnationals (Honess 1997, Dulaimi et al. 2001, Acquaah 1986). At the other end it represents benevolent concern over humanitarian rights and power to embark into reducing poverty in disadvantaged countries (Sutherland 1998, Keil 1998, IRCC 2004). While globalisation has been described as a force to fight poverty by creating jobs and tackling injustices, on the other hand it has been regarded as:

“…an economic strategy internationally pursued by the developed world and by transnational corporations, the aim of which is to create the open markets in which small local competitors will be swept aside, regardless of the social or environmental cost. (Lange 1999 p.2)

Lange (1999) further noted that the more open the world economy becomes, the more alike world markets become and business uniformity or harmonisation of law and practice make the national state less relevant.
However, there are also other public interest and citizen groups that do not support the breadth and intention of globalisation (Public Citizen 2004). These emerging views also need to be taken into account to ensure a balanced viewpoint.

While trade liberalisation has broader consequences, this research particularly explores those matters in relation to trade and competition. Globalisation has received mixed economic attention on one hand as the saviour of business investment in a world which is growing smaller, but it has equally been criticised for the takeover mentality of multinationals. The impact on smaller businesses, and ignorance of government to its consequences, has been a major point raised by protesters at the economic summits (Sutherland (b) 1998, Friedman 2000, Steiglitz 2002). Just who takes advantage of globalisation and who benefits from uniform goals and objective, needs to be evaluated.

Globalisation has also its negative aspect, being called a one-size-fits-all golden straitjacket, where ‘some worry that they don’t have the knowledge, skills, or resources to enlarge the straitjacket and ever really get the gold out of it’ (Friedman 2000 p. 329). In the literature, the arguments against globalisation also acknowledge the growing marginalisation of low-income countries and their inability to seize trade and investment opportunities (Lange 1999). The world's richest 20 per cent of people accounted for 86 per cent of total private consumption (Sutherland 1998b). The literature has shown that globalisation is a force that cannot be readily halted. The authors selected for this research (Hart 1998, Steiglitz 2002, Friedman 2000) have mostly provided the positive consequences of being part of each other’s economy and exploiting our export potential. For this research proposal, globalisation is about trade potential, the erosion of national borders and regulatory convergence. The next section refines the broader argument and examines how the policy regulators have incorporated global theory for the purpose of developing international standards for the construction industry. Such changes towards harmonisation of laws have been investigated in Europe with the aim of erasing borders between countries.
2.2.1 **European harmonisation of building law**

In a world where every country thinks it has developed its own individual public safety standards and product compliance, globalisation drives the ultimate demand for only one standard, one test, one approval or certification. This includes the acceptance for mutual recognition of the rigour of the testing for final acceptance, and a reduction in the multiplicity of regulations which provide similar products. In the literature, Helps (1997), Odams de Zylva (1997) and Boodman (1995) show that the outcome of technical standards can be delivered through harmonisation of controls and transparency in the process. Technical standards enable consumers to have products which satisfy a minimum standard or control of quality and performance. However, the procedures to assess conformity can vary widely between countries and in sophistication depending on the availability of technical infrastructure and costs. ‘The additional costs to undertake multiple tests to conform with the requirements of the importing country can be prohibitive’ (DISR 1999 p. 64).

These international trends are driving a greater similarity of legislation in the construction industry. The issues will have an impact on the construction industry's ability to work within a legislative framework, trade offshore and adopt similar legislative principles and procedures. The breadth of literature draws reference to three key themes:

- **Global construction law** (standardisation of contracts, liability and post-construction liability laws and harmonisation issues). This considers the literature related to uniformity of legislative principles and model legislation which could be adopted by countries.
- **International building regulations** (uniform building legislation through performance-based regulations and harmonisation issues). The research mostly focuses on the use of performance-based building codes to remove trade barriers and the acceptance by regulatory authorities that prescriptive regulations are a trade barrier.
- **Standard building practices and product accreditation** (the use of similar building products and single accreditation testing).
This research is mainly concerned with use of performance-based building codes and the consideration of global standards for the construction industry. It is important to consider the literature related to the harmonisation of standards as it is part of the driving force to have uniformity and subsequent adoption by countries to assist trade and export potential. The need for uniform technical standards is a prerequisite of the trade agreement between countries (Hart 1998, Deroukakis 2000). Foliente (2000) has also noted that to facilitate world trade, the internationalisation of performance-based standards is needed. He qualifies this by stating that this is only possible if a distinction is made between regulations and standards. He defines a building code or regulation as:

A document used by local, state or national government body to control building practice through a set of statements of 'acceptable' minimum requirements. This is a legal document. Since the acceptable requirements are usually established based on socio/political and/or community considerations, they nationally differ from country to country (Foliente 2000 p. 13).

Building standards are then defined as:

Essentially technical documents that standardise, generally in terms of quality or performance, but sometimes in terms of size or procedure, some activity in relation to building consideration. They serve as some kind of benchmark. (Foliente 2000 p. 16).

R. Wraight, then Chief Executive of Standards Australia, defined a standard as:

A document established by consensus and approved by a recognised body, that provides for common and repeated use, rules, guidelines or characteristics for activities or other results, aimed at the achievement of the optimum degree of order in a given context (Wraight 1997 p.25).

The term harmonisation has received a mixed interpretation in the literature. The legal profession has used the term **harmonisation** to refer to the achievement of similarities in parts of the legal framework related to the building industry. Later, the research will demonstrate how other authors have used the term in building control to define a
relationship of standards between countries. Essentially this particular term reflects the notion that regulations are developed to be more congruent.

Harmonisation law appears to derive from a series of complex ideologies pertaining to the synthesis of law by the legal profession. While this research does not provide a legal analysis of harmonisation, it considers some of broader principles for the standardisation of law as undertaken by the European Commission to illustrate the complexity of harmonisation. Hart (1998), in his report on standards, has used the term harmonisation with less rigour and raised the question of which standard would be the basis of harmonisation. He suggested that the inevitable answer would be that standards are set by the larger and more powerful economies (Hart 1998).

The following analogy best illustrates the concept of harmonisation through the harmony of music. That harmony requires diversity of tones, but not uniformity, which would be monotone:

Harmonisation is to imply a state of consonance or accord, the combination or adaptation of parts, elements or related things, so as to form a consistent and orderly whole (Boodman 1995 p.122).

By definition, harmonisation is a process in which diverse elements are combined or adapted to each other so as to form a coherent whole while retaining their individuality. However, in terms of achieving harmony, Boodman (1995) also recognised that comparative law eliminates diversity which is not necessarily harmonisation.

The harmonisation of law as conceived in comparative law does not entail the creation of new and complex form comprised of diverse elements. Instead, it does not involve a mere comparison of laws, it entails eliminating their diversity either formally through statutory reform or informally by borrowing techniques and solutions. While these are valuable and perhaps necessary processes for legal evolution, they are not in the nature of harmonisation (Boodman 1995 p.129).
The European Commission has had a strong initiative on the harmonisation of European construction liability laws by virtue of construction firms bidding outside their national boundaries. Uff and Jefford (1995) have argued in favour of harmonisation through contract rather than through regulation. In terms of the development of standards:

...a considerable degree of harmonisation of technical standards has been achieved and major steps have been taken towards the creation of a level playing field in public procurement (Helps 1997 p.525).

Common reasons for harmonisation include justification for economic efficiency and reducing costs of doing business in multiple jurisdictions (Boodman 1995). Sweet (1995) examined the uniformity of construction contracts in America and argued that uniformity of contracts is possible due to the homogeneous legal system, common language and traditions, national standardised contracts, and common law system which borrows from other jurisdictions. He concluded by giving advice to those in the European Union (EU) who would like to have a single construction market accompanied by uniformity of construction contracts and construction law. There is no need to promote the single market as the reason to strive for uniformity as ‘diversity meets the needs of the parties’ (Sweet 1995 p.119).

Sweet (1995) noted, however, that the creation of uniform rules for procurement and different contracts for different types of transactions might be a solution. He further stated that mechanisms for exchange of information and legal education would help bridge some of the cultural and legal gaps between the different legal systems. The European Commission actively promoted harmonisation of European construction liability law in the 1970s and 1980s. Further research in the areas of construction defect and liability insurance was undertaken by Lavers (1999). The Commission set up GAIPEC\(^7\) to examine liability, guarantee/warranty and acceptance, and financial cover for guarantee/warranty. In 1992 GAIPEC made a number of recommendations including uniform procedures for acceptance of building work. A review indicated that:

\(^7\) GAIPEC is Groupe des Associations Inter-Professionelles Europeennes de la construction
Approximately 60% of the responses were in favour of harmonisation based on a perceived need for additional consumer protection and more freedom of movement for professionals and other construction participants (Helps 1997 p.528).

Those opposed to the intervention argued that European measures would contravene the principle of subsidiarity and would result in increased cost, undue complexity and confusion since other aspects of the legal systems of member states would remain unharmonised (Helps 1997). The Commission's overall conclusion was that, despite some apparent support for harmonisation, there was still no consensus within the European construction industry which could form the basis of concerted action.

However, it was noted that:

Disparities in law and practice between member states operate as barriers to the free trade movement of goods and services within the European construction industry which could lead to economic distortions and prevent a level playing field (Helps 1997 p. 530).

Such international standards would provide companies in mutual countries with an ability to undertake the construction contract and the procurement of construction works under the same legislative and regulatory base. Wraight (1997, p. 37) argued that ‘because of their long life, large aggregate capital value and major socio-economic impact on the quality of life, the building and construction sector is strongly controlled by regulation and standards’. In theory, the suggestion for standardising building contracts and operating within the same regulatory and building code environment sounds logical. However, in practice achieving this has been difficult. Boodman (1995) also concluded that harmonisation of law per se has no general meaning, is not theoretically justifiable and evokes no particular method or model. He also argued that harmonisation can be supported in the modernisation of laws achieved through the unification or the adoption of uniform model legislation. Furthermore, countries that want the benefit of this type of legislation can ‘receive a free ride upon the reform of other jurisdictions’ (Boodman 1995 p. 137).
The literature review has found that similarity of contractual obligations between countries would aid contractual agreement between parties (Odams de Zylva 1997). The European Commission examined issues relating to the harmonisation of building law, a major component related to the standardisation and procurement of construction contracts and seeking to achieve harmony between member countries. The literature in this area refers to the harmonisation of construction law which is not about building regulations but rather the legal environment for construction law in relation to the development of contracts for the procurement of business. The findings in the literature review are very relevant as they draw a comparative analysis between the development of uniform contracts and the potential for standard regulations and codes.

One of the major obstacles in introducing a single contract is that every member state has a different legal system. Helps (1997) indicated that the only time harmonisation could be considered a possibility was if there were a more unified legal system.

Odams de Zylva (1997) also investigated the difficulty of harmonising international construction. He noted the difficulties the EU had with common principles of contract law. Because of the scope of the differences, choice of law rules were considered insufficient and would never establish the legal uniformity necessary for an integrated European market. This would create more uniform law rules. He concluded:

> The reality of the present situation is that judicial formalism in a jurisdictional vacuum is neither concerned with the issues which may affect the wider construction community nor can it promote the development of international jurisprudence. It has been argued that common principles can make the marketplace more uniform. Therefore, it is conceivable that the development of a set of common principles in international construction law could in the same way achieve harmonisation (Odams de Zylva 1997 p. 116).

It follows that a contract form could be drafted in sympathy with industry needs and could provide uniformity within a framework of internationally recognised principles. Tieder (1998) considered the evolving international standards of construction law, particularly to assist in global construction where the manager, contractors, designers and engineers are all from different countries but work on the same project. While he did not mention
difficulties in harmonising law, he did recognise that commonality of practice and procedures are needed for global construction. Lavers (1999) suggested that the removal of trade barriers, and uniform post-construction defects and liability insurance would improve the global operation of global industries. The issue of promoting global uniformity of building legislation would require the support of the industry. If there were no direct benefit, then it would hardly be worth their efforts to work towards this uniform building legislation.

While there is literature available on harmonisation, Helps (1997) and Boodman (1995) both concluded that it is not possible to achieve harmonisation. Odams de Zylva (1997) concluded that while legislative harmony could not be achieved, uniformity of contractual standards and rules which recognised the principles of construction law could be considered. At best, he argued, it can be a legislative model, but the fact that there is different legislation in each state make the system unworkable. Problems would also occur with confusion and complexity of a new system. Tieder (1998) supported commonality and practice procedures and there is support for the development of technical standards as a feasible alternative to achieve uniformity. Hart (1998) added that in his opinion harmonisation could be achieved through mutual recognition of products and assessment and certification of products. This is preferred as policy, as it preserves many features of diversity within idiosyncratic jurisdictions.

Construction industry responses to the European Commission’s view on harmonisation concluded with the need for more consumer protection and improvements to the quality of work (Helps 1997). Public Citizen (2004), noted that the Transatlantic Consumer Dialogue (TACD) adopted the principles for harmonisation in 2000. TACD stated where harmonisation of standards are appropriate, they must embody the highest level of consumer protection. It was noted that this will not be achieved with the WTO as they promote lower public health and product safety standards.

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8 For example, California established product and environmental regulations and standards which are usually higher than other US States and would strongly oppose harmonisation of its standards with less rigorous jurisdictions.
The above section has defined the key terms that are used to convey a similarity of standards between countries, but as globalisation is within a different political structure, it does not have a government to enforce the use of standards. The next section looks at who is responsible for administering global standards if they are developed.

2.2.2 The role of governments and global organisations

Globalisation does not have national borders and governments play limited roles unless they are part of a global organisation. In theory, governments necessarily play a less influential role in the process of globalisation, by their very nature, not going beyond their own territorial boundaries. The national system was developed on the assumption that most activities are confined within the nation state. Furthermore, the national regulatory structures built up over the past century and a half to address issues of health, safety and fairness and more, now serve as impediments to further economic development rather than being a facilitator (Hart 1998). There is a need to have global objectives for increasing trade. In response, global and national organisations have been established with the support of government to overview and develop policies which could be adopted by government. The next section will focus on the development of regulations which support uniformity of building standards and products and the types of organisations that are responsible for the development of policy and regulations. A key aim of this thesis is to identify the benefits of adopting uniform building standards, and identifying who are its beneficiaries.

Fagan and Webber (1999) have argued that governments currently use the idea of globalisation to justify their own policies at national and local levels. Managers of transnational corporations, for example, construct their corporate objective to reflect global imperatives. This has promulgated the metaphorical use of the word *globalisation* to exert pressure and influence over decision-making, thereby indirectly assisting the restructuring process. Many companies use the metaphor in promoting a global interest in business, but most businesses would be concerned if offshore tender agreements resulted in a national domestic firm’s losing a contract to a rival international company. The issue of national protection strategies, the need to protect the domestic market from foreign invasion, needs
to be further addressed. Hart (1998) also recognised the difficulty national governments face in harnessing national governance and global commerce.

National governments can no longer distinguish between domestic companies or foreign firms for research and development. In Australia, this is evident in the construction industry, where many of the leading firms are not owned by Australians, but by overseas counterparts where the name has remained the same but ownership has changed (Houghton et al. 2000). A further issue is competition policy where new international production arrangements force governments to choose between the international company and national industries\(^9\). So while on one hand the government may appear to support globalisation on the other it can try to protect national interests from further competition that could erode the financial capital market.

Berry and Rafferty (1999) explained the global economy in Australia and its competitiveness. The concept of competitive industries as a national economic policy objective became a dominant focus of the government in the 1990s. However, one clear finding was that competitiveness is an attribute of companies and not of nations. The authors further stated:

> In an economic sense, global competition is about individual companies meeting global standards and costs, productivity, technology, quality and service. This is not the activity of national but market participants – corporations. National policy for competitive industries therefore addresses the competitiveness of companies in the first instance. (Berry & Rafferty 1999 p. 71)

\(^9\) Such as the example in April 2001 of the proposed Shell takeover of the North West shelf owned by Woodside Petroleum and the government decision not to allow the takeover to occur as a result of national interest.
At the international level, the WTO\(^\text{10}\) is the only global international organisation dealing with the rules of trade across national boundaries. The WTO has Technical Barriers to Trade Agreements\(^\text{11}\), which are negotiated and signed by the bulk of the world’s trading nations and ratified by their parliaments. The agreement is to assist the producers of goods and services, to export and import and conduct their business. The WTO has, however, recognised that there are hindrances to effective trade between countries which require the following strategies:

- Technical regulations and standards
- Import licensing
- Rules for the valuation of goods at customs
- Preshipment inspections and further checks on imports.

Hart (1998) argued that the WTO provides for detailed codes which ensure an increasing uniformity in the regulation of trade, and goods and wide-range economic transactions that occur across borders. Rules about technical barriers provide organisations with the ability to organise production globally. All the WTO signatories are required to adopt almost all the constituent codes of the WTO to ensure that they reflect a universal code. The WTO regime represents the importance of trade and growth of economic activity. More that 160 countries are involved in the WTO.

Others have criticised the role of the WTO in that it has broken down borders and eliminated a nation’s right to protect its citizens and its natural resources, while allowing multinational corporations uncontrolled and unrestricted access to the country’s markets and resources (Clavio 2003). Faux (2002) has also identified that while the WTO and IMF

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\(^{10}\) The World Trade Organization which was established on 1 January 1995 by the Uruguay Round of negotiations.

\(^{11}\) Technical Barriers to Trade Agreement (TBT) tries to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles. The agreement recognises countries’ rights to adopt the standards they consider appropriate — for example, for human, animal or plant life or health, for the protection of the environment or to meet other consumer interests. Moreover, members are not prevented from taking measures necessary to ensure their standards are met. In order to prevent too much diversity, the agreement encourages countries to use international standards where these are appropriate, but it does not require them to change their levels of protection as a result. The agreement sets out a code of good practice for the preparation, adoption and application of standards by central government bodies. It also includes provisions describing how local government and non-governmental bodies should apply their own regulations — normally they should use the same principles as apply to central governments.
are pushing for openness of markets and trying to eliminate regulation and protection, they
themselves are not open to competition and constitute a cartel. The fact that governments
are required to adopt these universal codes should also place the government in a
privileged position to question why some of these codes are sanctioned in the first place
and to question what evidence there was to develop that policy.

Coen and Grant (2000) reviewed corporate political strategy and global policy through a
specific case study of the Transatlantic Business Dialogue (TABD), a joint initiative of the
European Commission and the US State Department. The dialogue evolved since 1995 to
establish business and government policy. The TABD brings together 112 top American
and European chief executives to coordinate business responses to international trade,
standards and regulations without the need for political intervention.

The study noted that the TABD was invented to improve transatlantic ties, intensify
cooporation of governments as a means of preventing trade barriers and creating
international pressure to get things done. The TABD established a standards and regulatory
policy group, whose purpose was to promote a new regulatory model based on the
principle – approved once, accepted everywhere – on both sides of the Atlantic. The
groups tried to achieve the removal of cost inefficiencies caused by excessive regulation,
duplication and deficiencies. It has achieved success in the areas of mutual recognition
and harmonisation of standards.

The ABD identified five broad areas of cooperation that governments and business should
pursue in efforts to reduce regulatory barriers to trade (Hart 1998 p. 38):

- Mutual recognition agreements
- Greater acceptance and self-declarations of conformity
- Harmonisation
- Increased transparency
- Greater reliance on functional, performance-based rather than design-based,
specifications.
So, while it was considered important to establish a committee to review standards, the organisations on the groups did not feel satisfied their objectives were achieved. In addition, it was difficult to motivate change without the support of all the related organisations which the change would affect. There was a need to establish the transparency and openness of the project.

A self-interest public group also had an adverse opinion of the role and operation of the TABD. On its website the group has stated:

Just when you thought the World Trade Organisation was back in its box, up pops the news of another multinational organisation with similar intentions – to promote global profit making for big businesses above all other considerations. (Public Citizen 2004 p.2)

This group regards the TABD as a secretive group of American and European executives who believe they have a right to pursue global profit. They meet annually with US and European government officials to push for the removal of any impediments to the pursuit of profit, such as domestic regulation governing environmental or social concerns.

The influence of globalisation in Europe is more prominent than in Australia and is mainly due to the geographical proximity and size of all the countries and the need to remove barriers between them. More literature is available on the globalisation of the construction industry in Europe due to the international bodies which exist to review these issues.

Ultimately, globalisation needs management through an international system to examine international challenges and to provide a vehicle where issues of national, cultural, economic, political, environmental and social matters can be discussed. However, the political will to do this may be weakened by other agendas such as supporting trade and multinationals. A global economy could also require the harmonisation or similarity of standards that could be uniformly used by everyone irrespective of their origin. Such assumptions require further evaluation and research to ensure that the disadvantages do not outweigh the advantages.
The literature review in this section has illustrated that the focus of globalisation is achieving a common element or standard. The section summarised the debates about policy responses to regulation trade barriers in terms of heterogeneity versus harmonisation and mutual recognition (Hart 1998). The section highlighted that transnational companies have a self-interest which may differ from the government’s.

2.2.3 Influence of standards on the construction industry

In 1999, countries around the world spent approximately $US3600 billion on construction. The US construction market was estimated to have been worth $US725 billion, Japan’s market was worth $US677 billion. China and Germany are the 3rd and 4th largest, worth $US341 billion and $US316 billion respectively. In 1999, Australia ranked 12th in terms of construction markets at an estimate of $US55.6 billion. (Centre for Strategic Economic Studies 2000 p. 1).

It was noted in the same report that data on building and construction service exports are very limited. Often data on construction service exports and imports are withheld for commercial confidentiality. The confidentiality test, however, applied by the Australian Bureau of Statistics is that either more than 85% of exports are attributable to one company or more than 90% of exports are attributable to two companies. In conclusion ‘the data suggests there are very few exporters of construction services’ (Centre for Strategic Economic Studies 2000 p. 49). How much of this must be due to not having international performance-based codes?

The Australian construction industry is not supported by any international organisation that provides for the development of global strategies (Blair 1999). In Australia the construction industry has operated on its own ventures with limited government support until more recently by the Department Industry, Science and Resources (1999). In addition, there are organisations such as Standards Australia and the Australian Building Codes Board, who are linked in with international organisations such as the International Organization for Standards and the Interjurisdictional Regulatory Collaboration Committee, supporting the development of global standards for the construction industry.
In order to provide assistance to the construction industry data need to be collected, analysed and examined to determine the existing situation. Australian Commonwealth and State governments should promote building development at the international level. The research requires an analysis of the factors which would make it beneficial for the industries to consider trading overseas and the impact of global building legislation. Those factors need to be expanded on the basis of previous research (Khoon 1991, Moran & Riesenberger 1994, Crosthwaite 1998, and Poot et al 1998).

2.2.4 Building construction as an export economy

Research into global cooperation and construction industries seeking opportunities offshore has been examined by authors from a number of countries (Low 1991, Bennett 1993, Carillo 1994). Earlier research examined the role of construction in the economy. For example, Arditi and Gutierrez (1991) noted that the performance of US contractors in foreign markets during 1980-88 was unfavourable due to a decline in international construction and because of an increase in external debt of Third World countries. Low (1991) researched the location of world markets in construction. Bennett (1993) examined five of the large contractors in the building industry in Japan in 1991, and Carrillo (1994) surveyed international construction companies (consultants and contractors) in the UK and the US to determine the areas of construction technology transfer. None of the literature cited above made any conclusion that export performance could be increased through more performance-based codes.

If building and construction is an export economy, then what advantages would there be with standard building regulations? The need to be more part of a global economy is increasingly dominating the construction industry seeking to increase export potential. There was more literature on globalisation with respect to international trade and offshore investment. The literature covered global currency, exchange rates and tariff and/or protection barriers, and foreign investment. In this literature review, globalisation of the construction industry has been addressed by Abdul-Aziz (1994), Ofori (1993), Pietroforte (1997), Crosthwaite (1998) and Raftery et al. (1998) in various studies related to the
development of globalisation and its impact on the construction company in the region
they have studied. It is important to understand some of the dynamics of the construction
industry and the mechanisms of trade, and then to justify the research question, that is,
whether performance-based codes will improve trade and remove barriers.

Abdul-Aziz (1994) examined global strategies between Japanese and American
construction firms. Pietroforte (1997) examined the building construction alliance of two
firms, one in Italy and the other is the US, to permit each other to compete more effectively
in global markets and by enhancing each company’s existing corporate capabilities, and
the opportunities they had for international markets. His research showed that
organisational flexibility and cultural sensitivity are required to coordinate and integrate
different roles and contributions by firms. The issue of use of local knowledge in joint
ventures was recognised as an important factor in entering a country. The easiest way for a
foreign contractor to operate was through a joint venture with local construction firms.
Raftery stated that this arrangement had advantages where foreign and local partners could
complement each other, e.g. the domestic sectors have a better understanding of local
environments while foreign firms have expertise in finance, technology and management
(Raftery et al.1998). Such a joint venture would need to support the strategy that
partnerships and alliances can provide an important tool in analysing policies for global
uniformity.

International operations for business are considered to be valuable for a number of reasons,
as they would provide:

- Global procurement of human and physical resources
- Improved transportation infrastructure
- The existence of international financial markets
- Demand and supply that are not geographically bound. (Pietroforte 1997)

Crosthwaite (1998) examined the internationalisation of British construction companies to
determine whether an increase in overseas activities could counteract some of the problems
with the domestic construction market. He undertook a survey of British senior executives
in construction firms during 1990 and 1996 to analyse their perceptions of an overseas market. The study found:

- Companies had increased overseas turnover but all were not experiencing profits.
- Overseas workload increased because of joint ventures rather than foreign acquisition.
- Long-term profitability was the most important reason to tap new booming markets.
- Preference is to operate with developed countries with more security and less risk.

Some of the problems with an open market were identified by Raftery et al. (1998) who argued that the construction sector in Asia had entered a period of increased competition because of globalisation and free trade. These factors posed opportunities and concerns for competition whereby increased competition from foreign contractors could edge out local contractors, which consequently could stifle domestic construction industries. De Valance (2001) also noted that with deregulation and opening of national markets, contractors will be subject to increasing competition. The impact of such competition will be a crucial factor in the long-term prospects of Australian construction companies.

It was also noted that the success of the Japanese is due to technological superiority, financial capacity, skills in forming strategic alliances with host governments, and giving government support and aid to construction. The final conclusion was that the market would operate and the less competitive firms would be squeezed out to the benefit of all (Raftery et al. 1998). Overall three trends were demonstrated in the research by Raftery et al. (1998):

- Larger private sector participation in infrastructure projects
- Increasing vertical integration in the packaging of construction projects
- Increased foreign participation in domestic construction.

These implications have a significant effect on development in the Asian region for micro-economic and construction industry development policies and particularly in developing countries. The literature also showed that in order for companies to survive and be exposed to additional business opportunities they needed to be more strategic with their
communication and marketing skills (Khoon 1991). Effective marketing will allow a company to penetrate foreign markets and expose the company to other joint ventures.

While it is implied that the building industry in Europe is globalised, Honess (1997) indicated that, under European Union legislation, all services and supply contracts over certain threshold values within EU countries must be advertised in the *Official Journal of the European Communities*. This form of advertising allows contractors from other countries to tender for projects, thereby enhancing and encouraging globalised activities. Honess (1997) emphasised in his simple guide to marketing construction business that it was important to extend business clients and boundaries.

The greatest concern noted by the authors (Crosthwaite 1998, Pietroforte 1997, Raftery et al. 1998) was the increased foreign participation in the domestic construction market which removed opportunities for the internal domestic market. The fact that trading offshore is encouraged by government equally allows other countries to penetrate Australia’s market. This can be a risk if the domestic market has limited potential and depends on local contractors.

A further issue explored in the literature was the progression of Singapore’s construction industry to world-class status by going beyond the skilled application of tools to a shift in culture, values, beliefs and the assumptions guiding organisational activities (Dulaimi et al. 2001). A report was prepared in Singapore to drive its competitiveness through re-inventing construction. The twenty-first century was seen as a key milestone in the development of the construction industry, overseas competitiveness and a consideration of the impact of foreign works in Singapore. Detailed surveys were carried out and the industry was keen to achieve greater cooperation and closer integration to improve performance. Some comments sought government intervention to provide incentives for training, concern about the ability to compete internationally and the need to effectively protect much of Singapore’s construction industry. Although the research did not specifically examine the use of performance codes as a factor to improve international competitiveness, it acknowledged the trend to improve overseas competitiveness.
In Australia, studies into the construction industry were focussed on creating mechanisms to improve Australian competitiveness in the international market (DISR 1999). One of the key solutions for change identified in the report was the alignment of national and international standards. This is further elaborated in Chapter 3.

2.2.5 Conclusions

The literature identified the areas in which the building and construction industry operates in terms of its key objectives and the role of the bodies responsible for the development of standard regulations. The construction industry focuses more towards its physical operation in alternative offshore trading markets. Another solution to improve competitiveness includes training, the level of research, integration of functions for general contractors and suppliers’ chains, alliances with overseas companies, joint ventures and tendering with consortiums. There was very limited literature available from the construction sector which highlighted that global standards would achieve greater competitiveness and global growth for the construction industry. This feature was either omitted from the research question or not mentioned by the respondents as a critical factor in determining construction competitiveness. Alternatively there is probably a lack of research of the building designers, product innovation and design and contract specifications. Further quantitative and qualitative research is required on the opinions of architects and building designers who may provide a closer nexus between the views on standard building regulations and their implications for offshore trading and improvements to overseas ventures.

This research will bridge the gap between offshore trading of the construction industry and improved opportunities for competition if the building regulations were standardised amongst developed countries.

The principal conclusion drawn out by the authors is that the globalisation of construction activity and increased competition will remove the smaller players from the market. There is a gap in the literature with respect to the views of the construction sector in regard to standard building codes and subsequently whether performance-based codes would have
any influence in competing in a more globalised construction industry. For this reason it
becomes necessary to also explore another approach with the users (regulatees) and
analyse the origins of regulations, their primary purpose and the strategies which may aid
the construction sector.

2.3 REVIEW OF REGULATION THEORY, REGULATORY REFORM AND THE
DEVELOPMENT OF PERFORMANCE-BASED BUILDING REGULATIONS

The previous section referred to the trends towards common standards that can be achieved
through the uniformity of building regulations or product compliance. Building
regulations can be further examined using theoretical explanations which analyse the
development of regulation from its original purpose to its evaluation as a tool for global
uniformity. Hart (1998) referred to the development of national standards for the building
and construction industry in Canada as an example where the process of standardisation
has occurred irrespective of the fact that regulatory control is usually exercised at the
municipal level. The National Research Council and the Canadian Standards Council have
made it possible to develop and implement various national codes. Similarly Australia has
the Australian Building Codes Board with national performance-based codes through the
BCA, but the States maintain responsibility for administering their own legislation.

The basis of making regulations and the final relationship to the development of
performance-based codes is examined in this section.

2.3.1 International trends in regulatory reform

The key authors who reviewed the policy of regulation included (Acquaah 1986, Ogus
1994, Baldwin & Cave 1999). From these authors it is possible to specifically look at the
issues which impinge on the development of the policy at different levels. The philosophy
of these results should assist in gaining a better understanding of why there is regulatory
reform in areas such as the building industry and possibly explain how regulations can
create a more uniform or standard environment.
This section examines the development of regulation theory and its applicability to the building and construction industry. Public interest theory as distinct from private interest theory will also be examined. To illustrate the examples of regulation theory this thesis will specifically look at the regulation reviews undertaken in Australia to seek reforms in the construction industry in particular, and the development of the Model Building Act which has been adopted in part and considered by Australian States and Territories.

This research evaluates regulations, their outcomes and the development of global standards for the building industry. Overall, the literature search has not found adequate material published on building regulatory reforms and subsequently there is limited understanding of why these regulations have been created to form the basis of global building standards. Most of the literature on regulatory reform theory and process provides generic focus on the creation of regulations for industries other than the building industry although in some cases public interest objectives are implied (Ogus 1994, Acquaah 1986). It has been further noted that there are many rationales for regulating which can be attributed to market failure in that the regulation is ‘justified because the uncontrolled market place will, for some reason, fail to produce behaviour or results in accordance with the public interest’ (Baldwin & Cave 1999 p.2).

DISR (1998) noted that the application and implementation of the performance philosophy throughout the building process is of growing worldwide interest. The report stated that building codes and standards in Europe, the United Kingdom, the USA, Canada and New Zealand have or are in the process of making revisions in order to replace the constraining prescriptive rules with performance-based codes, standards and guides. However, having a performance-based code does not imply that the building industry has globalised; it is merely a statement that the country has adopted a form of regulation control that is based on performance rather than prescriptive regulations.

At an operational level and on a world scale there are no international building codes or regulations which are used uniformly by the building industry or by government regulators, although the literature (Tubbs 1999, IRCC 1999) suggests that their development and use is forthcoming. At the minimum level there are standard construction contracts to aid project management of buildings in various countries but, as
described in the previous section, their usage is limited by the lack of uniform legal systems between countries.

### 2.3.2 Regulations for public interest theory

There is a need to define why there are regulations. The development of regulations can be influenced by government decisions in terms of having control, a monopoly, improving safety, economic considerations and many other matters which affect the public interest. As will be explained, this research will look at regulations from the public interest perspective, as this is more relevant to the building and construction industry. Public law has been adapted to the task of regulating industrial activity and provides a systematic overview of the theory and forms of social and economic regulation. Ogus (1994) examined two opposing theories: firstly, public interest theories which argue that regulation should aim to improve social and economic welfare, and, secondly, private interest theories where private interest is satisfied. Both theories are built on economic concepts. Baldwin & Cave (1999) also categorised regulatory theories to include public interest theories where regulations would achieve certain publicly desired results in circumstances where the market would fail to yield these results. As an example, building regulations and minimum standards would meet the criteria for public interest. Alternative regulation theories apply to private interest which can be scoped through the motivation of private individuals and the relationship to the political agenda (Ogus 1994, Baldwin & Cave 1999).

Traditionally trade agreements provided for discipline and how societies could regulate trans-border commerce, including the exchange of goods, services, capital and technology. As Hart has stated:

> Trade agreements of the future will regulate how societies may govern themselves, such as their social arrangements, the protection of the environment, the regulations of competition and the protection of private property (Hart 1998, p.17).

Social (public interest) regulation includes health and safety, environmental protection and consumer protection and covers quality of service provision and imposes penalties for non-
compliance. Economic regulation is narrower and primarily applies to industries with monopolistic tendencies (Ogus 1994). In Australia, governments have recognised the need for the public safety and health of occupants in buildings.

Health and safety are regarded as an important rationale for consumer protection and have been acknowledged in the literature as a key objective of building regulations (ABCB 1997, IRCC 1998). The safety of entering a building is of utmost concern to ensure that it remains safe under all circumstances. In addition, a building's health is important for public safety. For example, in Victoria the Building Commission has mandated registration of cooling towers and clearing of water storage units to ensure that legionella poisoning does not occur (Building Commission 2004). As well as public safety and consumer protection, regulations are also prepared to ensure that decisions and functions achieve cost efficiency. The preparation of regulations should quantify the potential costs and benefits to be derived from a particular policy suggestion.

### 2.3.3 Early period of regulation development

The origins of regulatory law can be traced to the nineteenth century. Regulation was predominantly an act of central government but enforcement was a matter for local administrators (Ogus 1994). The policy of regulation appears to have two main thrusts for analysis. The first area is the regulation itself and questioning its origin and necessity. The second area investigates how to live with regulation, that is living within an environment where there are boundaries of acceptable behaviour or activity and creating mechanisms which control those who break the boundaries or restriction. Regulation theory is used in the literature as the basis for explaining how different levels of government adopt policy. Discussion centres on how regulation should provide benefits to the regulatory agency and the regulatory firms by developing relationships.

Regulations in the nineteenth century coincided with the rapid expansion of industrialisation and urbanisation, and the emergence of administrative structures to accommodate this. The legal status of the bodies became a problem as they were independent. Eventually these bodies' powers declined due to difficulties with
enforcement and re-emerged with central and local government. In Australia, building regulations arose from a need for public safety and the need to provide for effluent discharge and stable erection of buildings. In Victoria, the first building regulations appeared in the 1940s. Regulations in public health, conditions of employment and consumer protection also emerged. Economic regulation arose from the railways and the supply of water, gas and electricity as these industries were not seen to be competitive.

The period after 1970s was identified as a period of deregulation which involved the removal of external constraints and a change to less interventionist methods and forms. (Ogus 1994). Regulations became less prescriptive and were replaced by recommended standards to be achieved, or by alternative means of meeting those targets. This was particularly important for performance-based codes in building regulations. Social regulation continued to grow in the areas of environment and financial services. It was considered that competition would reduce regulations (Ogus 1994).

The evolution towards a single European market also had an impact on regulatory policy as the national regulatory controls were a barrier to integrated markets. Thus the concept of harmonisation of laws emerged. However, due to national interests, effective harmonisation was limited to general principles where member states retained their own regulatory system (Ogus 1994, Helps 1997). Hart (1998) also recognised the growth of trade issues affecting the national regulatory controls and the potential conflict which could arise in seeking global commerce and the development of the global market.

The growing area of trade liberalisation and the continued penetration of national boundaries have given rise to yet another form of regulation – where the regulator is obliged to comply with the building regulations. Willman et al. (1999), in a paper on regulatory organisations and regulatory effectiveness in privatised companies, used the theoretical basis of other authors to identify the different levels of internal and external trust for the regulators and the regulation of firms. In this area of privatised regulations, it is important to ensure that the regulatee understands the requirements and responsibilities. The study found that the stronger the awareness, the more dependable the relationship with the regulator. This research explores the level of awareness and use of performance-based
building codes. In Australia, performance-based building codes (BCA 1996) are adopted through the building regulations in each State.

The following section has been included to illustrate the development of regulatory reform in Australia and the emphasis on the need for less diversification as a means of achieving economic efficiency and cost reduction.

### 2.3.4 Building regulatory reform in Australia

Australia is a good example to illustrate the process to achieve building regulation uniformity. Earlier reports included proceedings of a conference sponsored by the Building Regulation Review and the Local Authorities Review Program (1990). Australia and New Zealand discussed the need to review the certification of private agents to improve the efficiency and effectiveness of assessment applications for building and planning, and also to examine the role and opportunities for the development of performance-based codes on a national level.

There was agreement to achieve both and this paved the way for further work by the Regulation Review Unit. Based at the University of Tasmania, Graham and Byers (1991) commenced research to review the need to change and streamline the development approvals process. The paper examined the overall efficiency of the regulatory system in Australia and its effectiveness in meeting in the public interest. The discussion paper estimated that it costs $350 to $450 million per annum in delays, indicating the need to not only review the regulatory system but also to highlight the difficulties in local government for the delays (Regulation Review Unit (RRU) 1990 Graham and Byers 1991).

Research reports prepared at the State and national level acknowledged public safety issues, but the focus of the reports was to achieve economic efficiencies in terms of reducing costs for the entire construction industry. In 1990, the Regulation Review Unit prepared an inquiry for the Victorian Government into the building and construction regulations. The inquiry was conducted because of concerns that over-regulation was increasing the costs to the industry and to consumers. The main reform package was a shift in liability from councils to the industry with an extension of private certification. The Building Act (Victoria 1994) provided for both private and municipal building surveyors to issue building approvals. Secondly, the legislative and administrative base was reformed. At the same time at the national level, the Building Regulation Review Taskforce (1991) prepared its final report based on two intensive years of investigation. The report set out a program for streamlining building regulations and to lower the overall construction costs in Australia, which were estimated to be $250 million per year. The agreements in favour of the national system included:

- Development of a single Australian market to enable interstate competition
- Enable innovative designs in regulation
- Provide greater consistency in interpretation
- Provide uniformity of qualifications and provide best expertise.

The fundamental assumption was that a reduction in building regulations would reduce costs for the building industry. No alternative answer to the question was raised by the inquiry such as the enhancement of the quality of administrative systems within the building industry. Deficiencies in the previous system were identified by these reviews as:

- Variation in legislation between States
- Fragmentation
- No transparency of regulations
- Cost of appeals.

In order to achieve regulatory reform both the BRR (1991) and the RRU (1990) stated it would require:

- A national framework for legislation
- Set up of Australian Building Regulation Corporation for national management
Set up a building levy

Provide a five-year reform agenda.

At this stage, none of the reviews considered the international trade agenda, but rather a national model for uniformity. Government authorities have used regulation reform as an integral part of the wider microeconomic reform agenda. Much of the preliminary literature on regulation in Victoria addressed the economic environment, and that regulation reform should focus on not imposing unnecessary costs or impeding opportunities for the development of business. The Victorian Government gave a high profile to regulatory reform activity in terms of microeconomic policy. Generally, for policy statements, the government endorsed a minimalist approach to regulation with a view to a reduction in the overall regulatory burden on industry and a preference for performance-based building.

Previously in Australia, there were eight different Building Acts and Regulations each governing the approval process for the building industry. Today, there are still eight different Building Acts but there is one Building Code of Australia (BCA), which provides for similarity in technical standards and therefore some uniformity across Australia. This change occurred when the Australian Uniform Building Regulations Coordinating Council (AUBRCC) was established, which included ministers responsible for building regulation. The charter was devised to facilitate consistent technical standards and codification.

There was recognition that although there was a single national construction industry, there were eight state and territory Acts demarcating regulatory activity, and furthermore entirely different state and territory approval and dispute resolution processes. It was conceded that the different legislative philosophies were not conducive to national harmonisation of building control and they severely impacted upon the maximum efficiency of the construction industry. (Lovegrove 1993 p.120)

Considerations that gave rise to nationally consistent regulations included social and economic costs, a mobile workforce, inability to meet the demands of international counterparts, engaging experts for different legislative areas and the complexities of the legislation making it difficult to understand amendments without legal advice.
The objective of developing a Model Building Act was to facilitate conformity throughout Australia, to reform liability laws and to come up with an ideal dispute resolution model. If a comparison is drawn from the literature review then the development of model legislation supports the notion for harmonisation whereby the principles contain uniformity but their adoption can be diversified. Such is the case in Australia, where the States have adopted parts of the Model Building Act. The development of the microeconomic reform agenda only briefly considered globalisation and its impact on overseas interests.

Lovegrove (1993) also noted that:

There was no single method of facilitating uniform legislation which could be considered ideal. The most effective method of facilitating uniform compliance, namely Commonwealth legislative enactment, was an approach that the states and territories did not welcome, as it involved giving up state and territory power to the Commonwealth (Lovegrove 1993 p120).

The development of the Model Building Act also gave rise to the consideration of performance-based building codes. The BCA, which came into operation in 1996, is a performance-based code which sets out the level of performance that a building is to achieve. This allows cost savings in building by:

- permitting the innovative use of alternative materials and forms of construction or designs while still allowing existing building practices through deemed to satisfy provisions
- allowing design to be tailored to a particular building and
- being clear and providing guidance on what the BCA is trying to achieve.

The next section examines the development of performance-based building codes and the reason they were introduced. The question to be finally analysed is do performance-based codes positively influence competition and offshore trading for construction industries.
2.4 PERFORMANCE VERSUS PRESCRIPTIVE BUILDING CODES

2.4.1 Introduction

The Interjurisdictional Regulatory Collaborative Committee (IRCC) has defined performance-based codes, and this has been used as the basis for this research:

By the term 'performance-based' we are describing the situation in which regulations are written in terms of the required outcome rather than by prescribing the process by which the specified outcome can be achieved. The adoption of this approach opens up the possibility of new and innovative solutions to the construction process. At the same time it provides a clear definition of the levels of ‘health’, ‘safety’ and other societal issues that a particular country has chosen to establish as a minimum for its own society. (IRCC 2004b p.2)

The previous section reviewed the development of global trends towards homogeneous regulations and identified benefits such as increased offshore trading, marketing abroad and removal of trade barriers. The underlying reason for having regulations for public interest in terms of the health and safety of the public, was also a focus (IRCC 1998). As part of the evolution towards achieving common goals, the regulatory sector took up the challenge through the formulation of concepts that could be applied uniformly by the building industry (IRCC 1998). The solution to achieving uniformity was the development of performance-based codes as distinct from prescriptive-based codes (Foliente 2000, Bukowski 2001, Beller et al. 2001, CIB TG37 2004). This section will also review the literature on performance-based codes, their impact on offshore trading for the construction sector and the economic reasoning behind trade accessibility (Deroukakis 2000).

Review of the literature suggests that innovation and flexibility are the key to building design (Tubbs 1999, Foliente 2000, ABCB 1997, CIB TG37 2004). The next section examines the philosophical underpinning of performance-based codes by referring to the need to address social objectives and reviewing the theoretical assumptions for code development. The literature review demonstrates that a reduction of prescriptive codes would not only remove trade barriers but provide a global standard where flexibility will prevail (Hart 1998, Deroukakis 2000).
2.4.2 Benefits of performance

The research mainly focused on the general development of performance-based building codes through government and building organisation published papers, conference papers and professional journals. There are a number of key researchers who specifically look at the details of performance-based building codes include the ABCB (1997), IRCC (1998), Tubbs (1999), Thomas, R. (1999), Foliente (2000)Nassau (2000), and Beller et al. (2001). The bulk of the material comes from the IRCC itself. There is further research material on the implementation of performance-based codes in relation to fire management, but this material is not considered as part of this research topic.

Some of the more comprehensive literature prepared on the move towards performance-based building codes was prepared by the IRCC in 1998\(^\text{12}\). The intent of the IRCC is to advance a common understanding of the international regulatory environment, to promote the exchange of information and to facilitate a more open environment of inter-jurisdictional commerce in the use of building design and construction (CIB TG37 2004 p. 6). Further, the IRCC discussion paper states:

> The trend around the world to introduce performance-based codes is central to improving efficiency in the construction industry. In encouraging innovation and flexibility without strict prescription, performance-based building codes encourage new techniques and practices, leading to expansion and increased efficiency. This promotes investment in the industry, which in turn increases national GDP. (IRCC 1998 p. 3)

The assumption regarding the benefits of performance-based codes in terms of efficiency and innovation will be discussed in a later chapter. Performance-based codes and the analysis on the social objectives behind their formulation, development and subsequent implementation by various countries are central to this research.

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\(^{12}\) This committee is comprised of representation from a number of countries and their purpose is to work internationally, producing documents on the development, implementation and support of construction-related, performance-based regulatory systems. The role and function of the IRCC is pivotal to this research and also the adoption of performance-based codes by the countries or building authorities.
The underlying support for any regulation should be consideration of the basic theory supporting the need for the regulation, which in this case is the public interest theory (Ogus 1994). The above discussion paper referred to public policy considerations in the formulation of performance-based codes. It was acknowledged that prescriptive building codes only include general statements for the protection of the general health and welfare of the public. The use of performance would encourage innovation to protect the health, safety and welfare of the public and other policy objectives. Just how much these objectives have been met needs to be further evaluated.

Comprehension of societal needs is a fundamental part of public interest theory. The basic concept was that a prescriptive building control system interferes with one's liberty of choice in building and, so, limitation of such interference should be identified as the purpose for improving the legislation (Ogus 1994, IRCC 1998). Therefore the social objectives should be in the primary goals; for example the key to having building control is to ensure that buildings are built to safety standards for the wellbeing and health of the occupants. A further goal can therefore be that a portion of the industry may wish to seek international opportunities to trade. However, it appears that the literature focuses more on the need to trade as the reason to have performance-based codes. Only a small number of firms in Australia however, undertake offshore investment opportunities. Most construction is undertaken within the domestic sector13. Therefore, an interest in social objectives and reasons for regulations should be of utmost importance.

Performance-based codes require that social objectives may include:

- Amenity, welfare and convenience
- Physical interdependence for people with disabilities
- Protection of property
- Protection of the environment
- Conservation of particular resources, for example water or energy

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13 Chapter 3 will research the trends in the construction industry in Australia and the proportion of work that is being undertaken offshore. By comparison performance-based codes are prepared for the entire construction industry whether they are domestic or internationally inclined.

Unfortunately, there appears to be a lack of literature offering critical analysis of how performance-based codes may satisfy public interest theory objectives and therefore forms a gap in the literature review. Rather, societal goals are meant to be explicitly expressed as an objective in using the code. The IRCC (1998) has indicated that countries can include these matters as part of the formula in developing performance codes as they can differ between countries. The question remains whether developed and developing countries provide an acceptable level of building safety to their communities. The need for further evidence to substantiate this is not covered in the literature. A later section will look at the risk of using performance-based building codes.

The IRCC (1998) considered strategies in the area of technology requirements, the need for education, training and delivery, and the scope of public policy consideration. This also included the social objectives, scope of legislation, assessment of compliance with performance and technical disputes, the support framework and enforcement, as well as process management including management and costs. While these form the basis of codes, the degree to which they protect or deliver an outcome needs to be investigated. The same areas have been referred to in a recent document: ‘along with regulation there is a need for an entry representative of enforcement, support tools, education, supporting public policy and many other aspects’ (CIB TG37 2004 p.4). The literature suggests that the life safety of a building is at the forefront of all building regulations and codes (IRCC 1998, ABCB 1997). At least that is the case in developed countries, but it is unlikely that the same can be said about developing countries (Nassau 2000). All too often the media carries stories about collapsed buildings and the inability of building infrastructure to withstand earthquakes.

There also appears to be a limited uptake of these themes in academic or professional journals, creating a further gap in the literature. There is generally a shortage of refereed journals which can be used by the industry to advance research.
2.4.3 Assumptions for performance versus prescription

There is a fundamental difference between performance and prescription. In the past, prescription was seen as a measure to satisfy key requirements for compliance with building regulations. This meant that buildings were constructed in similar ways to achieve compliance with the requirements, providing certainty with outcomes and expected results. The prescriptive approach described by Bradbury *et al.* (2000) noted that regulatory methods require less initial effort than their performance counterparts, and a prescriptive method was much easier to enforce. It was also recognised that some countries are currently limited in their fire engineering tools, significantly deterring the movement to a performance-based regulation (Bradbury *et al.* 2000). With new building designs and new market products, compliance has been more difficult to achieve.

A prescriptive-based building control system provides precise specifications and description of how a building must be constructed in order to comply with the building controls. IRCC (1998), Tubbs (1999), Thomas, R. (1999) and Nassau (2000) have argued that this approach does not allow for innovation, is inflexible and generally not cost-effective. However, prescription provides certainty for the designer and the building code official with less room for legal argument. It also does not require the same amount of expertise, education and training of both designers and officials.

Under a prescriptive regulatory régime, decisions were dependent on detailed construction requirements which provide acceptable solutions for the designer to build to and the building surveyor to check against. Under the prescriptive environment, problems arose when a designer/builder wanted to change the rules. Prescriptive rules were also unable to respond quickly to changes in the industry with new products on the market and therefore could ultimately become prohibitive to apply. ABCB (1997) noted that the use of performance is not new, as building surveyors were able to exercise a similar discretion before.
Generally, prescriptive building regulations have been regarded as a trade barrier because compliance is required to a prescriptive set of building regulations dictated by that country’s jurisdiction (Hart 1998, Wilson 1997, Deroukakis 2000). The use of performance-based building codes by virtue of the qualitative elements will encourage standardisation between countries and therefore reduce trade barriers (Foliente 2000, CIB 2004, IRCC 2004a).

While this research refers to globalisation and therefore implies international consideration, there are fundamental differences between countries which are developing and which have no formal building code. Acquaah (1986) reviewed international regulations and transnational companies. He argued that the usual view of international regulation of economic activities emphasised cooperation to resolve specific problems, particularly to facilitate trade and commerce. However, developing countries promoted the idea that international regulation of economic issues should do more than merely facilitate trade, but should also address equitable distribution of benefits and problems: ‘What was needed was a regime that would address the existing imbalance which left Third World countries at a disadvantage in international economic relations’ (Acquaah 1986 p. 22).

The literature review found that the use of performance is largely limited to developed countries only and does not include developing and struggling economies. Nassau (2000) indicated that there is a limited application of performance-based regulations in developing and underdeveloped countries, and this has removed their ability to be included in global trading opportunities. The main drawback with performance-based codes and their operation is that they omit the developing economies almost by default. This is critical in considering the international trade agenda as the opportunities for Australia may emerge for developing economies which do not have performance codes or any building regulation. This will be discussed and validated in a later section.

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14 For example East Timor is in the process of considering building legislation to ensure community building safety but for a while they were more concerned about other key human safety issues such as clean drinking water.
Developing countries are more concerned with poverty alleviation often before the safety of buildings becomes a key factor in terms of setting up appropriate construction regulations and industry dynamics (IRCC 2004a). Often a tragic accident and the collapse of a building or civic infrastructure will promote the need for more improved construction standards within that country but problems eventually arise with implementing and enforcing requirements. The underdeveloped and developing countries require funding by development assistance programs by the World Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the Australian Agency for International Development (AusAid) and the like.

This research thesis will refer to developed countries\textsuperscript{15} that have had years of experience and practice with quantitative codes and have now ventured into performance and qualitative documents.

Some of the literature suggests that the benefits of a prescriptive approach provide certainty for the designer and for final approval and compliance (IRCC 1998). There are probably fewer legal issues arising out of compliance because one either complies with the prescription or does not. Having a base level also means that there is no need for advanced expertise and the further education and training of users of the building system.

Prescriptive building codes have been described by the IRCC (1998), the ABCB (1996), Foliente (2000) and Nassau (2000) as inflexible, making it more difficult for other countries to enter the market place through construction solutions or the use of alternative products. Prescriptive codes which are different in each country are regarded as non-tariff barriers to trade (Hart 1998, Deroukakis 2000), which eventually inhibit the development of a global economy.

The prescriptive counterparts, unlike performance-based codes, did not specify objectives and functional requirements which are qualitative assessments. They can also include

\textsuperscript{15} Developed countries would include United Kingdom, Canada, USA, Japan, Western European countries, Hong Kong, Singapore, South Africa, Australia, and New Zealand.
quantitative judgements. Many countries including Australia and New Zealand have decided to pursue and adopt the Nordic five level structure as the model for their regulations. This format of the Building Code of Australia includes:

- **Objectives** – expressed in general terms about what the community expects from the regulation
- **Functional statement** – indicates in general terms how a building is expected to achieve its objectives
- **Performance requirement** – how a building and the various elements which constitute it are expected to perform
- **Deemed to satisfy** – a detailed indication of the steps or recipe which may be taken to guarantee that the performance criteria will be achieved. Can be used by a designer, builder or manufacturer who does not want to develop new means of achieving performance requirements. It may also be specified in the Australian Standard or other documents that are referred in the BCA or tried and true solutions used over previous years
- **Alternative solutions** – are all possible means of satisfying the performance requirements that do not fall within the deemed to satisfy provisions (Standards Australia 1997 p. 13).

Figure 2 shows the performance BCA in Australia, based on the Nordic system. It is arranged according to a hierarchy of provisions that starts with an objective and is followed by the functional statement, performance requirement and building solutions. The building solution may be an alternative solution. Deemed to satisfy is quantitative (prescriptive). Functional requirements (statements) can be a qualitative way of deciding what steps must be undertaken to achieve a stated goal or objective. It has been mentioned that no single model would address every country’s need and therefore would result in differences around the world (ABCB 1997, Nassau 2000). This is due to the differences between countries in adopting both quantitative and qualitative portions of building codes.
2.4.4 Qualitative and quantitative codes

The key authors in defining qualitative and quantitative codes include Thomas, R. (1999), and Beller et al. (2001). The latter presented a paper to the CIB World Congress on this issue\(^\text{16}\) (CIB TG372004). Qualitative controls are non-measurable statements of what is intended to be achieved by a building control. Quantitative controls are measurable statements of what is intended to be achieved. It has been argued that the top level of a performance system model is qualitative and expresses the needs of society and consumers, with detailed numerical or specific design methods not being provided (CIB TG37 2004). Both forms of performance requirements provide the designer with a greater scope for innovation and design flexibility and for cost-effective building solutions (Nassau 2000). The in-depth interviews will analyse their use by the industry.

\(^{16}\) This area is also subject to further research by the CIB Technical Committee 37 (Performance-based Building Regulatory Systems).
Thomas, R. (1999) presented a diagram on the transition of prescription to performance codes. Figure 3 illustrates the key variables which are defined as the pendulum in policy regulation moves from a prescriptive building code that defines measure to a more performance oriented building code where objectives determine compliance and provide alternative design solutions.

**Figure 3 Transition from quantitative to qualitative (measure) performance codes**

![Diagram](image)

Taking the first key transition, prescriptive codes are quantitative and as a country adopts different levels of performance-based codes the quantitative aspects of measure are reduced and replaced by more qualitative data. The more performance codes there are, the more likely a qualitative decision will be made.

The figure illustrates how the range of options increases as the dimensions in the use of performance-based building codes increases, yet both qualitative and quantitative criteria are required. The use of purely prescriptive building codes provides for a measurable solution to a design issue, but with increasing performance the number of design options increases dramatically and therefore provides for greater opportunity for innovation in building and product designs. The final part of the diagram is vital to comprehending the use of performance by making the assumption that policy makers and authorities control quantitative building codes. However, as the level of performance-based codes are introduced so the control shifts from the local authority, to more control and decision
making by the building designers. The level of skill required to operate a performance-based building code system also increases. Thomas R. (1999) concluded that the level of qualitative or quantitative criteria, in terms of expressing the requirement, would have a significant effect upon how we go about enforcing the code and also the range of alternative approaches that are being permitted within regulations.

The increasing skill level and the move away from authority control to control by designers will be much debated in countries are seeking to implement a performance-based building system. They will have some impact on a country's ability to successfully implement and enforce this type of system. Unfortunately there is little research material available on the different qualifications and skills required for the use and implementation of performance-based codes.

Many governments would not want to give up control of what they regard as satisfactory building standards which are acceptable to the public. For example, as structural loading is a safety issue, it is acceptable as a quantitative value for identifying the building load and may be included as a minimum requirement in the building regulations. CIB (2004) provided a Performance System Model (PSM) which has stated criteria in terms of quality and quantity. This particular model (PSM) originated from the IRCC and expanded on the NKB model by adding varying risk (performance) levels.

Qualitative descriptors of performance-based codes rely on the expertise and education of the building designers in discussion with the building surveyor who is responsible for compliance with the building code at the early stages of the building design process. Nassau (2000) and Bukowski and Peacock (2001) have noted that performance solutions require individual evaluation or discretion. Analytical methods that support performance solutions require appropriate measures of performance under similar conditions. Often designers and regulators need to find relevant types of data. Performance requirements are an expression of safety levels acceptable to the community, which can differ between different communities (Nassau 2000).
Beller et al (2001) examined whether or not quantitative criteria should be part of the mandatory position of performance-based codes. The research found that some countries have qualitative criteria written into the legislation but in other countries regulations are quantitative and are found in deemed to satisfy documents, or acceptable methods, or other reference standards. They took this further arguing that there is no single way to deal with quantitative versus qualitative values. Australia has a qualitative document because it is a public policy document, and the BCA includes deemed to satisfy prescriptive measures and provisions. Similarly, Canada has quantitative aspects also in its building regulations. On the other hand, New Zealand and the International Codes Council (ICC) consider building regulations to be public policy documents and therefore refrain from using detailed measurements and descriptions in their documentation at the broader level. The UK conforms to ICC regulations. (Beller et al. 2001).

The most important issue noted by Nassau (2000) and Beller et al. (2001) is that qualitative performance requirements move the responsibility of determining what is required from the building control authority to the designer. Jurisdictions must understand this shift in responsibility and be satisfied that the design professionals are both sufficiently educated and responsible to take this step. This requires appropriate education and accreditation systems, and the monitoring of practitioners who administer qualitative decisions due to the potential for litigation in respect of their decisions and the quality of work (Campbell 1997, Lavers 1999).

Over recent years there has been a growing trend for countries to adopt a performance-based code with clearly defined criteria. This trend is continuing through the growing importance of international building regulation committees. Nassau (2000) has noted that the advantages of performance-based building codes, particularly in relation to allowing or enhancing innovation, trade and competition, have been recognised by many countries, but at this stage relatively few have actually taken the step of adopting one.
2.4.5 Development of performance-based codes in Australia

Australia had followed a trend that emerged overseas for the introduction of performance-based codes. In 1996 Australia first introduced the concept of performance codes with BCA96. It was recognised in their introduction that while there are benefits there are also risks (ABC 1997). The exercise of discretion by those making the decisions will require a higher level of skill and knowledge and therefore education will be required. Although some education programs were in place it could be years before there are skilled and experienced practitioners in performance codes. The use of performance codes and the level of training and education will be addressed in the following sections. The research will consider how the lack of knowledge in applying performance codes would have an impact on offshore trade.

Victoria adopted the performance-based version of the BCA96. As a result, building surveyors were able to apply performance standards to specific building products and building techniques as an alternative to using prescribed regulations in the design and approval of buildings. It has been assumed that there is more flexibility and creativity for to the building industry while maintaining health and safety for building occupants.

Thomas, B. (1999) showed the savings that can be achieved using performance-based fire systems for a number of projects in Victoria. He found that for the Crown Casino development in Melbourne, secondary steelwork, which was designed to delete the required fire rated level (FRL), resulted in cost savings in regards to material and labour, and indirect savings with construction programming. Also, for the Federation Square project, use of primary steelwork for the main plate over the railway lines, designed as a level 3 risk, validated the deletion of the required FRL structure and deleted the installation of sprinklers to the underside of the deck over the railway lines.

The use of performance-based systems in the building industry has also been justified by researching the key areas for efficiency (CSIRO 1999):

- Ease of privatisation
- Savings in time and cost of projects
Chapter 2 Globalisation and the Development of Performance-based Codes

- Ease in understanding and interpreting terminology in performance-based systems
- Enhancement in the building industry.

One of the key issues identified was that innovative solutions could be accompanied by technological risks. This would require a more comprehensive regulatory effort to administer in terms of design success and design failures than currently administered by the IRCC. Exposure to legal litigation in terms of the deemed to satisfy provisions have not had adequate times to determine what or how the law courts will be considering qualitative requirements (Campbell 1997, Lavers 1999).

Campbell (1997) identified there was little legal evidence to determine the actual implications arising from the use of performance-based building codes. There was potential exposure to professional liability for the use of alternative solutions. In this regard it was important for the building surveyor to maintain a competent level of understanding of the application of the codes and to recognise their limits. In particular it was vital for surveyors to keep proper recording and documentation of decisions such as the methods used to establish compliance and keeping documentary evidence to support decisions such as engineers' reports which support the argument for the provisions.

2.5 PERFORMANCE-BASED CODES AND OFFSHORE TRADING

Once building and construction companies and enterprises have broken through the difficulties to trade overseas, they are confronted with another barrier of complying with the country’s building code and building laws. Where there is no standardisation or global uniformity of building code provisions, this means that the codes will be different in every country, thereby acting like an additional barrier to trade. Some countries may prefer this to keep work domestically confined in their local economy, but there may be little control of an international tender entering the domestic market. Key authors in this area include Hart (1998), Deroukakis (2000), Nassau (2000) and Foliente (2004). Prescriptive codes, which are still enforced in most countries, have been described as a major non-tariff barrier that inhibits building and construction trade.
This section draws attention to the use of performance-based codes as a benefit for trade. GATT and the WTO require all trade barriers to be dropped, demanding transparency of requirements where others can see the reasoning for the requirements. Prescriptive codes that apply to only a host country act as a barrier to trade for others seeking offshore business opportunities and the ability to export products to other countries.

Deroukakis (2000) noted that standards and technical regulations have created another level as a barrier to trade. In particular this is evidenced in the building industry where different countries have adopted a different set of standards for construction, having alternative values on occupant safety.

Despite progress in the development of international standards and in the negotiation of multilateral and regional disciplines on the application of standards and related regulations, technical barriers to trade in goods and similar barriers to trade in services remain a series of potential impediments to international trade (Hart 1998 p.32).

To address this issue, the WTO included a number of clauses in the WTO Agreement on Technical Barriers to Trade (WTO 2004). These clauses provide for conditions to the use of technical standards to aid trade between countries and to adopt international standards, and they also refer to the use of performance rather than design or descriptive characteristics. Two clauses have been selected to demonstrate the provisions. The word building does not appear in the text, but it has a broader application:

Clause 2.1 Members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favourable that that accorded to like products of national origin and to like products originating in any other country.

Clause 2.8 where ever appropriate, Members shall specify technical regulations based on product requirements in terms of performance rather than design or descriptive characteristics. (WTO Technical Barriers to Trade 2004).
The literature review did not reveal a detailed analysis of how the WTO agreement in total affects the building and construction industry. Some of the authors, such as Foliente (2000), have taken a small section of the agreement to identify a point. There should be further research developed on the total meaning of the provisions and a review of the research undertaken to make the statements. The researchers’ concern is that the whole basis of performance-based codes has been on the principles of trade and innovation. The question that will be explored further in the research is: how many people use performance-based codes and trade overseas?

The above agreement suggests the industry needs to be similar and equally have a market share of each other’s economies, and allow for offshore employment opportunities in alternative countries which share the same level of building legislative requirements. On the other side, however, is an economically vulnerable country which is also placing itself before the open global market, risking that construction opportunities are provided to an offshore company. This occurs at the expense of the local market being able to provide the product or service, but at a higher premium.

Performance-based codes are seen to support global trade policies in the following ways. According to Deroukakis (2000), performance-based codes:

- will provide international credibility
- will provide a common basis upon which products and solutions can be compared and assessed – i.e. can be used to create a common market
- can be used as a marketing device to expand trade opportunities
- preclude other countries from using regional regulatory systems to restrict trade
- support innovative products/new technologies and provide new export opportunities
- can simplify conformity assessment procedures.

Deroukakis (2000), Hart (1998), IRCC (1998) and Nassau (2000) all explored the relationship between international trade and the need for performance-based codes. They argue that governments have acknowledged the interrelationship between the regulatory environment and the impact of additional regulations in the way industries operate within the global economy. This development and adoption is central to this research.
Deroukakis (2000) supported the notion that generally performance-based codes facilitate trade but has indicated in the literature that there may be some barriers:

- Given that performance-based codes require an increased sophistication for their development and enforcement, it may prohibit less skilled and developed countries from implementing them.
- No single regulation can balance the cultural, legal and economic environment of every country.
- Evaluation methods for performance-based codes in different countries can create confusion and difficulties among trade partners.
- Performance accreditation systems may be different in liability risks and the difference can serve as a trade barrier.

Clearly it is important to question as part of the research the amount of consideration given to the ease of implementation of performance-based codes by other countries, the type of education and marketing campaign to train the persons using performance-based codes, the advertising of material to ensure that all relevant designers are aware of the latest products that improve global compliance and ease the use of performance-based codes.

Hart (1998) recognised that little systematic research has been done on the economic and trade impact of differing standards and technical barriers nor is there prima facie evidence that they are harmful. Indeed, there is much evidence that standards can promote and facilitate trade.

Deroukakis (2000) mentioned that as the global marketplace is going to increasingly apply pressures for more countries to move towards the adoption of performance codes. The Australian Government (Department of Industry, Science and Resources 1999) expressed concern that ISO standards tend to reflect the European industry. To ensure this can be overcome the government took a proactive approach by being involved in ISO committees for building standards (DISR 1999).
In accepting that performance-based codes can have an impact on foreign trade it has also been recommended that the successful transition from prescription to performance will require (IRCC 1998, Deroukakis 2000, Foliente 2000):

- technology
- education programs
- public policy
- support framework
- implementation process.

Whether these have been achieved should be subject to further research. Given the breadth of overseas leadership in construction, the Australian Government has sought to promote Australian building and construction industry as embracing an export culture over the next decade. However, it was also noted that Australia cannot consider itself a significant global player in the construction area (DISR 1999 p. 68). The future of the Australian construction industry and how performance-based codes will affect its potential construction performance will be considered in the next chapter. The CSIRO (2000) has also argued that the international standardisation process will advance with or without Australian involvement. An important point to note is that the political basis for action stems from the WTO Agreement on Trade, which provides heightened authority for ISO standards. The conclusion of the CSIRO was that if Australia wanted international standardisation processes to include its interests, such as climatic conditions, then it must be active in relevant international forums.

### 2.6 OFFSHORE TRADING AND THE AUSTRALIAN CONSTRUCTION INDUSTRY

#### 2.6.1 Introduction

This section explores the literature related to the Australian construction industry, its overseas competitiveness and comparisons to international markets. This information provides the backdrop to understand the philosophy behind the government’s agenda to improve Australian competitiveness and endorse the use of performance-based codes. It
also refers to how performance-based codes will assist the industry. Governments in developed countries have recognised that variations in building practices and construction standards may effectively create an impediment to trade and that mechanisms to eliminate these technical barriers are being investigated.

An early point to be emphasised is that the Australian construction industry and its exports are identified as materials, products, systems and services (Centre for Strategic Economic Studies 2000). Traditionally, the literature related to the industry measured success in terms of exports and derived revenue (DISR 1998, DISR 1999, Engineering News Record (ENR) 2004). The related research issue is how to identify how performance-based codes can improve export trade potential. Such a figure or conclusion cannot be derived from published data on exports. Rather, the researcher must investigate the question with key players who may have a comment on the use of performance-based codes as a means of removal of a trade impediment. This will be discussed in Chapter 4.

### 2.6.2 An export economy

In Australia, the building industry accounted for 6.3% of Gross Domestic Product (GDP) ($46 billion) in 2002-2003 and over 7% of the labour force (730,000 in 2002-2003) (ABS in DITR 2004). In Australian terms, construction business forms an important part of our national economy. However, at the global level the Australian construction industry reflects a different paradigm, where our smaller status is made more vulnerable (Raftery et al. 1998). The share of world GDP is an important measure of a country’s overall strength. Two figures are presented for analysis.

**Figure 4 Share of world GDP and construction as a share of GDP by selected countries 1996**

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent of GDP</th>
<th>Construction as share of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>25.69%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Japan</td>
<td>16.09%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Australia</td>
<td>1.37%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Korea</td>
<td>1.70%</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

Source: Caton (1999)
In terms of the share of world GDP in 1996, construction in Australia had only 1.37%, compared with the USA, having 25.69% and Japan 16.09%. On a world scale Australia is a small contributor and there are probably more opportunities outside than within it. This feature has a significant impact on our strength, export potential and vulnerability. It has been noted by one international authority that Australia's performance was 'small beer' by global standards (Centre for Strategic and Economic Studies 2000, p. xiv).

In order to promote trade, the building and construction industry developed the Building for Growth Action Agenda in partnership with the Australian Government over a three-year period between May 1999 and June 2002. A number of key documents on the competitiveness of the construction industry were published during this period (DISR 1998, DISR 1999, PriceWaterhouseCoopers 2002). Detailed tables on the construction industry and the final evaluation of the DIST programs are elaborated in Chapter 3.

### 2.6.3 Role of the government

In 1998 Technical Resources Pty Ltd prepared a report for the Department of Industry, Science and Resources. The purpose of the study was to:

- Examine the progress of regulatory reform in the Australian building and construction industry
- Identify issues inhibiting further reform
- Recommend policy issues which required action by industry and government.

The report examined issues relating to the construction industry and the regulatory process including performance-based regulations, the Warren Centre for Advanced Engineering, the Building Regulation Review Task Force and the national Fire Safety Systems Code. Although the report acknowledged the benefits of regulatory reform, it did not specifically have a position in relation to the uniform standards of codes at an international level. The report made suggestions with respect to alternative priorities dealing with barriers to trade. The findings of the report provided some insight into the views of the construction industry
in Australia as well as impediments to operating successfully and the type of support that would be required at the Commonwealth level.

The DISR (1999) focussed on seven key issues that were identified by the industry as being crucial to the industry’s long term performance and international competitiveness:

- Utilising advances in technology.
- Innovation, research and development.
- Environmental issues.
- Innovative procurement and project delivery mechanisms (benchmarking, alliances).
- Managing the supply chain.
- Regulation – ABCB.
- Globalisation.

Some of these areas were also identified by the Centre for Strategic Economic Studies (2000). Under the area of regulation, it was noted that ‘shifting building-related regulation towards a system of positive incentives is well understood in most developed countries, but regulatory harmonisation still has some way to go’ (Centre for Strategic Economic Studies 2000). The key areas of interest to this research includes innovation, research and development, the benchmarking projects and changes to regulatory reform in terms of aiding offshore trade. The benefits of regulatory reform include the reduction in the level of regulation and improved safety provided by a more efficient building process. The literature suggests that the major advantage of performance regulations is the ability to provide innovation in design and construction, although specific evidence was not provided. On the matter of international harmonisation it was stated:

> It is now well recognised that the language of performance can become the basis for harmonisation and globalisation of the building industry, and may be a means for eliminating non-tariff barriers to trade. The technical evaluation of innovative materials and systems is carried out by technical assessment organisations against the required performance levels. (DISR 1998 p.17).
Thus the pattern was set that performance will assist the building industry. The DISR (1999) indicated that Australia has signed the World Trade Organisation (WTO) Agreement on Technical Barriers to Trade (TBA Agreement) which deals with this problem. The Asia-Pacific Economic Cooperation’s Sub-Committee on Standards and Conformance (SCSC) also sought to remove technical barriers to trade. The report noted:

In the past the development of international standards has been poor … some International Organisation for Standardisation (ISO) standards tend to reflect the European industry [yet may] be in conflict with national standards, such as those of the US. This makes them less relevant to regional economies, that comprise our target markets, and less likely they will be adopted in those jurisdictions. (DISR 1999 p. 63)

Notwithstanding this concern the government reinforced its objective to become involved in more ISO committees (DISR 1999). The competitive position of the Australian building and construction industry depended on ‘aggressively embracing an export culture over the next decade’ (DISR 1999 p.70). To do this the industry will need to have:

• Greater innovation and research and development
• Greater use of information technology
• Sharper focus on environmental sustainability, and
• Built a critical mass to export successfully.

It was also noted that many companies have made significant inroads into overseas markets, some are multinationals in their own right and the removal of further assessments for conformity would encourage further expansion into overseas markets. (DISR 1999 p. 64). It was also acknowledged that Australian manufacturers of building products are among the world leaders. Australian firms have a strong presence in the Asia-Pacific region, which by the mid-1980s accounted for about 85 per cent of our building and construction exports.
2.6.4 Innovation and research

The arguments in favour of international competitiveness are to improve Australia’s capacity towards innovation to take advantage of market share and the need for strong and sustained levels of productivity. Nutt & O'Hea (1998) noted that in a global competitive market, innovation and efficiency are two important attributes of success. Further, they indicate that a ‘good local reservoir organisation on which a designer can rely for export advice encourages the designer to innovate and design leads to export’ (Nutt & O'Hea 1998 p.38). As an example, De Valance (2001) investigated the relationship between the procurement methods used on building and construction projects, the opportunities for innovation and the subsequent competitiveness of the Australian construction industry. The findings suggest traditional tendering and procurement methods work against innovation. He noted that Australian construction firms have low research and development budgets to determine new ways to do things. The figure below shows the percentage of income that was allocated to further research and development in 1987. The date in itself demonstrates the lack of research in this area, which results in authors such as De Valance (2001) referring to this research.

Figure 5 Percentage of income spent on research and development in selected industries in Australia 1987

<table>
<thead>
<tr>
<th>Selected sectors</th>
<th>Percentage income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>3.9</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3.0</td>
</tr>
<tr>
<td>Mining</td>
<td>1.0</td>
</tr>
<tr>
<td>Construction</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Source: De Valance 2001 (from Building Research and Development Review Committee 1987)
Involvement in construction research and development in Japan has shown 3% of gross receipts, which was the highest research and development spending in the construction sector (OECD 1992). As De Valance has noted:

The larger the firm, the more likely it is to engage in R&D and innovation. Therefore the expansion of international contractors into new markets could lead to an increase in both the size of the largest contractors and their ability to undertake R&D spending. (De Valance 2001 p.7)

The Australian Construction Industry Forum commissioned a report from PriceWaterhouseCoopers (PWC) (2002) into innovation and growth. The report suggested that Australian competitiveness would be hampered by our lack of research towards developing innovative products. However, Australia is slower to innovate than other countries including the UK, France, Spain, Germany and the USA. While the research found that innovation is slow in the building and construction industry, the process in Australia was even slower (PWC). A survey was conducted comparing the Australian Construction Industry Forum (ACIF) and the Department of Industry and Resources with 239 respondents from industry participating. The report found that the greatest inhibitors to innovation are ranked accordingly:

- Internal response pressure
- Lack of capital and finance
- The risk involved in commercialising innovation

The results found:

Innovative organisations experienced significant gains over less innovative peers. High innovators experienced much better financial results than low innovators in the building and construction industry. High innovators scored on costs and improved their turnover (PWC 2002 p. 54).

An indicative statement on Australia’s behaviour in the research found ‘evidence to indicate that the Australian building and construction industry lags behind the rest of the
world’ (PCW 2002 p. 55). It was recommended that the government have a role in demanding innovation in construction and undertaking research into the innovation performance of industry. The wider use of innovative products is more likely through the use of standards and uniform building products that have been assessed and comply with global accrediting methods and requirements. While such products are endorsed, there may be no standards or innovative designs that are maintained due to patents and copyright laws. The overall conclusion is that Australia's strength is not in innovation, particularly if industries maintain low research and development budgets.

2.6.5 Strategy for the future

Globalisation of the construction industry will require a dramatic change to a more strategic long term and enduring approach to deliver a total construction service. The strategy for Australian construction companies is:

- To establish regional and local subsidiaries
- Merging and acquiring
- Forming joint ventures and partnerships with local contractors
- Forming nationality group consortiums
- Investing directly, participating in equity or securing external finance. (DISR 1999)

While Australia is geographically isolated, the government will still ensure that Australian Building Standards Committees are aware of ISO standards. The DISR seeks to encourage the adoption of international standards and develop links with the ISO, but it fails to document or detail which ISO standards they are referring to. There appears to be fragmentation and duplication over the roles and functions of other committees and organisations with a similar charter.

The DISR (1998, 1999) acknowledged the role of the ABCB and the IRCC in the development of performance-based codes at the international level, but failed to expand on

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17 The alignment of Australian standards with international standards is regarded as a challenge by the government to meet the needs of the Australian industry. Reference is made to the section on ISO where it is noted that there are limited committees looking specifically at the issue of globalisation in the building industry. Rather, the standards being considered are those of a technical nature.
the outcomes or evaluate the relationship between the industry and the use of performance-based codes. The CIB is also proactive in establishing international dialogue through committees and working parties to examine performance-based implementation. These organisations will be included in in-depth interviews for this research. Recently a committee of CIB, CIB TG37 (2004), released a final report of its findings into performance-based building regulatory systems which suggest the consideration of future strategies.

In 2002, the Australian Government’s now Department of Industry, Tourism and Resources continued its support of trade and industry policy objectives including:

- Increasing the international competitiveness of Australian industry
- Improving overseas market access for Australian industry
- Development new markets and promoting Australian business and exports overseas.

Another important feature of the building and construction industry is that it is a private enterprise business which operates in isolation of government policy, other than compliance with relevant laws and regulations. It is profit-driven and seeks to find new markets in which its products and services can be sold (Crosthwaite 1998). It is this enterprise which takes the risk in venturing offshore. The fact that regulators have promoted performance-based codes in an effort to promote trade may have a minor impact for these companies. However, the Commonwealth through the Department of Industry Science and Resources, has played an active role in examining how the Australian construction industry operates and how it could improve the operational objectives of the industry throughout Australia and overseas. Whether this effort has any dividends will be considered in the next chapter.

It has been argued that:

The building and construction industry is at an early stage of global industrial formation, that, by 2010 will be dominated by ten large firms … As the globalisation of building and construction continues, linkages into global product systems and with the major project-based firms is likely to be an increasingly important determinant of competitive success (Centre for Strategic Economic Studies 2000 p. 9).
In conclusion, the building industry in Australia has entered a period of major change and must confront the challenges of globalisation, advances in technology, innovation and environmental issues. The Australian Government through its work in this area aims to assist the industry in strategic research, policy refinement and regulatory reform. The recommendations of the Action Agenda have continued to be monitored by the Department of Industry Science and Resources. The strategy is to enable the sector to grow and prosper in an increasingly globalised market. The government Action Agenda was evaluated in a more recent report (DISR 2004), and will be further discussed in Chapter 3. The issue is that there has been little relationship made with the industry in the literature to determine how performance-based codes can assist the construction sector's ability to trade. Yet, the whole issue of performance-based codes generating trade is a major policy platform of regulatory bodies such as the CIB, the IRCC and the ABCB. This leads to a significant gap in the literature in determining whether performance-based codes will improve offshore trade.

2.7 KEY ISSUES EMERGING FROM THE LITERATURE REVIEW

The literature review, identified a number of key issues, including: the trend towards the standardisation of building legislation; the subsequent adoption of the principle of performance-based codes by building authorities; the need for specialist expertise in the implementation of performance-based codes; the use of performance as a tool for innovation; the growing importance of global organisations; and the research question of whether performance-based codes will have an impact on the competitiveness of the Australian construction sector. These issues are summarised below.

2.7.1 Globalisation and standardisation of building legislation

Greater standardisation and uniformity between building products, services and regulations has created the groundswell for organisations to also seek increasing trade opportunities in building and construction projects. The rapid exchange of information between countries enables us to share ideas and research and provide the growth for export opportunities. A
large number of international organisations were established to undertake different tasks including the reviewing of the potential for global building regulations, global research in building related matters and specific research into the adoption of performance-based building regulations. Key references cited throughout the literature on globalisation principles have included Lodge (1995), Hart (1998), Berry and Rafferty (1999), Fagan and Webber (1999), Blair (1999), Keil (1998) and Deroukakis (2000), who referred to the development of standards.

The review analysed the influence of harmonisation as a concept to considering global uniformity. The authors Boodman (1995), Hart (1998), Helps (1997), and Odams de Zylva (1997) recognised that a degree of uniformity could be achieved, more in principle as model legislation than as a universal law with global application. The difficulty mentioned in adopting a universal law is the lack of homogeneity between the legal jurisdictions countries.

Generally there was a lack of rigour in the information and few authors considered the downside or the limitations posed by an international building code. Some of the gaps which emerged included the limited application of an international code to ten developed countries, when there are other countries with no building controls. It seems that developing countries have been consequently earmarked for profit-making opportunities by the Australian construction industry.

2.7.2 International pressure towards the adoption of performance-based codes

The WTO raised the issue of performance-based codes and so gave the impetus to extend the development of performance-based codes across cultural and geographic boundaries. There is an assumption that performance-based codes are suitable for the entire world, but the literature review considered that such uniformity may not suit all. The material published in research reports, conference papers and journals points to the positive benefits of performance-based codes and implies that it is only a matter of time before each country adopts the codes.
Chapter 2 Globalisation and the Development of Performance-based Codes

The number of organisations to consider the global issues pertaining to building is growing. The WTO, CIB, IRCC, ISO, EU, EU PeBBu, Aus PeBBu, CSIRO and BRANZ all have a major objective and this creates further impetus to achieve uniformity in our building requirements. Chapter 4 will further address the role of these committees which are driving towards achieving a global agenda.

Nassau (2000) highlighted a number of issues that need to be taken into account, including that performance is more suitable for developed countries which have the skill and expertise required to implement discretionary decisions. The literature has indicated the problems for developing countries:

The concept of one performance-based building code for all nations is an admirable but utopian goal. It is demonstrated that such uniformity may be possible in developed countries that have similar cultural, religious, socio-economic and political environments, social, legal as well as industrial relations and building industry cultures and traditions (Nassau 2000).

In conclusion there is a general gap in the literature which questions the benefits of performance. A key question of the research will therefore ask respondents for their views on the use of performance-based codes by seeking opinions on the benefits and problems. There are also concerns with our lack of innovation and education skills in developing research on performance solutions. De Valance (2001) showed that the industry spends very little on research and development, and yet this is the key issue in setting a country's ability to utilise performance codes. In Australia, the ABCB (1997) prepared the BCA (1996) as a performance document of building regulations to be adopted by the States. The Model Building Act was also developed for adoption by the States to make us more uniform with each other. Both these tools adopt the performance-based principle and support the notion of harmonisation or uniformity of standards. This was undertaken to ensure that the Australian construction industry could operate with fewer boundaries within Australia. The CSIRO undertook research in Victoria to review the operation of performance-based building regulations, the results indicating a very limited use of performance-based building codes.
Chapter 2 Globalisation and the Development of Performance-based Codes

In respect to a single model, Beller et al. (2001) have stated that ‘no single model will address every country's need’. For this reason differences will arise in the provision of performance-based regulations. There are key organisations reviewing the development of codes including the IRCC (2004a) and the CIB.

2.7.3 Skill levels and expertise

A critical factor in the global adoption of performance codes is the insufficient skill level, education institutions and inadequate training facilities to ensure that a performance-based code could be appropriately enforced and administered. Although the literature did not reveal an education strategy for the implementation of performance-based codes there were key assumptions that this new method of deriving solutions would be taught to the major stakeholders. A key research question to the survey respondent will be to find out what type of education was undertaken. The use and relevance of qualitative provisions are diluted if there are no skilled people available to interpret qualitative information. There needs to be a system of registration or accreditation which deems people competent to undertake the task of compliance with the requirements.

Tubbs (1999), Hart (1998) and Nassau (2000) acknowledged that in regard to the introduction of performance-based codes, other issues to be addressed including technology development, education, public policy and support programs such as peer review programs. Nassau (2000) gave reference that a performance-based system relies on designers and code officials being sufficiently trained and qualified in order to be able to determine whether the design actually complies.

In Victoria, the Building Practitioners Board registers building surveyors, building designers and building inspectors. Architects are deemed to be registered if they are registered under the Architects Registration Act. As well as practitioners undertaking the task of signing off for deemed to satisfy provisions it is also important for the councils and other relevant users to note and manage the risk of future litigation. Where there are private certifiers, then there will need to be further control to ensure those people carry the
appropriate professional indemnity insurance. The literature is limited in terms of how these matters are being tackled.

Another issue to emerge from the literature is that in terms of organisational cohesiveness and cooperation, the building and construction industry operates quite independently from the organisations that promote the adoption and use of building codes. The literature rarely gives cross-references between the bodies and the overall focus is quite separate. The organisations responsible for code development should include information regarding how the regulatory frameworks should operate. The literature that has been referred to rarely interlinks the two areas of expertise particularly to the construction industry and regulators. This leads to the questions: who prepares the code, for whom are the codes, and who uses them?

2.7.4 Innovation and cost reduction

The literature concludes that a performance-based approach results in greater innovation and cost savings. However, the literature fails to show the difficulties in designing for performance for all building based projects. How much of the industry actually needs a performance-based design for innovation? Who in the industry are using performance-based codes and is one system being applied to a small percentage of the users? These are further gaps identified in the research.

This research discusses standardisation, offshore opportunities, and the issue of performance-based codes providing flexibility and innovation. Porteous (1999) stated that building designers were loathe to share ideas about their designs. So, while there is more scope for innovation, if those ideas are not shared then each new innovative ideas will need to be tested using a different range of criteria. That is, one design criterion will not fit all innovative solutions. The cost of preparing a different test for each innovation or design will therefore result in increased test costs. A number of themes were considered in the literature review but was limited in discussion with regard to cost effectiveness.
Some studies undertaken have been into increasing costs of adopting uniform codes. A study prepared by the National Research Council indicated that sixty per cent of exports from the USA to the EU must be certified to EU standards, requiring costly redundant tests (Hart 1998).

In conclusion, information on estimating cost savings as a result of changes to building regulations is not so encouraging. There appears to be a general lack of literature available in Australia on building research on regulatory costs and program formulation.

**2.7.5 Pivotal role of global organisations**

This research explores the proposition that international organisations must be mindful that those countries that are being encouraged to adopt performance-based codes should the expertise and capacity to do so. Based on the theoretical model presented by Thomas R. (1999), it is noted that administration and discretion by the designer increased as the level of performance in the codes increased. This leaves the designer subject to risk and future litigation. Hence, it is vital to maintain high levels of note and record keeping on the criteria for certain decisions (Campbell 1997).

A number of international organisations have been mentioned in the literature review, each with a different purpose. The role and function of all these organisations will be considered in Chapter 4. The fact that there are so many organisations raises the concern of who is really in charge. It seems that each interest group follows its own agenda without fully divulging the need to respond to what the industry may be seeking. The key organisations interviewed for this research will be the IRCC and the CIB as they are responsible for the advancement of building codes and research.

Ofori (1993) identified that one of the reasons why little progress has been made in practical effects relating to construction industry development is the gap between basic and applied research. Study of the construction industry is hindered by the lack of advancement in this area of general knowledge of the economics of the construction industry, which should contribute towards improving the national economy.
Research has been undertaken into Australia’s export opportunities offshore, but how many companies are actually engaged in this business? There is little nexus in the literature between the use of codes and the export of intellectual property and products by the construction industry. That displays a gap in the literature and the research capacity of international building organisations.

The other question to consider is how can governments pursue national interests in a world where the principal organisers have a globalisation agenda rather than a national interest?

### 2.7.6 International trade or public safety

The literature review overall has shown that a key objective of performance-based codes is to promote standardisation between countries thereby aiding offshore trading. The words of the WTO Agreement to Technical Barriers to Trade has been used as the key directive to ensure that all member countries adopt performance-based codes. The phrase 'building industry' does not even appear in the text, and what legitimate interpretation has been made to review the document in its entirety? The other issue is that of interpretation and the difference between technical standards as developed by the ISO and the use of the performance-based regulation. As will be seen in a later chapter, this is the source of much confusion within the industry. The push for performance to be a tool for international trade is at the expense of having building regulations set to meet social demands within a country.

Nassau (2000) has argued that rather than striving for international uniformity, the goal should be to seek health and safety in upgrading or preparing basic building codes. This was further realised at a global conference in Washington (IRCC 2004b) where dealing with poverty and the environment was recognised as an important aspect of global culture.

Final decisions on creating innovative solutions where the product or construction fails are a high-risk business where the health and safety of occupants are at stake. The level of risk needs to be determined and how far the challenge of innovative buildings can be stretched.
Is public safety at risk? The entire concept of performance is to achieve international harmony of building regulations but it is implicit that this should not occur at the expense of public health and safety in buildings. However, performance-based regulations are complex tools which can be used by those skilled enough to apply them. Also, as performance-based regulation is applicable mainly in developed countries, problems can arise for several reasons. Firstly, this leads to the situation where those developing countries which experience many problems, for example with building collapses and inadequate building works and safety, are no better off than before. In a world that is increasingly becoming globalised, there are many countries without building control legislation, and so lives are put at risk. Secondly, the emphasis in the literature on international trade as a key focus is a further concern. The literature concludes that a degree of sophistication is required to enable successful international tendering, but this would be difficult for developing countries to achieve. Thirdly, Australia’s trading partners are developing countries who do not have performance-based codes in place and this may affect Australia’s ability to trade offshore. The research will consider whether the use of a performance-based code is a reason why a country would choose to trade offshore. Does it make a difference? The research will question whether developing countries that do not have a performance code are at a disadvantage for international contractors operating in the region.

2.7.7 Effect on competition

The literature has led to several conclusions about the impact of performance-based codes on construction:

- More competition
- Promote overseas trade
- Remove trade barriers of technical regulations
- Provide for greater flexibility and innovation.

While this is encouraging, some of the figures on Australia’s performance in an overseas market suggest that there is a long way to go before profits can be reaped. As mentioned
the codes refer to developed countries, which implies that trade should be easier in those countries. Caton (1999) had indicated that, given Australia’s size in relation to GDP and proximity to the Asian markets, Australia could do better looking towards developing countries. The research will consider whether Australia’s competition is reduced if it cannot construct in Asian markets.

Competition drives economic performance of countries and industries in the international market. As competition increases and the global economy grows, the relationship between the variables will be more affected by government policies and attitudes. Government policies should therefore assess trade, capital, technology and the specialisation of firms.

De Valance (2001) pointed out that Australian contractors would be competing against aggressive new entrants from other countries who will be using increasing diversity and complexity of procurement methods and technology. This affects the Australian industry’s ability to accommodate change at that pace. Is Australia prepared to have a liberal policy that allows other contractors to come into its domestic territory and compete for local work? Australia has a low research and development budget and needs to consider protection policies before it embraces further competition within its shores.

### 2.8 CONCLUSIONS AND GAPS IN THE LITERATURE

The key research question was to determine whether performance-based codes would help Australia’s construction industry to trade offshore. A series of related questions which were addressed in the literature review included:

- What are the perceived benefits of performance-based regulations for the building industry?
- What is happening internationally with the development of performance-based building regulations?
- Who are the key beneficiaries and users of performance-based codes?
- What is the real agenda underlying the development/introduction of such regulations – public safety or international trade?
These questions have been considered throughout the literature review and they will be further validated throughout the following sections and in the in-depth interviews. The literature provides positive altruisms which have been developed to coerce legislative decision-makers and policy development organisations with foregone conclusions about the need to become part of the global picture or miss out all the opportunities. On the surface everything is favourable, performance is superior, global is best – but at what cost? There does not appear to be adequate research into the risks of undertaking this exercise. There is insufficient evidence to assess whether performance objectives are being analysed in terms of satisfying social objectives, overall construction output, and sharing of innovation designs and there is no central organisation collating information which carries details about any potential risks or threats from performance-based codes.

While in Europe it may be desirable to have common performance products and standards, the situation in Australia and developing countries may be very different. Due to its global isolation, export trade opportunities are not that easy, Australia being limited in the export of products and by our distance to other countries unlike Europe. In addition, given that Australia’s construction industry is not as large as those of other developed countries, the risks of international companies competing for our domestic work opportunities can have negative economic impacts in regard to labour and employment. There has been very limited research undertaken in this area to review the repercussions of these decisions. The key issues emerging from the literature review are:

- Globalisation has resulted in the standardisation of building legislation
- There is growing international pressure through global organisations and government towards the adoption of performance codes by developing countries
- Performance-based codes provide for innovation and reduce costs to the industry
- Performance-based codes will require increased skill levels and expertise
- Global organisations have a pivotal role in developing research and considering issues with the implementation of performance-based codes
- Performance-based codes are a tool for international trade
- Performance-based codes will have a positive effect on the construction industry.
There was limited available literature that considered the problems of performance-based building codes and processes. The key research question is to determine whether performance-based codes will improve Australia’s construction industry to trade offshore. Given that one of the objectives of performance is to facilitate trade then the research should find that Australia’s competitiveness is increased. The next section will review the role of the Australian construction industry and its international competitiveness in more detail. Following on, the research will investigate the role of the key organisations.

In conclusion, the literature review revealed a number of gaps which will be addressed through the use of in-depth surveys. These gaps include identifying any problems associated with the use of performance-based codes, identifying who the codes are written for and if there are any discrepancies, whether there has been adequate education and training, the risk associated for practitioners, the reasons why construction industries go offshore, and whether the respondents believe that performance-based codes would have an impact on Australia's trade potential.
CHAPTER 3 TRENDS IN THE AUSTRALIAN CONSTRUCTION INDUSTRY AND THE USE OF PERFORMANCE-BASED CODES

3.1 INTRODUCTION

There are two key issues to respond to in this research project. The assumption provided in the literature review is that performance-based codes will result in the removal of trade barriers and increasing trade between countries. To further detail this scenario it is important to review both the trade potential of the construction industry and how it is operating overseas, and the use of performance-based codes by the industry. This chapter further elaborates on the material presented in the literature review and provides data to answer the research question.

Performance-based codes as a global tool enables the standardisation of uniform building products and, where adopted by that country or jurisdiction, then all building and construction codes will be assessed according to that building code. Clearly, in theory, the use of a common code throughout countries will enable construction companies and designers to take advantage of familiarity with another country’s building codes or similarity in the product standard. Wilson (1997), Hart (1998) and Deroukakis (2000) explained that this should increase trade between countries. The literature review presented a case that illustrates an ineffectual relationship between the development of performance-based codes and the end user of the codes in the construction industry.

This chapter highlights the Australian construction industry’s ability to trade overseas and explores the data for export opportunities in more detail than indicated in the literature review. It provides the scoping of the extent of our offshore trading abilities. In this section the researcher justifies the sample of construction companies for the in-depth interviews.

The second section provides details derived from a survey (CSIRO 1999) on the use of performance-based codes by the users of the codes in Victoria.
3.2 GLOBALISATION AND THE AUSTRALIAN CONSTRUCTION INDUSTRY

This section examines how the Australian construction industry fits into globalisation, and what impact globalisation would have on construction. The reason for the analysis is to review how the construction industry operates offshore. The literature has shown that the process of globalisation has placed firms in one country in direct competition with another. Australia is part of this process and government policies are encouraging global trade opportunities (DISR 1999, DITR 2004), which will be discussed later. However, the situation is more complex than international trade alone: a sequence of production systems occur through different countries where even the head office of a major plant located offshore can gain recognition (Fagan & Webber 1999). These corporations can take advantage of global opportunities, but they also depend on government regulations, competition and cooperation from local firms. Tieder (1998 p. 550) noted that ‘global construction is construction where the participants come from several different countries’. This can include an owner from Saudi Arabia, a construction manager from the US, a supplier from Korea and a mechanical engineer from Germany. The quote below summarises Australia’s export potential.

Looking at trade performance and overseas activities in 1999 Australian building and construction materials, products and systems were worth $3.2 billion. Export of basic iron and steel at almost $1.4 billion in 1999 accounted for 72% of total materials exported. The next largest was glass and glass products at $97.5 million. For construction services and exports, the study found that there was volatility in the market and that exports are seen ‘as marginal activity which is indulged only when there is an excess capacity/low demand in the domestic market’ (Centre for Strategic Economic Studies 2000 p. 19).

To aid the chronology of globalisation Figure 6 provides a summary of phases. The globalisation movement comprises a number of phases which have been interpreted from the literature and the OECD (1992). The information presented has been raised in the literature review.
Figure 6 Phases of globalisation

<table>
<thead>
<tr>
<th>Decade</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s</td>
<td>Reduced tariffs and quotas, foreign investment, export shares, import penetration</td>
</tr>
<tr>
<td>1970s</td>
<td>Investment in foreign production facilities, shifts in competition between multinational corporations</td>
</tr>
<tr>
<td>1980s</td>
<td>Influence of technology, intangible investment, companies needed technological sophistication, customised products</td>
</tr>
<tr>
<td>1990s</td>
<td>Comparative advantage, new patterns of industrial linkages, use of external alliances, joint ventures, subcontracting, licensing and interfirm agreements</td>
</tr>
<tr>
<td></td>
<td>Offshore trading opportunities, international investment, growth of multinationals</td>
</tr>
</tbody>
</table>

Globalisation was described in the literature review as an ideology without political boundaries where it is not responsible to a national government (Hart 1998). The building industry in Australia has entered a period of major change and must confront the challenges of globalisation, advances in technology and environmental issues. The Australian Government (DISR 1998) through its work in this area aims to assist the industry in strategic research, policy refinement and regulatory reform (ABCB 1997). More recently in Victoria, the State Government (DME 2004) released its report promoting offshore trade.

As referred to in the literature review, globalisation for government creates problems, as it becomes more difficult to control employment, economic growth and the distribution of income tax. Free trade removes all protection, including preference for local products, thereby allowing the influence of foreign multinational companies into the domestic market. The literature review has shown the risks this creates for the local domestic market with the increasing dominance of larger firms who are able to engage in offshore activities. By accepting policies to support globalisation, the Australian government should be equally aware of the risks. Figure 7 below summarises from the literature review the key advantages and disadvantages that globalisation has created for the construction industry.
Figure 7 Summary of advantages and disadvantages of globalisation for the construction industry

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creates new divergent markets – supply and demand</td>
<td>Ignores the nation state</td>
</tr>
<tr>
<td>Cheaper labour costs in some countries</td>
<td>Provides for laissez-faire capitalism</td>
</tr>
<tr>
<td>Business not accountable to the nation</td>
<td>Moving profits offshore</td>
</tr>
<tr>
<td>Work through international treaties for some control</td>
<td>Secures economic advantages in politically vulnerable countries</td>
</tr>
<tr>
<td>Financial deregulation</td>
<td>Decrease government taxes, lack of trade protection policies</td>
</tr>
<tr>
<td>Market competition</td>
<td>Does not favour local firms</td>
</tr>
<tr>
<td>Generates wealth</td>
<td>Removes national sovereignty</td>
</tr>
</tbody>
</table>

Figure 8 summarises the key issues from the literature review in terms of how the construction industry see the opportunities of globalisation and how the regulators view globalisation for the construction industry. There are two different perspectives.

Figure 8 How the construction industry and building regulators penetrate international markets

<table>
<thead>
<tr>
<th>CONSTRUCTION INDUSTRY</th>
<th>BUILDING REGULATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve export potential in new and evolving markets</td>
<td>Homogeneous building products and services</td>
</tr>
<tr>
<td>Marketing policies abroad</td>
<td>Homogeneous technical (building) standards and adoption of uniform codes</td>
</tr>
<tr>
<td>Joint ventures and alliances for companies</td>
<td>Removal of trade and protection barriers</td>
</tr>
<tr>
<td>International trade opportunities</td>
<td>Improve competition in the industry</td>
</tr>
<tr>
<td>Additional offshore profits</td>
<td>Cost efficiencies to be gained through uniformity of product compliance testing and regulations</td>
</tr>
<tr>
<td></td>
<td>Create restrictive agreements to avoid monopolisation by dominant countries e.g. EU</td>
</tr>
</tbody>
</table>
The construction industry has a different primary goal to that of the regulators. The construction industry is profit-driven and therefore more involved with trying to improve export potential and finding larger markets for products, construction services and professional expertise. On the other hand the regulators are promoting competition and placing the industry on what they believe to be a level playing field. The regulators support standard and uniform products and consider that performance-based codes will remove trade restrictions between countries. Unfortunately construction companies differ in their export potential and an equal footing does not always equate to successful penetration of foreign markets.

In particular the research will show that there are many barriers faced by the industry which are broader in scope and complication than whether a country has adopted performance-based codes or not. The DISR (1999) noted that Australia’s opportunity to expand exports is reduced due to non-tariff barriers, ability to export building products, company alliances, incompatible regulatory frameworks, product certification and approval and recognition of professional qualifications.

The research will further explore how the regulators view the mechanisms for the construction sector to engage in competitive practices. Trends in the export of construction projects is not limited to construction services but also ranges from the intellectual services of architects and consulting engineers, and project managers, to the export of building products and company alliances for larger scale projects.

The size of companies and globalisation also needs to be emphasised when discussing multinational companies. The following information demonstrates the size of global enterprises. Three-quarters of world trade is conducted by powerful multinational corporations (Gettler 1998). The world’s top 200 corporations have over 28% of the world’s annual production, employing only 18.8 million people. The five sectors include trading, automobiles, banking, retailing and electronics. Of the world’s largest
100 economies, 51 are corporations and 49 are countries. For example, Mitsubishi is bigger than Indonesia, General Motors is bigger than Denmark, Ford is bigger than South Africa and Toyota is bigger than Norway. They have headquarters in seven countries: Japan, the US, Germany, France, the UK, the Netherlands and Switzerland (Byrne and Rodway, 1998). Corporations were also becoming pluralistic in nature in terms of origin, geographic distribution and form. For example, German-based Siemens air-traffic management was in the UK and Korean corporate Hyundai had its computer network in the US (Gettler 1998).

In 2001-2002, the construction industry in Australia accounted for 5.4% of Gross Domestic Product (GDP) and employed 705,000 people, equivalent to 7.1% of the national labour force. Construction work undertaken in 2001 – 2002 was valued at $58 billion. As mentioned in the literature review, however, from a global perspective Australia contributes only a small proportion to total world GDP. In 1999 Australia contributed 1.3% to the total world GDP (Caton 1999). This small percentage means that there are more opportunities outside of Australia than within it.

### 3.2.1 Australian construction industry and trade

In terms of global trade Australia is a small participant by comparison to other countries. Figure 9 is based on a report prepared by the Victoria University of Technology (Centre for Strategic and Economic Studies 2000). The purpose is to demonstrate the intensity of the leading countries compared to Australia. The data were developed in 1996. Australia is a small player at the global level and while it may be desirable to have a portion of overseas opportunities, its weaknesses will be the level of competitiveness and that larger international firms could penetrate the Australian domestic market (Raftery et al., 1998, De Valance 2001).
Countries including the US, Japan, China, Italy and Germany have the largest portion of the construction industry. In 1996 the top 10 firms controlled one-third of the international market (DISR 1999). In 1996 the US had 48 companies in the top 225 compared to Australia’s two companies. Further interpretation showed 40 of the top 225 international building contractors were active in the Australian market, which was another indication that leading firms in the international industry are globalising their operations. This demonstrates international involvement in our domestic market. The leading international players are the US, Japan, China, the UK, Germany, France and Sweden. They make up 40 per cent of the total revenue (Centre for Strategic Economic Studies 2000).

An update of these figures in 2004 shows a similar picture. Figure 10 shows selected international contractors and construction revenue generated outside that company’s home. In 2004 Australia still only has two major players in the top 225 international contractors list. The companies are ranked according to construction revenue generated outside each company’s home country in 2002 in US$millions. The figures include prime contracts,
shares of joint ventures, subcontracts, design-construct contracts, construction management and ‘at-risk’ contracts.

**Figure 10 Construction revenue generated outside each selected company’s home**

<table>
<thead>
<tr>
<th>RANK 2002</th>
<th>RANK 2001</th>
<th>Firm</th>
<th>International revenue $USmillions</th>
<th>Total</th>
<th>%intern over total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Skansa AB Stockholm, Sweden</td>
<td>11,520.0</td>
<td>13,951.0</td>
<td>82.5%</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Bovis Lend Lease UK</td>
<td>3,625.0</td>
<td>4,658.0</td>
<td>77.8%</td>
</tr>
<tr>
<td>28</td>
<td>32</td>
<td>Obayashi Corp. Corp., Japan</td>
<td>1,057.0</td>
<td>9,767.0</td>
<td>10.8%</td>
</tr>
<tr>
<td>34</td>
<td>37</td>
<td>Leighton Holdings Ltd Australia</td>
<td>731.0</td>
<td>2,923.0</td>
<td>25%</td>
</tr>
<tr>
<td>37</td>
<td>45</td>
<td>Kumagai Gumi Co. Ltd Japan</td>
<td>689.0</td>
<td>4,697.0</td>
<td>14.7%</td>
</tr>
<tr>
<td>77</td>
<td>85</td>
<td>McConnell Dowell Australia</td>
<td>244.6</td>
<td>320.5</td>
<td>76%</td>
</tr>
</tbody>
</table>

Source: Engineering News Record 2004

From the figure it can be seen that the two Australian companies listed in the top 225 are Leighton Holdings, ranking 34, and McConnell Dowell, which ranked 77 in 2002. Construction revenue generated outside the country is comparatively smaller than that shown by Skansa from Sweden, Bovis Lend Lease from the UK and Obayashi Corporation from Japan. The two Australian companies are not involved in commercial construction projects but rather civil construction including pipelines, transmission towers and hydraulics. Also, both companies have a very different amount of international turnover, being 25% and 76% respectively. The figures suggest that Australia does not have a building and construction company listed with the top 225 companies.

As part of the Building and Construction Industries Action Agenda, the Business Builders program 1999–2002 provided $625,000 in funding to assist medium-sized companies in
the industry to seek new overseas markets. This enabled Australian companies to establish a presence in countries and regions such as Africa, China, India, United Arab Emirates, Philippines, Singapore and South East Asia (DITR 2004). It is noted that some of the developing countries do not have performance-based codes.

The Centre for Strategic Economic Studies (2000) report examined the overseas market activities of the Australian building and construction industry. Figure 11 shows the size of construction markets including rank.

**Figure 11  Size of construction markets in 1999 in $US billions**

<table>
<thead>
<tr>
<th>Country</th>
<th>$US billions</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>725</td>
<td>1</td>
</tr>
<tr>
<td>Japan</td>
<td>677</td>
<td>2</td>
</tr>
<tr>
<td>China</td>
<td>341</td>
<td>3</td>
</tr>
<tr>
<td>Germany</td>
<td>316</td>
<td>4</td>
</tr>
<tr>
<td>Australia</td>
<td>55.6</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: Centre for Strategic Economic Studies 2000

In 1999 US dominated the construction market with $US725 billion compared with Australia’s $US55.6 billion. There is also a substantial difference between the largest markets, being the US and Japan, which are twice as large and China and Germany. Australia accounted for 1.6% of the total world construction market. In terms of Australian export, in 1999 New Zealand was the largest single destination for materials, products and systems exports, taking in some $607 million or 19%. The second largest destination for Australian building and construction goods exports was the United States, taking $499 million or 16%. Other major destinations included China (including Hong Kong) at $241 million. Compliance with similar standards would suggest some advantage in the uniformity of building products and design and standards accreditation testing. This thesis is more concerned with the use of performance-based building codes as differentiated from the standardisation of building products but it nevertheless shows that
there is a healthy market for the standardisation of products design in the above countries. The opportunities for standardisation have been referred to in Wilson (1997).

Although Australia is exporting, the conclusions of the Centre for Strategic Economic Studies (2000) report suggest that the Australian building and construction manufacturing industry’s trade performance was not very encouraging as the balance of trade at that time was negative. Australia’s share of world trade in construction and related services is also very small, and few Australian-based companies are major international players. The report stated:

Building and construction (B&C) services exports are a small part of Australia’s trade.

They account for around one-third of one percent of total goods and services export credits… There is very little to suggest that Australia has any advantage in the B&C related services, indeed it appears to be going backwards. Nor at the aggregate level, is there very much of a platform upon which to build successful B&C service exports push. (Centre for Strategic Economic Studies 2000 p. 94)

The above statement provides an unfavourable conclusion and illustrates the limited role Australia can play in the global arena. Regardless of the findings, the regulators continued to pursue the development of performance-based codes to ease trade between countries. Literature by Foliente (2000) and Prior and Szigeti (2003) related to performance codes in Australia suggest that the system has to be ahead of the construction industry and to prepare for the industry's future into the market.

Circumstances may have changed for the better but at the time of writing this report the only evidence of future prospective development was information from the federal Department of Industry, Tourism and Resources (DITR). They had undertaken some major initiatives commencing in 2001, which were reviewed in a report just released at the time of writing.

A broad range of research has been developed and prepared as part of the foundation to this process by the then Department of Industry, Science and Resources. In January 2001
the Australian Government announced that it would provide $54 million to the Co-
operative Research Centre for Construction Innovation (CRC) as part of research
collaboration between government and industry. The CRC aims to create and
commercially exploit construction-related tools, technologies and management systems
through five research programs:

- Virtual environments for lifestyle design and construct
- Construction project delivery strategies
- Environmental sustainability
- Integrated design and construct systems
- Management, adaptability and future of built assets (DITR 2004)

The objectives of the Building and Construction Industries Action Agenda were to:

- provide leadership and facilitate change
- maximise global business opportunities
- foster technological innovation
- create ecologically sustainable environments and create best practice regulatory
  environments.

The projects included the development of a website to benchmark building construction
performance and research. It was argued that in an increasingly globalised environment
the competitiveness of Australia’s building and construction industries could only be
strengthened by access to best practice (DITR 2004). Titled GlobalConstruct.net, this
web-based international benchmarking tool was developed to assist companies to compare
themselves with other companies around the world operating in the same industry
segments and marketing.

The focus of GlobalConstruct.net was on providing tangible returns on investment for
participating companies. It also catered for the needs of industry associations by providing
them with up-to-date interactive benchmarking. In the review, however, the international
benchmarking tool did not cater to determine the impediments from trading offshore such
as builder registration, building licenses and performance-based codes. The benchmarking
initiative found that while companies supported the concept they ‘identified problems with
its implementation – focus on big operators, inappropriate business models, costly, concerns with confidentiality and not user friendly’ (DITR 2004). Also in the review of the benchmarking project (which investigated the cost of construction for seven standards projects), the report found:

Australia’s performance fell below that of OECD economies, an equally important finding was that there was no one area of reform in the industry, which will lead to a large boost in performance. Rather incremental reform across a range of factors was necessary. (DITR 2004 p. 11)

There were other initiatives undertaken by the government to assist the construction industry in Australia. The market place responded negatively to the availability of forecasting services. It was noted that while criticism was directed at their implementation there was insufficient dissemination of the information throughout the construction sector.

Another project, described as having little benefit to the construction industry, was developing improved project documentation to help reduce disputes and improve efficiency in the industry. This project involved extensive interface and consultation with the Australian Procurement and Construction Council. The response was that, while some respondents found the documentation developed to be worthwhile, others found it of little value (DITR 2004).

The Action Agenda recognised that while some Australian businesses had succeeded in exporting building products and materials and architectural and consulting services, opportunities exist for increased exports, especially the export of services to Asia. The following figure shows Australia’s gradual growth in building and construction exports.

**Figure 12 Exports by the Australian building and construction sector ($Am)**

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<td>$391.0</td>
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Source: DITR 2004
Figure 13 shows that research and development spending levels across the construction sector were low and that the changes were needed in culture to embrace greater innovation. The analysis noted:

While individual firms may not have the capacity to spend significant amounts on R&D, there was scope for acting collectively, pooling resources and setting common and generic research priorities, possibly through a landmark research project (DITR 2004 p. 13).

Figure 13  Research and development expenditure by the Australian building and construction sector (SAm)

<table>
<thead>
<tr>
<th>1995-95</th>
<th>1997-98</th>
<th>1999-00</th>
<th>2000-01</th>
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<tbody>
<tr>
<td>141.2</td>
<td>146.8</td>
<td>158.1</td>
<td>154.2</td>
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Source: ABS data (DITR 2004)

As part of the process, the government had also established the National Building and Construction Committee (NatBACC) in 1997 to advise on the development of the Action Agenda. In the review of the progress NatBACC recommended that the Australian, State and Territory governments develop consistent building control and planning control administrative systems and that there be harmonisation of the technical objectives of building control and planning control. It was acknowledged that this would require additional research in the long-term directions of building regulation trends in line with meeting community expectations (DITR 2004).

On regulatory reform the report acknowledged that reforming the regulations is a powerful mechanisms to change the culture of the industry and therefore encourage the development of codes by the ABCB. The Action Agenda process provided funding towards the work of the ABCB. However, while there was widespread support in the comments received for
the work of the ABCB and the move to performance-based regulations, there was little industry awareness of the activities of the Development Assessment Forum (DITR 2004).

The conclusions/outcomes of the work achieved from the Action Agenda included:

- A broader awareness of the global forces shaping the industry and the importance of international competitiveness
- Greater awareness of the benefits of innovation
- Greater awareness of the benefits of a more informed market place
- Progress on sustainability issues by assisting the ABCB to achieve new codes relating to energy efficiency and sustainability. (DITR 2004 p.20)

The literature noted that another important outcome identified by some sectors, which was described as being of a lesser order, was the greater awareness of export opportunities (DITR 2004). Indeed, the documentation led the reader to believe that this should have been at the forefront of its investigations.

While the situation at the national level is looking decidedly weak, the Victorian Government’s message is quite different. The Department for Manufacturing and Export (2004) has advocated:

> A strong export culture is central for growth in today’s globalised world. Selling into international markets both brings home export dollars and sharpens competitiveness of companies and economies, connecting them to world’s best practice and boosting technology transfer, skills development and overall productivity (Department of Manufacturing and Export 2004 p.1)

Unfortunately the intention of the statement cannot be compared too favourable with the performance of the construction industry at the national level. The paper on Victorian exports is aimed to create strength with emerging market opportunities. The report also provided national figures on export opportunities.
An Austrade report in 2001 (Knowing and Growing the Exporter Community) showed only 4% of Australian businesses exported and only 2% of non-exporters intended to export (Department of Manufacturing and Export 2004 p. 3).

From the information above, the construction sector in terms of export potential is not a thriving industry. Nevertheless the Victorian Government provides programs to:

- Assist firms in gaining an awareness of export
- Support firms in growing exports
- Promote Victorian industry capabilities
- Coordinate and build government export services.

This will also be supported by meeting with export advisers who can assist and break through the barriers. An example of a successful venture was that of Grocon, an Australian building construction company which attended the trade mission to Dubai with the Master Builders Association. Grocon’s Joint Managing Director, Daniel Grollo, said:

We think the potential opportunity that exists in the Gulf is unparalleled anywhere else in the world and managed carefully, we see the potential for our operation there, over the next ten years to rival the size of our operation we currently have in Australia. We will start conservatively but our expectations on potential are enormous. (Department of Manufacturing and Export 2004 p. 15)

It is surprising that after all the research and funding that was made available to assist the building industry in its competitiveness on the world markets, there was no funding allocated to review the impact of performance-based codes in international trade. This would also affect designers, architects and structural and design engineers. It appears that the agenda for the construction industry is to promote trade opportunities. This differs from the agenda for the regulators, which seeks to adopt performance-based codes. The literature does not make a direct connection between these two elements.

From the material that has been presented it is clear that there is no strong evidence that Australia is successfully trading offshore. Given all the initiatives and money that has been spent, Australia is unable to successfully show that it is a key player in the global
market. If anything the results show a reluctance to embrace globalisation through the development of offshore trading links. The construction industry itself does not appear to be heavily engaged in assisting the development of further policies in this area. Firms are also unaware of the significance of the material that is being presented to them. It can be stated that they are unaware and do not understand the opportunities which may be available, or simply have decided that it is not for them.

To summarise:

- The Australian construction industry is only a very small portion of the total global building industry. Australia has a growing export base but it is comparatively smaller than those of other leading countries including the US, Japan, China and Germany.
- With an open trade policy Australia’s construction industry may be vulnerable.
- Australia risks losing contracts to larger multinationals and offshore players who seek to enter our domestic economy. Given the size of our largest players it is unlikely at this stage that our industry will be penetrating the international global sector in the short term. However, there may be possibilities for specialist contractors or products.
- The only detailed research on performance-based building codes was undertaken in Victoria in 1999 and shows that their use was limited in building projects. Thus the assumption that they are being used effectively on overseas projects is questionable.
- The construction industry in its literature seems to be making brief statements about supporting the use and development of performance-based codes but is leaving it up to the regulators to make further progress in this area. The industry and the regulators agree that performance-based codes will improve the effectiveness of the Australian construction industry yet there is no evidence that any person is embarking on the challenge to see how this will be achieved.
- The government is supporting growing patterns of export but its policies are not readily accepted by the construction industry.

In-depth interviews of various representatives of the Australian regulatory and building industry will investigate the factors which influence export decisions and provide evidence of what support is required to encourage offshore trading. It will also establish whether
performance-based codes have an impact on the Australian construction industry's ability to export both products and services.


The former Chief Executive Officer of Baulderstone Hornibrook was nominated for an in-depth interview. The company was founded in 1946 and is one of the larger construction and engineering contractors in Australia. It has a presence in Australian cities and in Indonesia and PNG but in overseas markets it is represented by Bilfinger and Berger, its German-based parent. It is a diversified construction group involved with apartment housing, commercial buildings, water treatment plants and pipelines. Bilfinger & Berger has more than 60 branches and offices and over 100 affiliated companies around the world. It employs about 55,000 people worldwide. Group sales reached $US 4.5 billion. In Australia, Baulderstone Hornibrook realised a record revenue of $1.2 billion in 1998 (Centre for Strategic Economic Studies 2000).

The representative of the Timber Plantation Association was also interviewed as a result of recommendations made by other participants that it would be of benefit to the research (Foliente 2004, Bretherton 2004). The Timber Plantation Association has been actively engaged in the export of timber products and has been involved in regulatory committees through the ABCB to develop greater uniformity of product compliance standards.

3.3 USE OF PERFORMANCE-BASED CODES IN VICTORIA

The research question for this thesis related to the use of performance-based codes and how this will aid offshore trading. The Building Commission in Victoria arranged for an independent survey of the use of performance-based codes by the industry. This field of study provides critical information to this research thesis. The material is being used to
justify the need for further education and expertise. In a report prepared for the Building Commission, the CSIRO (1999) conducted research into performance and found that in Victoria:

Knowledge of the performance-based aspects of the BCA96 is not well understood with only 60% of builders admitting to having never used the provision. Although the responses of building surveyors show that their knowledge of the BCA96 is better, still only 37% of them have never used the provision. (CSIRO 1999 p. ix)

The above study was designed to identify whether the legislative changes have provided cost savings and to what extent. A survey was sent to building surveyors to establish information about their knowledge and impact of the performance-based BCA including awareness, level of use, perception in change of functionality, the perceived benefits, reason for use, frequency and use of cost benefit analysis. The survey was sent to 1250 building practitioners who were permit applicants, but of those only 180 (14.4%) responses were received. A second survey was sent out to 1800 new practitioners and the response was 300 (16.6%). Generally it was found that the awareness of the BCA was low, with less than 50% having used it as shown in Figure 14.

Figure 14 Knowledge of performance BCA (CSIRO 1999)

From Figure 14, in 1999 only 13% of people regularly used performance-based building codes, and 33% used it sometimes. It was recommended that there be an education
program about the use of performance, particularly for residential builders. The DISR (1999) also found that although performance standards are designed to create innovation in the building industry through alternative design practices, statistics have shown that only 10% of building work is completed using solutions based on performance. It can therefore be concluded that in 1999 there was limited knowledge of performance-based codes and limited use of alternative design practices. This matter will be further highlighted by the detailed in-depth interviews with building practitioners. It is recommended that further studies be undertaken to determine more current practices with the use of performance-based codes.

When reviewing the reason for using performance-based solutions the majority of respondents indicated these solutions were costly. This result is the opposite to the primary objective of performance codes, that they were to be creating cost efficiencies. Figure 15 shows some of the problems experienced with performance-based solutions by building practitioners. The figure illustrates that there are difficulties with possible solutions under the performance-based approach and difficulties with the preparation of reports and that the process can be costly.

**Figure 15  Problems experienced with performance-based solutions (CSIRO 1999)**

![Bar chart showing problems experienced with performance-based solutions]

Source: CSIRO (1999)
Figure 16 illustrates the use of performance by building surveyors only, showing that 37% never use it and 59% only use it sometimes. Only 4% use it for most projects.

**Figure 16 The use of performance by building surveyors in Victoria (CSIRO 1999)**

![Pie chart showing the use of performance by building surveyors in Victoria](chart.png)

Source: CSIRO (1999)

It can be concluded that in 1999, following the introduction of performance-based building codes, most of building practitioners were generally not using the alternative solutions for most projects. The assumption that there is a global trend towards performance-based codes is concerning as their use in the industry is limited, as indicated by building practitioners. The issue is that building surveyors do not need to use performance-based codes to approve building work. There may be a distinction between the type of building work and the relevance of using performance-based codes. These questions will receive further attention with the in-depth interviews to determine whether performance-based codes should be more applicable to a particular type of project. The issue of liability and accepting risk when using performance codes will also be investigated.

In 1999 there was reluctance by building surveyors and building practitioners to embrace
performance-based building codes. While things may have changed, the government has maintained its support of performance-based codes. It is assumed that performance-based codes are for the benefit of the users even though there has been no additional education to support their use.

The respondents were asked to specify other reasons for the use of performance-based solutions and responses included comments such as:

- Only where it was clear that no compliance existed for life-safety issues
- Where regulation deemed to satisfy is not available
- Improve fire safety
- Usually due to irregular lot shape and savings at tight corners
- Usually at the end of a job if a minor non-compliance needs to be justified to allow to remain without alteration
- Good for solving problems where deemed to satisfy provisions are inflexible.

The CSIRO Victorian study (1999) found that when performance-based solutions are used it is usually to allow for innovation required by the client (41%) and/or a more cost-effective solution (39%). Nearly all commercial builders who were interviewed said they considered performance-based solutions on most projects with the aim of reducing the project cost. Reported examples of savings included 0.1%, 1.5%, 3.3%, and 29%.

The main problems cited with the use of performance-based solutions were the initial costs in proving the solution (24%) and the difficulty in obtaining reports (23%). Nevertheless, less than 10% of builders who used them believed that the benefits were less than the costs, with 50% stating that the benefits were greater than the costs.

Another question related to identifying major problems with performance-based solutions by building surveyors. Figure 17 illustrates the findings.
Overall, the greatest problems in the use of performance by building surveyors were the difficulty in assessing the solution and problems in obtaining the reports. The “other” category included the following responses:

- Lack of guidance to achieve outcome, legal implications
- Replacement of passive protection by active systems that have potential to fail
- Hidden costs of permit conditions (e.g. maintenance or limiting occupancy to x people or y specific use)
- Time consuming; ongoing liability; methods vary widely
- Deemed to satisfy generally quicker and simpler for residential developments
- Country location of practice causes difficulties in contacting relevant authorities (e.g. fire authority)
- No problem benefits outweigh costs, save time and allows innovation
- Difficulties to communicate concepts to clients
- 41% stated that they never used them.

Twenty building industry companies were interviewed to obtain their observations of performance-based codes. A small sample spread was used from large to residential and
commercial projects. It was noted that the use of performance-based aspects of the
building code varied among different users, with residential builders who reported little use
and large volume builders who have never used the provision. The codes where mainly
being used for one-off individual residential designs after having proven that approval
changes to the variations provided actual cost savings.

For homes the savings were $200 - $500 per job. Fire systems gave the biggest savings
mainly due to the sprinklers which can be used to reduce the cost of fire-rated walls.
Finally, performance-based measures can be considered where the building surveyor is part
of the overall design team rather than being the checker at the end of the design process.

However, commercial builders reported frequent use of performance-based solutions, often
resulting in significant time-saving. The most common areas were in ‘fire services where a
combination of smoke detectors, sprinklers and fire rated panelling provided advantages
over fire isolated access and egress routes’ (CSIRO 1999 p.54).

Also, the savings were possible by performance-based decisions being made to the
building surveyor using a specialist report provided by an engineer, which negated the
need to go to the Building Appeals Board. Commercial builders reported significant
savings of $300,000 on projects between $20-$40million.

3.4 CONCLUSION

The data in 1999 clearly provide evidence that there is a lack of knowledge of
performance-based codes by different users throughout the industry. Those that use
performance find it more relevant to commercial buildings, where greater savings can be
demonstrated. The government needs to further address the issue of the use of
performance-based codes by the industry, particularly in the domestic sector. Other issues
that need to be considered include:

- Education and training
- Monitoring the costs of the use
- How performance is useful in offshore trading.
The promotion of performance-based codes may be a utopian goal for all projects let alone be the objective to improve offshore trading. It would be appropriate for the government to review the use of performance-based codes by the construction industry and determine the extent of its usage in offshore trading or when making decisions regarding offshore trading opportunities.

The research found little evidence that Australia’s construction industry has embraced global offshore trading as a result of performance-based codes. Equally the findings in the data cannot successfully demonstrate that there is wide use of performance-based codes, in particular, the use of codes as a means of increasing trade opportunities between countries. If this is the case then there appears to be very little literature available to justify this position. So it can be assumed that utopian goals appear to be in the minds and policies of the regulators. The construction industry as a whole has shown a limited response to the funding and strategies that have been made available through federal government initiatives. It is time for the strategists to review the manner in which the policies were developed. Clearly, there is a need to examine projects on a case study basis and determine how a construction industry can operate at the international level. This would involve documenting the process from the time of seeking the contract through to procurement and investigating the barriers that occur in trying to undertake further activities.

The next chapter provides the research method to respond to some of the concerns expressed in the literature review. It also outlines the roles of the peak organisations responsible for regulatory reform and nominates interviewees from the organisations as well as key industry participants.
CHAPTER 4 RESEARCH METHOD

4.1 INTRODUCTION

In the building industry, there has been a global shift towards achieving some uniformity between countries with the adoption of performance-based building codes and product accreditation. Developed countries have supported the introduction of performance-based codes and there were no views to the contrary. There is also a perceived willingness for government and codes bodies, such as the IRCC, ISO and ABCB, to support the role and direction of global policies in seeking standard building documentation and the application of performance-based building codes in the unquestionable pursuit of globalisation and trade. This has led to the establishment of committees and organisations for support and verification and to aid global discussion of these principles and the acceptance of performance-based building codes. A number of questions need to be answered and an appropriate research method must be selected to effectively respond these questions: What are the benefits and problems of performance-based building codes? Do performance-based building codes remove trade barriers? (IRCC 1998, Wilson 1998, CSIRO 2000, Deroukakis 2000, CIB TG37 2004).

There are three parts to this section on research method. The first part considers the merits of alternative research methods and their limitations. The second part is an account of the research method adopted for this project. The third section provides a summary of the role and function of the peak organisations responsible for the development of performance-based solutions for the building industry. This is represented by a chart which summarises the organisations and their key objectives and demonstrates the breadth of the organisations and committees, concluding with a review of organisations from which the interviewees were selected.
4.2 CONSIDERATION OF ALTERNATIVE RESEARCH METHODS

In developing this research proposal a number of considerations were made about the most appropriate research method to collect and validate the information which responds to the research question. The key research question was: Would performance-based building codes remove trade barriers in Australia and what are the other implications?

The literature review recognised that there was a basic failure by organisations to survey the views of the industry about their opinion on the introduction of performance-based codes, who uses them and, more importantly, its effectiveness for offshore trade. Ideally the research question allows sufficient scope to undertake two sets of research, a survey of the developers of the codes and their users, and a survey of the construction industry and its operation in terms of offshore trade. In the first scenario a survey of the developers of the codes and their users would require consideration of qualitative characteristics in the response. The literature in this area is supported by Sarantakos (1995), Minichiello et al. (1995) and Bryman (2001). The researcher had the scope to consider focus groups and content analysis or in-depth interviews to gain such qualitative information (Sekaran 1992, Bryman 2001). The in-depth interview enables the researcher to describe a situation according to participants and to understand the culture as it exists. This enables the development of theory as distinct from applied research.

An alternative research method which was considered for the construction industry was a quantitative analysis. The researcher could survey various components of the construction industry including general managers or those in charge of offshore operations, building engineers/designers, architects and project managers. This quantitative data can be derived from simple random sampling (De Vaus 1991) that would have sought information over a period of time to report key figures on offshore trade, identifying how different regulations are being used between countries and mechanisms for trading offshore. A similar survey on operational issues was undertaken in the UK by Crosthwaite (1998) when he analysed the internationalisation of British construction companies using an empirical analysis. Crosthwaite (1998) demonstrated that a pattern in trade emerged over a five year period.
using the project managers’ opinion on the percentage of overseas trade and the 
identification of trade regions.

In Australia, the building industry collects financial information which is usually 
confidential but if available would have provided data on the percentage of income derived 
offshore over a five year period. A quantitative analysis would be based on fact, have 
objective reality and be conducted with a structured survey rather than in-depth interview. 
The analysis would commence with hypothesis testing, and deductive and experimental 
data which was not subjective but objective (Bryman 2001).

Researchers can also combine in-depth interviews with other data-collection techniques, 
such as participant observation and questionnaires. The research acknowledges that 
qualitative method can extend beyond the in-depth interviewing technique and that 
methods should be selected and utilised according to the research questions (Sekaran 1992; 
Minichiello et al. 1995). There is also the scope to consider a multimethod approach 
referred to as triangulation. This involves ‘combining different methods in the same study 
to highlight different dimensions of the same phenomena and to compensate for the short 
comings of each method or to validate the findings by examining them from several 
vantage points’ (Minichiello et al. 1995 p.14).

This would provide the findings with rigour and allow for further testing of validity 
through triangulation. Triangulation is usually used in ethnographic research. Fetterman 
(1998) has described this as ‘at the heart of ethnographic validity, testing one source of 
information against another to strip away alternative explanations and to prove a 
hypothesis’ (Fetterman 1998, p.89). He believed that triangulation always improved the 
quality of data and the accuracy of ethnographic findings. Triangulation questions whether 
there is another answer to the reasoning, which is to counteract threats and validities

Structured observation and behaviour was not considered an approach for this study as it 
would not reveal the depth of the responses required to answer the research questions. 
Bryman (2001) has noted that structured observation has been criticised for the reliability
and validity of the issues because it is focussed on the behaviour and you are ‘rarely able to get the intentions behind the behaviour’ (Bryman 2001, p. 173).

Another method considered for this thesis was a case study analysis (Yin 1994) to review the development of an innovative project which was designed by an Australian company who is trading offshore. I took out the word unfortunately – it is better to keep your writing objective. After some discussion with possible participants this was discounted due to some confidentiality issues. In addition the method would not have demonstrated the interrelationship between the different organisations who promote the use of performance-based codes. Future research could consider the importance of case study research in establishing how a construction company can trade offshore and what are the determining factors to trade including the use of performance design and from which country the building codes emerge.

The concept of a full survey of the construction industry was abandoned due to the probable difficulty in obtaining a high response rate from the building industry and issues arising from trying to get financial figures in the competitive environment of offshore trade.

Following a review of different research methods it was determined that the in-depth interview would satisfy the research question by providing a meaningful understanding of the development of performance-based codes and their use by the industry at various levels.

4.3 RESEARCH METHOD

The selected research method was exploratory in nature, identifying how international committees work as the catalyst for countries that are part of the group to adopt performance-based building codes. It looked at the views of members on the committees and reviewed how users of the codes perceive any difficulties and their opinion in respect of international code development for offshore trade. Sekaran (1992) has identified the elements of research design where studies can be either exploratory in nature or
The information for this research was descriptive in nature. This enabled benchmarking of common values and beliefs on the benefits and problems with performance-based building codes and established any similarity in the manner in which a policy is deliberated by various international organisations.

An in-depth interview with key users of performance-based building codes was used as theory building to establish a cohesive picture of what elements should be incorporated to use performance-based codes. This process was instigated by placing at the forefront of the reality perception of the users of performance-based building codes in terms of identifying the benefits or otherwise. It has argued that this method is usually part of an exploratory study where ‘the researcher is attempting to gain understanding of the field of study, and to develop theories rather than to test them’ (Minichiello et al. 1995 p. 75). The descriptive study has enabled the development of a paradigm or model on the preparation of international policies, relevant elements for consideration, identification of how to determine the key players and beneficiaries of the changes, the problems it may present and how the construction industry could participate. Bryman (2001) also observed:

The nature of the relationship between theory and research, in particular whether theory guides research (known as deductive approach) or whether theory is an outcome of the research (known as inductive approach). (Bryman 2003, p. 3)

The mode of research used is a qualitative approach so as to enable research of the actual opinions of key stakeholders to be addressed (Minichiello et al. 1995, Bryman 2001). Other than published statistics available from various reports, there will not be any quantitative data collected as part of the analysis. As previously mentioned this is due to the difficulties to obtain operational data from construction companies about their level of penetration in offshore markets and their reluctance to disclose vital operational information. At the time of the research the building industry in Australia has been subject to scrutiny by Royal Commissions on its operation and therefore seeking a detailed operational survey at this point in time would not be appropriate. Notwithstanding these limitations, the purpose of the research is to investigate the development of performance-
based building regulations and the views of the spokespersons identifying issues and supporting the drive towards their adoption by the industry.

The use of in-depth interviews with a content analysis derived from the results was to ensure that the research examined the basic paradigm beyond the usual rhetoric. Often literature is heavily edited before its release, and some useful clues to such omissions can be revealed with an in-depth interview. In addition, much of the literature is unpublished and the interview will provide further insight into the reasons and logistics for the decision.

The in-depth interview comprised an interview schedule varying from semi-structured to unstructured formats. A semi-structured interview process allowed the researcher to have a series of guided questions to ensure that interviews remained focused. Bryman (2001) also considered that semi-structured interviews allow the researcher to provide the latitude for further questions to emerge. It was important for the interviewer to remain focused, so as to enable a comparative analysis of results. At the same time, opportunities were provided for respondents to include broader or alternative questions which the researcher may not have previously considered. This interview process was undertaken with the international representatives of codes committees and Australian and overseas members of the international organisations involved in the adoption of performance-based building codes. The derived information provided a clearer understanding of the influence, reason and the rational for the operation of international committees and councils and their goals and objectives. Emphasis was on the reasoning for the international adoption of performance-based building codes and the implementation methods for internationalisation of such building regulations. Content analysis was used as part of the analytical review of the transcripts from the interviews.

The questions were not fixed or ordered but evolved based on the interviewee’s response and the need for further clarification in a particular area as the interview developed. The types of questions asked provided greater flexibility than a survey-style interview. This process provided 'a more valid explanation of the informant’s perception of reality' (Minichiello et al. 1995 p.65). Qualitative data analysis was used for responses to open-
ended questions through an interview or for data collected by observation of responses to open-ended questions (Strauss and Corbin 1990).

The interviews used an unstructured approach to facilitate broader discussion. Unstructured interviews dispensed with formal interview schedules and ordering of questions, instead relying on social interaction between the interviewer and informant to elicit information (Minichiello et al. 1995; Bryman 2001). A copy of the questions, which were used as a prompt, is attached in Appendix A. The reason for the unstructured approach is to identify and allow in-depth discussion of the issues to enable them to be understood in the context of the benefit of international building regulations and the implementation mechanism to introduce performance-based building codes.

The interviews were undertaken in a relaxed atmosphere where the researcher commenced with a broad series of questions that would be relatively easy to answer but provide the interviewee with a perspective of what will follow. The researcher will control the flow and the types of questions that become more narrow and later more specific. This type of interviewing technique is classified as funnelling (Minichiello et al. 1995). For example, the first question relates to globalisation, it is very broad and the response is merely to commence the conversation: ‘In your opinion, what is globalisation and what does it mean for the construction industry?’ The results themselves will not provide further clarity or theoretical modelling on the issue of globalisation as this would be unrealistic given the breadth of the subject matter.

Other questions were more focused and discussion will be monitored to ensure that the relevant issues are covered. There are two forms: one for the construction industry and the other for regulators.

The responses were summarised according to a meaningful classification matrix for the purpose of this research, including:

- Perceptions of globalisation within the construction industry
- Benefits of performance-based building codes
- Problems with performance-based building codes
• Cost savings using performance-based building codes
• Who takes responsibility for performance implementation
• Training and expertise
• Role of designers and level of risk
• Removal of trade barriers.

A criticism of this technique may be the selection of the interviewees. This selection may create a bias in the outcomes of the research given that all these people from time to time meet in the one location and make key recommendations that become a best-fit model rather than a series of alternative ways to examine a particular issue. Nevertheless, the interviewees are the drivers for the initiatives and their views form an integral component of the development of government policy in their residing country. For example, the IRCC has membership from the ACCB, who are the authors of the BCA, which is used by each State in Australia.

The purposive sampling method was used in the selection of the interviewees. The peak organisation for the development of performance-based building codes is the IRCC. Some of the members who reside in Australia and New Zealand were interviewed. These people were selected based on their prominence in the organisation and their role within the country they represent. This can be construed as purposive sampling in the selection of interviewees. In addition, other organisations which have a key role will also be interviewed. This includes members of the CIB and AusPeBBu18 that have an impact in the development of performance-based building regulations. Purposive sampling is a form of non-probability sampling where cases are judged as typical of some category of interest to the researcher’ (De Vaus 1991). Purposive sampling cannot be generalised to a statistical population.

These international and national organisations include:
• Interjurisdictional Regulation Collaborative Committee (IRCC) with members from Australia and New Zealand.

18 Aus-PeBBu is Australian Performance Based Building network, launched in Australia in 2003
• Previous coordinator of the European Union PeBBu who has now returned to the ABCB.
• CIB, Coordinator Aus PeBBu.

In addition to the above international organisations there was a further interview on the perspective of Australian counterparts who are responsible for the development of performance-based building regulations in Australia. Some of the international representatives also work for the organisations below:

• Australian Building Codes Board (ABCB).
• Commonwealth Scientific and Industrial Research Organisation (CSIRO).
• Building Commission (Victoria) who were engaged in international contracts to provide building regulatory services to other countries.
• The ex CEO of Baulderstone Hornibrook, which trades offshore.
• An architectural company trading offshore.
• One fire engineer and two building surveyor/fire engineers.
• One representative of the Master Builders Association who manages international operations.

The information presented by the interviewers provides for qualitative research and enable the researcher to develop a theory as something that emerges out of the collective analysis of the data. Bryman (2001) has noted the importance of grounded theory and of allowing theoretical ideas to emerge out of one’s data. Chapter 5 uses the data to establish a conceptual theory or model for development of international codes.

All of the in-depth interviews have been tape-recorded and transcripts have been made of the recordings. Minichiello et al. (1995) argued that validity is enhanced by the preservation of authentic data such as the transcripts of the tape-recorded interviews.
4.4 THE ROLE OF PEAK ORGANISATIONS AND SELECTION OF INTERVIEWEES

4.4.1 Introduction

There are overseas organisations which consider building legislative issues from a global perspective with the aim of achieving some commonality or uniformity in building technical standards, building codes and other areas such as liability reform. These organisations include government and non-government bodies. They include the International Organisation of Standards (ISO), the Organisation for Economic cooperation and Development (OECD), the European Commission in Geneva, the International Council of Building Research (CIB), the Interjurisdictional Regulation Collaborative Committee (IRCC), the European Union for Performance-based Building Codes Committee and the Australian Building Codes Board which meets to consider international building codes and performance practices. The researcher has selected the ABCB and the Building Commission due to their involvement with the development and implementation of performance-based codes. It should also be noted that some technical committees within these organisations are coordinated through the ABCB or organisations in Victoria.

Some participants (Balch, Foliente, Kip, Thomas, and Nassau 2004) have informed the researcher that Victoria and Australia have made significant improvements to the development and use of performance-based building codes both locally and overseas. The Australian Building Codes Board is a resource base for the IRCC and assists in the development of conferences and research material and provides administrative support and shares Australian material in the international arena. The practicality of conducting interviews with people on these committees who reside in Australia was of great benefit to the researcher because their proximity enabled the researcher to meet face-to-face to conduct most of the interviews. These were scheduled when interviewees were planning a meeting in Melbourne. It should be noted that interviews with other international participants residing in Norway and the UK were unsuccessful due to technical problems and were subsequently abandoned.
Also, the CSIRO has an interest in performance-based building regulations and a senior spokesperson is also the coordinator of the CIB committee into performance-based codes. Australia also has representation on various international committees. Figure 18 below illustrates the extent of all the peak organisations.

**Figure 18 Representation of peak organisations**

There are at least 11 different regulatory organisations (as distinct from building and construction organisations) around the world which deal with building and construction matters, whether they are central research agencies (CIB and BRANZ), committees for the development of international standards (ISO), commissions involved with harmonising standards for Europe, or organisations responsible for the review and implementation of performance-based building codes. They all have an impact on the building and construction industry. The researcher interviewed representatives from some of these committees, particularly those whose agenda specifically involves the development of performance-based codes.

Figure 19 provides a more detailed summary of international organisations (referred to above) that have an influence in the development of key policies which may affect the introduction of performance-based building codes and their effect on the building and construction industry. The report focuses on identifying the role and function of the organisation and any recent work that may have arisen in building regulatory control.
Figure 19 is also complemented by Appendix B, which further critiques the development, role and function of these organisations, which are not addressed below.

As can be seen from this detailed chart, there is a large number of organisations who are responsible for the development of standard policies, issues with harmonisation and regulatory control matters. The chart is a comparative analysis of peak organisations potentially involved in the development of performance-based building codes. The chart is divided into the organisation, the objectives or mission statement, the distinction as to whether they promote building standards for trade or promote standards for public safety, views on prescriptive building codes, the relationship to government, and any further comments or outcomes.
Figure 19 Comparative analysis of peak organisations with potential involvement in the development of performance-based building codes

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Objectives/mission statement</th>
<th>Promotes standards for trade</th>
<th>Promotes public safety standards</th>
<th>Supports performance-based codes</th>
<th>Views on prescriptive building codes</th>
<th>Status to government</th>
<th>Comments outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Organisation of Standards (ISO)</td>
<td>Provides for a variety of worldwide accepted standards Limited role in the area of building control</td>
<td>Improved trade opportunities and offshore potential</td>
<td>Yes, but limited in the area of building control</td>
<td>No</td>
<td>Not applicable</td>
<td>Reports to Government</td>
<td>Opportunities for model building standards</td>
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<tr>
<td>Organisation for Economic Cooperation and Development (OECD)</td>
<td>To achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability and to contribute to the development of the world economy</td>
<td>To contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations</td>
<td>Provide for sound economic expansion. Recognition of the need for transparent regulations</td>
<td>Not discussed specifically</td>
<td>Concerned that obsolete regulations may result in substantial costs or inefficiencies</td>
<td>Established 30 Sep. 1961</td>
<td>Supports economic development in the building industry</td>
</tr>
<tr>
<td>European Commission</td>
<td>The purpose of the national law is to facilitate the free movement and the use of ‘fit’ products throughout Europe. Harmonisation of liability reforms was not considered a barrier to trade</td>
<td>Harmonisation will not require additional consumer protection</td>
<td>Not directly applicable</td>
<td>Technical approvals structures are used for measuring compliance</td>
<td>Developed nine Eurocodes but do not cover building services</td>
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<tr>
<td>Organisation</td>
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<td>EU-PeBBu and Aus-PeBBu</td>
<td>To add new impetus to making performance-based building and construction. To raise the level of contribution made to the process by the international research and development community.</td>
<td>Promotes enhanced international trade</td>
<td>Not specifically stated but implied</td>
<td>Supports the move towards performance approach, new material and practices in building construction</td>
<td>Move away from prescription</td>
<td>Funds in Australia were made available by Department of Education, Science and Training</td>
<td>Promotes technological innovation and research</td>
</tr>
<tr>
<td>European Union</td>
<td>To promote economic and social progress. To assert the identity of the European Union on the international scene. To develop an area of freedom, security and justice. To maintain and build on established EU law.</td>
<td>Competition policy is <em>raison d’être</em> of the international market to allow firms to compete on a level playing field in all member states. To ensure that anti-competitive practices do not hinder healthy competition</td>
<td>Supports social progress</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Council for Research and Innovation in Building and Construction (CIB) Conseil International du Batiment</td>
<td>The purpose is to provide a global network for international exchange and cooperation in research and innovation in building and construction in support of an improved building process and of improved performance of the built environment. It covers the technical, economic, environmental, organisational and</td>
<td>In achieving its objectives the CIB shall promote for international benefit and appropriate collaboration with other international and national organisations</td>
<td>Public safety a key principle</td>
<td>Task Group TG37 performance-based building regulation systems and W060 – performance concept in building established to review principles</td>
<td>Review towards performance but show use of prescriptive in legislation</td>
<td>Centre of research support if government accepts</td>
<td>Worldwide network of 5000 experts from 500 member organisations who exchange information in over 50 commissions covering all fields in building</td>
</tr>
<tr>
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<tr>
<td>Consortion of European Building Control</td>
<td>Established in 1992 at the suggestion of the European Commission where the basic building control responsibility is the examination of plans for new, extended or altered building together with site inspections during construction to ensure compliance with national regulations, codes and standards, mainly for health and safety purposes. The consortium provides a forum for the dissemination of information, exchange of views, and the development of European objectives associated with the building control function.</td>
<td>Not specific</td>
<td>To support health and safety standards</td>
<td>To review compliance with national standards</td>
<td>Not specifically identified</td>
<td>Not part of government</td>
<td>and construction related research and innovation</td>
</tr>
<tr>
<td>Interjurisdictional Regulatory Collaboration Committee</td>
<td>Advance, at an international level, framework, guidance and support documents on construction related regulatory environment issues relative to development, implementation and support of Recognises performance-based codes as removing trade barriers</td>
<td>Accepts building safety as a principle</td>
<td>Supports performance-based codes with a view to standardising the provisions for use</td>
<td>Prescriptive codes do not provide for innovation and flexibility</td>
<td>Introduction of performance-based codes is central to improving efficiency in the building environment</td>
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<tr>
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<tr>
<td>International Codes Council (ICC)</td>
<td>The International Code Council (ICC) in the United States of America was established in 1994 for the purpose of providing a single set of comprehensive and coordinated national model construction codes. The founders of ICC are Building Officials and Code Administrators International Inc. (BOCA), the International Conference of Building Officials (ICBO), and Southern Building Code Congress International Inc. (SBCCI). Previously these three codes bodies represented the model codes used throughout the United States. The theory is a single set of codes may encourage states and localities that currently write their own codes to begin adopting the international codes without technical amendments.</td>
<td>To provide for portability of knowledge and consistent set of requirements. Codes could be adopted internationally.</td>
<td>Building codes support health and safety standards</td>
<td>Performance-based codes have been recognised as a way of adopting a national set of standards across the USA</td>
<td>Prescriptive codes still exist in part</td>
<td>Codes are developed by the private sector or corporations. Draft documents are made available for adoption by State and local governments</td>
<td>ICC is a model code for the United States rather than a model code for the world</td>
</tr>
<tr>
<td>Organisation</td>
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<tr>
<td>NCSBCS National Conference of States on Building Codes and Standards USA</td>
<td>To decide which competitive versions of model construction codes to adopt and how information technically can enhance the effectiveness and efficiency of the building regulatory process</td>
<td>Consideration given to promoting the adoption of US codes and standards to oversee and facilitate both US trade and economic development in parts of the world</td>
<td>Codes to reduce the vulnerability to national disasters by providing assistance</td>
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<td></td>
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</tr>
<tr>
<td>BRANZ</td>
<td>Provide independent, unbiased technical information on a wide range of building-related matter.</td>
<td>Appraise building products and systems for fitness and purpose and compliance with building codes in Australia and New Zealand in standardising products</td>
<td>Public safety considerations provided in compliance testing</td>
<td>Appraises building products rather than codes</td>
<td>Appraises building products rather than codes</td>
<td>Independent but provides research to government</td>
<td>Accreditation test of building products could be used globally and result in cost savings and avoid additional compliance testing</td>
</tr>
<tr>
<td>Australian Construction Industry Forum (ACIF)</td>
<td>To create a competitive and prosperous industry that provides leadership in shaping and delivering Australia’s national agenda</td>
<td>Promotes trade</td>
<td>Not specifically mentioned</td>
<td></td>
<td></td>
<td>Advises governments and departments</td>
<td></td>
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<tr>
<td>Australian Building Codes Board</td>
<td>To provide efficiency and cost effectiveness in meeting community expectations for health, safety and amenity in the design, construction and use of buildings through the creation of</td>
<td>Provides a national certificate of conformity for products</td>
<td>Supports public health and safety through primary objectives</td>
<td>Promotes international uniformity of performance-based codes. States implement</td>
<td>Move away from prescription</td>
<td>Australian Government has arching responsibility for building regulatory</td>
<td>Prepared Model Building Act (AUBRCC)</td>
</tr>
<tr>
<td>Organisation</td>
<td>Objectives/mission statement</td>
<td>Promotes standards for trade</td>
<td>Promotes public safety standards</td>
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<tr>
<td>National Conference of States on Building Codes and Standards (NCSBCS)</td>
<td>Represent the States building code and safety interests. Decide which competitive version of model construction code to adopt. To enhance the effectiveness and efficiency of the building regulatory process.</td>
<td></td>
<td></td>
<td>the Building Code of Australia</td>
<td></td>
<td>framework</td>
<td>2000 declaration of cooperative action to develop and adopt uniform construction codes throughout the region</td>
</tr>
</tbody>
</table>
While a detailed discussion will be provided later in this section it is interesting to observe a number of preliminary factors. Firstly, the marketing of the organisation is accompanied by statements on its merits to promote improved trade prospects. It did not specifically include examples related to measuring the standard of public health and safety standards, or the acceptable level of risk, which could arise with any standard that could be introduced by these organisations. It appeared that the public safety standards were implicit and therefore there was no further mention. For example, statements under the European Commission noted that harmonisation will not require additional consumer protection. The assumption is if those countries already have acceptable levels of health and safety included in their primary objective then harmonisation merely endorses these as a principle. The European Commission noted that harmonisation of liability reforms did not constitute a barrier to trade and therefore each country could have its own insurance reforms.

Unless there is a closer nexus between the organisations there will be great duplication in effort and research. Some of these global bodies tend to take their charter from a broader level to represents broader interests.

The fact that there are so many organisations can lead to the conclusion that the development of international policy and performance-based building codes are fragmented. The information and research needs to be shared equally and with diligence to ensure that the key players are aware of the issues arising from the material. A more cohesive response to these matters could be the development of a global organisation which represents the interests of the building and construction sector as well as performance-based code developers and regulators. Ofori (1993) and Hart (1998) also considered this.

Peak organisations have been identified to illustrate the breadth of the objectives and the similarity in roles. Interviews with some of the participants from these organisations will provide an insight in how they perceive their role and the future of the organisation. Figure 20 shows the sequence of selected interviewees.
The following presents a detailed description of the organisation included in the interview sample. Appendix C is a list of interviewees used for the study.

**4.4.2 International level - CIB**


The CIB was established in 1953 with the support of the United Nations as an association whose objectives were to stimulate and facilitate international cooperation and information exchange between governmental research institutes in the building and construction sector, with an emphasis on those engaged in research. The purpose is to provide a global
network for international exchange and cooperation in research and innovation in support of an improved building process and of improved performance of the built environment.

The objectives of the CIB are to be: a relevant source of information concerning research and innovation worldwide in the field of building and construction, a reliable and effective access point to the global research community and a forum for achieving a meaningful exchange between the entire spectrum of building and construction interests and the global research community.

In achieving its objectives the CIB shall promote for international benefit appropriate collaboration with other international and national organisations. While the CIB promotes itself as the centre of research, there are issues arising in respect of how they are able to implement change in the regulatory and political environment. The CIB has a worldwide network of 5000 experts from 500 organisations.

The CIB has a number of task groups and working commissions around the world on a variety of different issues. It is interesting to note that there is no working party to specifically review the globalisation of the construction industry. Rather the most relevant working parties are those related to the Geography of Culture and W87 Post-Construction Liability and Insurance, which related to an international aspect of construction insurance.

Dr Greg Foliente was interviewed in respect of his involvement as the Coordinator at the CIB on the Aus-PeBBu performance-based codes. Dr Foliente also works as team leader of In-Service Systems Performance Asset Sustainability at the CSIRO Division of Manufacturing and Infrastructure Technology in Victoria. Australian researchers can work through this organisation and connect with the EU-PeBBu network, which represents the European Union. Jack Bramwell was the Program Manager for EU-PeBBu before he recently returned to the ABCB. Mr Bramwell has also been interviewed.
4.4.3 International level - IRCC

The Inter-jurisdictional Regulatory Collaboration Committee is comprised of representatives from 10 countries. Their charter is to examine the performance-based regulations with a view to standardising the provisions for use by those countries and internationally. As previously mentioned, performance regulations alone do not constitute the globalisation of building activity they are rather a mechanism which would make dealing between countries easier if the intention of regulations were the same.

The purpose of the Inter-jurisdictional Regulatory Collaboration Committee is to advance, at an international level, framework, guidance and support documents on construction related regulatory environment issues relative to development, implementation and support of performance-based regulatory infrastructure, education, and technology issues related to merging the successful implementation and construction of construction related performance-based regulatory systems. The intent is to advance a common understanding of the international regulatory environment, to provide the exchange of information and to facilitate a more open environment of inter-jurisdictional concerns in the areas of building design and construction (IRCC 2004b).

The International Council for Building Research Studies and Documentation (CIB) at the request of the National Research Council Canada (NRCC), commissioned a task group to review the development of performance-based regulations internationally and to identify the common features of such regulations. The inter-jurisdictional group was formed in late 1993 after several teleconferences were held between representatives of ABCB, ICBO19, NRCC20 and SFPE21).

The benefits of the group were to:
- Provide a forum for promoting a common understanding and a framework for performance-based building regulatory system development
- Provide guidance and support material for countries

19 ICBO International Codes Building Organisation
20 NRCC national Research Council Canada
21 SFPE Society of Fire Protection Engineers
• Promote the pooling of resources on an international scale to aid research and development of commonly needed components of a performance-based regulatory system
• Provide economic benefit to countries embarking on performance-based regulatory development by providing guidance and support material, thus minimising duplication
• Provide a forum for those with experience in building regulatory system reform, from both the technical and the regulatory perspectives, to foster the exchange of ideas and the development of best practice
• Create a potential medium for inter-jurisdictional trade - it was recognised that the lack of regulatory harmonisation can affect the ability of jurisdictions to adopt standards and to import or export products, systems and skills (IRCC 1998).

The IRCC has advocated in 1998 that the growing trend around the world is to introduce performance-based building codes as central to improving efficiency in the construction industry. In this regard performance requirements are viewed by the IRCC as encouraging innovation and flexibility without strict prescription, and performance-based building codes encourage new techniques and practices, leading to expansion and increased efficiency.

Mike Balch was interviewed as a member of the IRCC. He is the Executive Director of the ABCB. Wayne Bretherton was also interviewed as a member, representing Australia on the IRCC. He also works for the ABCB and is currently on secondment to the Building Industry Authority (BIA) in Wellington, New Zealand.

4.4.4 National level - AUS-PeBBu

The establishment of this organisation means that Australia will be able to participate in a move towards the performance approach, which has occurred elsewhere through regulatory changes from a prescriptive to a performance-based building code. Performance-based building codes open the door to the use of new materials and practices in building and construction, such as composite products and innovative processes. The organisation is committed to:
• More user-oriented and cost-effective buildings
• Promotion of technological innovation and
• Enhanced international trade

The Aus-PeBBu has been made possible by a grant from the Innovation Access Program of the Department of Education, Science and Training. The ABCB is recognised as a participating organisation. However, the relationship with the ABCB given its function seems that it could create some duplication or the Aus-PeBBu could provide further research support to the ABCB. As previously mentioned, Dr Greg Foliente is the coordinator for this group and was interviewed.

4.4.5 National level - ABCB

In 1994 all States and Territories of Australia signed an inter government agreement to establish the Australian Building Codes Board (ABCB). The ABCB’s mission is to provide for efficiency and cost effectiveness in meeting community expectations for health, safety and amenity in the design, construction and use of buildings through the creation of nationally consistent building codes, standards, regulatory requirements and regulatory systems. There has been some movement towards international uniformity of performance-based codes.

The ABCB operates a national product certification scheme, which enables the ABCB to issue a national certificate of conformity. The scheme is available to all product manufacturers. The government is committed to ensure that cost effectiveness of the national scheme will be monitored to ensure that it does not impose a burden on manufacturers.

The Australian Government has responsibility for the development of national policies and a building regulatory framework throughout the Building Code of Australia. The States and Territories have their own legislative and administrative systems of building regulations. The States, together with the Commonwealth, have developed the performance-based codes.

22 The organisation’s functional statements are available on the web at www.cmit.csiro.au/innovation/2003
building code, the Building Code of Australia 1996 (BCA96). The States implement the BCA through their building legislation in particular, with provisions for performance-based technical standards. Executive Director Michael Balch was interviewed as a representative of the ABCB.

4.4.6 State level - Building Commission, Victoria

The Building Commission is also included in the listing as Victoria was the first State in Australia to adopt performance-based building codes with private certification. Also, the Building Commission at one stage had a policy commitment to contract out building work to other countries. By building work the researcher is referring to contracts which aim to rewrite new building legislation in other countries based on the Victorian model.

Most building regulations require a design to be independently assessed to ensure that the proposal complies with community expectations for a safe building. These expectations are expressed through the building regulations. Assessment is usually undertaken by either a municipal building surveyor or a private building surveyor, as in Victoria.

In Victoria a building design must be assessed by a building surveyor to ensure that it complies with the structural, amenity health, and safety requirements of the Building Regulations 1994. Peter Nassau, Director of Building Policy at the Building Commission was interviewed.

4.4.7 Practitioners

Victoria has adopted the Building Code of Australia and also has private certification, which places the users of performance-based codes outside the municipal system in the issue of building approvals. The privatisation of building approvals allows a private person to issue a building approval as an alternative to the municipal building surveyor. The use of certification was accompanied by the introduction of professional liability insurance to cover the risk. The Victorian system enabled the researcher to probe into issues that require a review of how performance-based building codes operate in Victoria, Australia and
overseas. This allowed the researcher to select building surveyors and fire engineers who work on major projects and who are leaders in their field of performance-based designs.

Persons selected for the interview included Stephen Kip, who previously held a senior position at the Building Commission and now working as a building surveyor and fire engineer engaged in major projects for Warrington Fire Research. Also interviewed were Bruce Thomas and Con Nicolas (Thomas Nicolas Fire Safety and Risk Engineers), fire safety engineers engaged in major projects for large construction companies throughout Victoria and Australia. In addition to the building surveyors and fire engineers the research also included an architect from a large architectural company which trades offshore. The architect chose to remain anonymous for the interview.

Representatives of the construction industry included Peter Dempsey the ex-Chief Executive Officer of Baulderstone Hornibrook, Keith Stubbs of the Master Builders Association – International Business Services, and John Carson of the Timber Plantation Association of Australia. Details on the selection these representatives from the construction industry were considered previously in Chapter 3.

4.5 CONCLUSION

This chapter provided the foundation for the research by exploring the different research methods and selecting the most appropriate method to respond to the research questions. An explorative semi-structured interview method was selected with key representatives of various committees and building organisations. A feature of this chapter was Figure 19, which provided a comparative analysis of peak organisations with potential involvement in the development of performance-based building codes. Representatives were purposely selected from this chart to participate in the in-depth interviews. The specific organisation and its role and function were further elaborated throughout this chapter. Chapter 5 provides the findings of interviews, identifies the concerns with performance-based building codes and proposes a theoretical framework for the consideration of international regulatory reform.
CHAPTER 5 DISCUSSION OF RESEARCH FINDINGS

5.1 INTRODUCTION

Generally, the researcher noted that the issue of global trade and the relationship to performance-based building codes was too premature for both the construction industry and the regulators to respond to effectively. It was in 1997 that the WTO at the First Triennial Review of the Operation and Implementation of the Agreement on Technical Barriers to Trade\textsuperscript{23} stated that 'wherever appropriate, members shall specify technical regulations based on product requirements \textit{in terms of performance} rather than design or descriptive characteristics.'

In response, the peak organisations have been working towards the development of performance-based building codes and the broader goal of responding to the pressures of globalisation and the desire to be more like each other. It has been over seven years since the WTO policy was endorsed. Yet when it comes to the construction industry, it appears to be a whole new venture and philosophy. The construction industry is responding differently to globalisation compared with the regulatory authorities. The literature review has shown that the prime drivers to undertake offshore trade are essentially driven by profit and the search for new markets (Arditi & Gutierrez 1991, Khoon 1991, Abdul Aziz 1994, Pietroforte 1997, DISR 1998). So, the results of the in-depth interviews proved to be extremely informative to gauge the trends and future potential of the industry in terms of whether performance-based building codes would increase offshore trade.

Overall, there was a mixed response to some of the more uniform questions asked of the respondents. The answers to some of the questions will therefore be independently discussed under relevant section headings. The researcher, however, employed a semi-structured in-depth interview technique and this allowed for a flow of alternative and unexpected information that that the respondents were willing to share. Although the topic

\textsuperscript{23} WTO Document G/TBT/5 Attachment, Committee on Technical Barriers to Trade, WTO, Geneva, Switzerland.
under consideration was quite structured, the opportunity was provided for the respondents to discuss their issues and the research they were undertaking to look into other areas. This information proved extremely valuable to the researcher and broadened the scope of the responses. Some of this information has been incorporated into the conclusions to develop a further theoretical paradigm to conclude the research.

From the literature review all of the bodies responsible for codes acknowledge the extent of efficiency to be gained from the introduction of performance-based codes. Equally they also acknowledge that further increases in the performance of the construction sector will contribute to the economy and GDP. Unfortunately, there is rarely any literature available which clearly demonstrates that the use of these codes actually affects the construction sector. Is the construction sector involved in decision-making at this level? Who are performance-based codes written for: the country or just the construction sector? Or the responsible building official who signs off building work based on these codes? Some of these questions were addressed as part of the interviews.

The next section describes the results of interviews with the key participants selected for this research. The interviews start with the local perspective, being building surveyors and fire engineers in Victoria. At the end of the section the researcher identifies key themes derived from the results to aid the development of a theoretical model to improve the system (Minichiello et al. 1995, Bryman 2001). The theoretical model is presented in Chapter 5.

5.2 RESULTS OF IN-DEPTH INTERVIEWS (QUALITATIVE ANALYSIS)

5.2.1 The research questions

A total of twelve in-depth interviews were undertaken with representatives from peak construction industry organisations and practitioners who use performance-based codes and decide whether or not to trade offshore. The broad research question was: Will the international development of performance-based building codes have an impact on


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*offshore trade for the construction industry?* This question suggested a series of related questions which include:

- How does globalisation affect the development of standards?
- What is the evidence for introducing performance-based codes?
- What are the perceived benefits of performance-based building codes?
- What are the problems with their introduction?
- Will performance-based building codes improve offshore trade for Australian construction industry?

Copies of the detailed prompting questions are provided in Appendix A. Responses to all of these questions will have a consequential bearing on the construction industry and how they use and implement the codes, as well as highlight the interests of the construction sector in offshore trading.

**5.2.2 Views on globalisation and the construction industry**

The first question related to their views on globalisation and what it means for the building and construction industry. This question was extremely general and was selected to commence discussion rather than to seek a detailed comprehensive response (Bryman 2001). Overall, all of the respondents acknowledged that there is such a process as globalisation making an impact on the development of standards and that all parties are a part of this process. Foliente (2004) referred to the process of globalisation as ensuring that clients receive the best products and services available, and clients should be able to articulate what they want, where the client is defined as the building owner responsible for payment of the project. It was also important to recognise who the beneficiaries of the process were. Bramwell (2004), with his experience in the European Union, noted that while globalisation is discussed he was not aware of any global building code or universal format that countries could adopt. On performance and globalisation he stated that while the objectives may be the same, with the same definition and methods used in calculating and testing, there will nevertheless be different ways of interpreting that information (Bramwell 2004). Nassau (2004) extended this by clarifying that, while international and
global uniformity is possible through more qualitative or quantitative statements, they can also be followed up with a deemed to satisfy provision which could then be tailored to that jurisdiction. This process should aid global compliance to a performance code, particularly for developed countries. Balch (2004) also noted that there should be consistency in the interpretation of qualitative statements. The key issue identified here is whether codes will be interpreted the same way in different jurisdictions.

Bretherton (2004) argued that 'the biggest issues arising from globalisation will be the cultural shift in requirements and the specific safety levels for many countries' and also whether countries have the trained professional expertise to understand performance codes. Currently, engineers are trained in concepts for performance designed solutions from an analytical perspective, but the building surveyors are not. The other issue with globalisation is that the regulators themselves are gatekeepers and they are trained and often rule with a prescriptive mentality. Regulators may not accept a new product even if the market has alternative suggestions/solutions. This will cause some difficulties in the acceptance of global building practices. Finally Bretherton (2004) indicated that performance can swing too far at the global level and if people do not understand its application it can also reduce the underlying levels of safety or quality expectations of standards.

5.2.3 Benefits of performance-based building codes

The next question focused on why there are performance-based building codes and what benefits are. Nearly all the participants stated one or more of the following issues:\footnote{It should be noted that these responses were provided by the interviewees and no further discussion was sought to gain substantiation for their statements.}:

- Innovation – to capture investments and intellectual property, creative designs
- Cost-savings, for example fire protection systems, fire engineering approach
- Global uniformity
- Increased flexibility
- Safer buildings
- Increased competition because other countries will have similar objectives to meet
• Performance explains what is trying to be achieved
• Consumers will benefit.

All parties agreed with the need for performance-based building codes and the need to support the system in theory and in practice. The problems that emerged, however, came from questions referred to later about the actual use of performance-based building codes and the degree of qualitative and particularly quantitative measures that are used in defining the performance objective.

Innovation was seen as the most important reason for having performance-based building codes. Kip (2004) and Thomas (2004) referred to the need for performance-based building codes to assist with creating more innovative solutions to fire safety yet maintaining the integrity and public safety of the building. Bramwell (2004) also said that a performance-based approach ‘opens the door to innovation’. Balch (2004) also supported innovation as it provides the industry with the opportunity to look at new techniques which would otherwise not be considered at the prescriptive level.

Nassau (2004) endorsed the principle of innovation but highlighted that performance codes are mainly adopted in developed countries. He indicated that performance is a better alternative to prescription as it provides for greater similarity and therefore global uniformity. These statements (qualitative and quantitative) can then be followed up by deemed to satisfy provisions which could be more tailored to suit that jurisdiction throughout the world. In contrast, prescriptive requirements in each country result in different solutions which are appropriate to the availability of material resources and construction expertise, which will therefore provide a different deemed to satisfy solution between countries.

Foliente (2004) equally stressed that innovation is the key reason for moving to a performance-based building code. A prescriptive approach serves as a barrier to innovation. As an example, Foliente referred to a base isolation system that protects buildings from expensive and life threatening damage during earthquakes.
Widespread application and adoption of these systems soon after they were first developed in the 1960s would have saved many lives and reduced economic damages from earthquakes. But the prescriptive code requirements hampered and greatly delayed their adoption. (Foliente 2000 p.12)

Bramwell (2004) stated that ‘the trend is to buy-in (performance-based codes) at the moment’. He mentioned that the idea was to have a universal format with the same definitions, the same objectives, and single methods of calculating and testing, which could be complemented by those nations’ different levels of performance25.

In concluding, performance-based building codes are a flexible tool for innovation and to create cost savings where possible. The total value and function of a building should not be undermined because it may have cost more in the short term (Foliente 2004). The fact that performance is written in a qualitative language means that it is easier to export and be adopted by other countries. Bretherton (2004) also stated that performance gives the recognition of transparency as one must state why a particular decision was made to accept the solution, as distinct from prescriptive.

5.2.4 Problems with performance-based building codes

The researcher asked the interviewees to identify what are the problems with performance. There was no shortage of responses to this question, with all participants acknowledging that there were problems with the use of performance-based building codes. Even the regulators had major concerns about the use and definition of performance. This was one of the key problem areas. Performance means different things to different people, and the interviewees indicated that the objectives are interpreted differently by people. There is also confusion about the term performance and regulations and the role and function of standards organisations such as ISO who develop standard regulations which are applied to performance codes. Carson (2004) has even stated that there is a lack of communication between the international organisations, such as the IRCC, developing performance and the

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25 Tests using technical operations, either on site or in a laboratory, to directly measure one or more performance criteria of a given solution (ABCB 1997).
standards organisations, such as ISO. The other confusion is just how many prescriptive
criteria the performance code contains and whether deemed to satisfy provisions are
regarded as prescriptive under a performance code or as quantitative measures. Nassau
(2004) and Balch (2004) noted that the BCA is a performance document and that 'deemed
to satisfy' quantitative regulations are part of a performance decision. The need to have a
prescriptive and quantifiable measure was recognised as important by some of the
interviewees (Thomas 2004, Kip 2004, Nicolas 2004). For example garden sheds would
not need to go through a whole range of performance objectives if they meet the deemed to
satisfy component.

Thomas (2004) and Kip (2004) emphasised that the Building Regulations 1994 which
empowered the building surveyor to have discretion of compliance were written before to
the current BCA when everyone was using deemed to satisfy, and that this has not
changed. For example, in Victoria the Building Regulations 1994 are written for
prescriptive measures which allow the building surveyor to issue dispensations where
buildings are subject to alterations and/or change of use are involved. In addition there is
also the granting of determinations by the Building Appeals Board where a particular
building regulation can only be met through an alternative method or procedure (such as
modification). To comply with the BCA one needs to meet performance design parameters
not the deemed to satisfy provisions. The deemed to satisfy criteria are deemed to meet the
performance design parameters, from a legal perspective only. The ability for the deemed
to satisfy criteria to meet performance design parameters from an engineering perspective
is often problematic and very difficult to achieve a direct correlation between the two
methods. For this reason building surveyors who are not trained in analytical/engineering
quantification methods should not be directing any performance (alternative solutions)
designs.

In addition, it was considered that building surveyors were not adequately trained to fully
appreciate the performance provisions. Thomas (2004) stated that ‘too many building
surveyors are making decisions and expert judgments were ostensibly based on a deemed
to satisfy perception – and what they think logically meets performance’ from this
perspective. Kip (2004) expressed concern that building surveyors are having too much
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influence in fire engineering designs but they are not fire engineers and do not possess the engineering quantification skills. Unless there is a comprehensive understanding by the building surveyor, the system can be fatally flawed. This concurs with Bretherton (2004) who stated that fire engineers are in a better position to make performance decisions.

Thomas (2004) indicated that there was little or no engineering relationship between the deemed to satisfy provisions and the performance design parameters, which can become a significant liability issue at litigation. Further, he added that when people design deemed to satisfy provisions in engineering terms, they usually do not meet performance design parameters although they may comply with legal requirements. Once they vary the deemed to satisfy provisions, they are not meeting performance from either the legal or engineering perspectives unless there is a verifiable application pursuant to Clauses A0.5, A0.8 and A0.9 of the BCA. (It is noted that the BCA 2004 has introduced Clause A0.10, which clarifies the holistic appraisal needed for performance design.) ‘What is required is quantification, we need to rethink and quantify in absolute terms (engineering/analytical context)’ (Thomas 2004). That is, to ensure building safety, the design should come down to the quantifiable terms that are measurable and proven to be sustainable. The other difficulty for performance when designing with respect to equivalence is establishing a benchmark. For example, the expected rate of failure, of the various sub-systems, the determination of system reliability (such as the probability of failure) and, from that set of circumstances, determining equivalence of performance and deemed to satisfy provisions. The ability to specify a quantitative aspect of performance-based building codes was one of the most difficult tasks identified by Bretherton (2004), Balch (2004) and Carson (2004).

Kip (2004) also supported this proposition and indicated that the time frame for introducing performance-based building codes was unrealistic. In support of prescription Kip (2004) mentioned that Fiji was interested in adopting the prescriptive part of our building code only, as the most portable code is prescriptive. Everyone knows what the expectations are, and what requirement levels should be meet.
Bramwell (2004) also noted that performance solutions were more difficult to monitor and enforce and to deliver proof to the authority, whereas prescription was easier to enforce. For example, a part of a building designed to be performance-only where the quantification is not made available creates uncertainty when compliance may be sought. Nassau (2004) agreed and indicated that a problem with performance was the qualitative and quantitative aspects of interpretation. A qualitative approach does work but this needs greater administrative support for checks and balances to deal with the way those decisions are made. That requires expertise on behalf of the building practitioners, being the designers, and the checkers, being the building surveyors. They need to be qualified to make expert judgement as to whether an alternative solution meets the performance requirement. Nassau (2004) indicated that the Building Commission established the Building Practitioners Board, investigators and auditors who can overview and monitor the whole system and appropriately sanction people who step over the line and people make decisions which are contrary to the meaning of performance requirements.

A further problem with performance-based codes at the global level was that the deemed to satisfy provision means different things in different countries. Thomas (2004) provided the example of the need to provide fresh air ventilation, but when this is translated to Bangkok, exterior air quality becomes an important issue.

Stubbs (2004) representing the Master Builders Association questioned whose standards will be used and reiterated that agreement was unlikely on whether it would be the British or American definition or that of another region such as Asia.

Bretherton (2004) succinctly summarised the problems with performance codes by referring to their limitations to within developed rather than developing countries. The core problem was that performance requires infrastructure and a higher level of trained professionals, with new technology capacity to research innovative products and design methods; it also requires a legal framework which identifies the risk levels. One of the key issues was that performance is qualitative and according to Bretherton (2004) the major problem is to decide how quantification can be considered part of this process. He
acknowledged that ‘it is difficult to identify what it is you are going to achieve without going back to first principles’ (Bretherton 2004).

All the interviewees identified problems associated with the use of performance codes. While there was general agreement that the primary objective can be synchronised between countries, the issue of what is the base measure and who applies it created concerns about enabling offshore trade\textsuperscript{26}. Those in the industry were more concerned about having something identifiable as it was their risk of litigation that was at stake rather than that of the regulator. Thomas (2004), at the conclusion of the interview, reflected on the realities of the designers in the current application of performance-based building codes:

\begin{quote}
If you can measure that of which you speak, and can express it by a number, you know something of the subject; but if you cannot measure it, your knowledge is meagre and unsatisfactory by Lord Kelvin 1824 (Thomas 2004).
\end{quote}

It can be concluded that while a performance-based code has difficulties for introduction, the feasibility of using a performance-based building code around the world for trade is more likely than a prescriptive code. It would appear that the only commonality of approach which has the capacity to be shared by all countries willing to adopt performance-based design parameters is the quantification approach (often from first principles), which is engineered, analytical and mathematically based.

A prescriptive code would need to be adjusted in most countries based on their level of safety and climatic factors. However, given that performance allows for greater design scope, the issues that arise is whose standard or benchmark equivalence would be used as each country has its own culture. Also, there is the issue of definition, where a qualitative performance code can mean different things to different countries, and the benchmark of that performance can be measured differently in each country.

\textsuperscript{26} Objectives are at Level 1 of the hierarchy. They set out an interpretation of what the community expects from buildings. They are primarily expressed in general terms and usually refer to the need to safeguard people and protect adjoining buildings or other property (ABCB 1997).
5.2.5 Cost savings and performance-based building codes

The regulators and particularly the fire engineers agreed that the use of the performance-based approach resulted in cost savings as performance provided the designer with the option to seek alternative methods of construction, resulting in cheaper solutions without sacrificing building safety. Nassau (2004) agreed that there were cost savings as a result of the performance-based approach and this was documented. These cost savings drive the developer more than anything else to adopt alternative solutions which in turn would result in a cheaper building cost. For example, in the construction of the Crown Casino in Victoria (Thomas B. 1999), the documentation showed that the installation of a sprinkler system resulted in the removal of fire-rated columns and walls, which provided the same outcome for building safety but reduced the cost.

Fire engineers Thomas (2004), Kip (2004) and Nicolas (2004) referred to the cost savings to be gained from using a performance approach. This was possible by coming up with solutions through determining the design elements and function of the building at an early stage. Research has shown that the installation of sprinklers can reduce the cost of a building but not jeopardise safety and evacuation. Other examples of cost savings can be seen from the Federation Square project and the Crown Casino (Thomas B. 1999).

A more recent example of cost savings was demonstrated with the design of the Berwick Hospital which was ‘globally’ designed by Thomas Nicolas (2004) on a performance basis. Warrington Fire Pty Ltd reviewed the performance design of the building and also found that the building was safer, more cost effective and innovative ‘which was the inherent logic in having a performance-based building code’ (Kip 2004). Bramwell (2004), Bretherton 2004) and Balch (2004) all noted that cost savings could be achieved through building products, factory-made systems and fire protection. Architect (2004) questioned how there could be costs savings when building costs were accelerating.

Foliente (2004), however, stated that a good project does not always equate to cost savings. He referred to the importance of adding value to the building rather than a decreasing the costs, and noted the need for a combination of function and cost.
Bretherton (2004) stated that housing codes could be prescriptive but it was not always desirable because they do not allow further innovation to be introduced into the construction industry. It is important to maintain some innovation. For example, he noted research undertaken by AV Jennings\textsuperscript{27}, which compared the use of 75x50 thick studs versus standard studs of 100x38. The results of the research illustrated that reduced size maintained the same level of public safety but was more affordable with no effect on quality. There are research costs which need to be taken into account in developing innovative products or solutions.

5.2.6 Responsibility of performance designs in a construction project and the beneficiaries

While the researcher assumed that this would lead to one answer, it was surprising to find out that it was not so much the building surveyor who was responsible for incorporating performance design, but the client, the architect, the building industry, the fire engineer, and some practitioners stated that they were not even sure. Foliente (2004) referred to the client and the need for the industry and education institutions to focus more on the requirements of the person using the building, or the developer/investor of the building. In his opinion it was the client who makes a request for the designer to utilise performance solutions and their requests should be taken more seriously. ‘The clients should have more input in driving these things’ (Foliente 2004). He also stated that not much study has been undertaken in the past; rather assumptions were made that technical people are the professionals who should know what people want. However, in construction the requirements in the brief also include non-technical matters such as triple bottom line which covers the social, cultural and environmental aspects of construction projects.

Bramwell (2004) also agreed that the client deals with the matter first and needs to determine their requirements for the building. The owner was also the key beneficiary, and consumers, those who use the building, would also benefit from a performance-based approach. When asked about their level of expertise Bramwell (2004) explained that the
client deals with the building matter first but would then consult an expert such as an architect and rely heavily on the principal adviser. However, he highlighted that the client may hesitate in developing a one-off design, and needs to overcome the hurdle of relying on traditional methods. As buildings are enormous investments clients can be reluctant to try out new solutions.

However, the fire engineers and building supervisors have said otherwise. In their opinion the introduction of performance-based codes did not come with an entourage of experts. The architectural profession has even slowly removed itself from applying performance solutions and leaving it up to the building surveyor which is potentially problematic (Thomas 2004, Nicolas 2004). Ideally, the architect and/or building designer should be designing with performance in mind. With the issue of fire safety requirements, the fire safety engineer is capable of developing alternative design solutions which can result in cost savings to the client/developer. In order to maximise the benefits of performance designs, the fire safety engineer should be involved at the inception of the project rather than later.

Bretherton (2004) noted that there are multiples of people involved in a construction project. He mentioned that architects do not necessarily think in a regulatory sense and do not use the building code at the potential level of expertise that they should. Architects see this as a hindrance to their design flexibility but have very little appreciation of performance solutions which would in fact serve to enhance design flexibility through innovation. Bretherton (2004) stated that ‘performance is being mainly used for fire-related matters rather than say, the number of toilets’. Design engineers are the main users of performance-based codes, as they have to deal with them, rather than architects, who are more concerned with the building as a form. Architect (2004) was not certain about the use of performance-based codes and acknowledged the limited use of performance criteria. There is a general perception that performance-based codes are appropriate for the structural and fire safety engineers.

27 AV Jennings is a large scale domestic builder based in Victoria
Nassau (2004) also indicated that for major projects it is the design team and the building surveyor who are responsible for considering performance options. However, Nassau had doubts if the clients where sophisticated enough to comprehend the alternative feasible design options with performance-based codes. Carson (2004) also questioned the client’s knowledge in being able to request a performance building and the lack of training and education of most of the industry, such as the architects, who could have a greater role in implementing performance. The building surveyors are responsible for administering the whole of the Building Code of Australia and any fire-related matters are now considered by fire engineers.

There is a variety of people who consider performance design, ranging from the client, the architect, the building designer, the fire engineer and the building surveyor. The concern is that there was no agreement that specifically stated that it was always the fire engineer/designer. Furthermore there is concern at the limited application of design options by architects. The Building Code of Australia and performance-based building codes could assist them in their designs but it appears that they have not embraced this concept (Nassau 2004, Balch 2004, Bretherton 2004). Architects deal with clients in the first instance and it would seem logical that they would be appropriately skilled to make some performance design decisions. Also, as some interviewees mentioned that the client is responsible for designs (Bramwell 2004, Foliente 2004), it brings into question the client’s level of expertise in determining the extent of use of performance codes and reliance on other experts. The question is whether the regulators are moving too quickly and leaving behind an uneducated industry.

Bretherton (2004) noted that performance-based building codes are being written for the community to allow for innovation, and to provide for transparency and hierarchy. Bretherton (2004) stated, ‘Society is seeking more from buildings, including safety’. It is imperative that governments address issues around trade, and support product manufacture. The problem at the end of the day, however, is whether the community is aware that the codes are written for them.
5.2.7 Training and expertise in applying performance-based building codes

All of the survey participants acknowledged the need for training and the general lack of training in the industry in respect of performance-based codes. A depth of technical understanding is required with the development and application of performance-based solutions and few people are educated to undertake this. Nassau (2004) stated that ‘as the building codes become more complicated, architects and building designers have taken a less interactive role and have sub-let their knowledge to a different group of practitioners’. Thomas (2004) and Kip (2004) identified that there were only a very small number of people in Victoria who could successfully understand the technicalities required to implement performance-based building codes. (It should be kept in mind that not all performance matters relate to fire safety.) These were all fire engineers and educators in fire engineering.

Foliente (2004) also acknowledged that the technical professionals require a lot more training and that performance-based building codes were either ‘a stumbling block or a stepping stone’, depending on the amount of training and practice of the practitioner.

In Victoria and throughout Australia there was some but essentially limited training in the use of performance-based codes. At the tertiary level, for fire safety engineers, Victoria University of Technology offers the Graduate Diploma in Fire Safety Engineering, which provides the base qualification for already qualified professionals to make assessments using the performance-based approach. Other tertiary institutions in other states have similar courses. Also, the Australian Institute of Building Surveyors provided regular seminars on using performance-based building codes. There was little else (Nassau 2004).

The ABCB (Balch 2004) also held a conference on the subject but has complemented the teaching through a 50 hour Box Hill TAFE program in Victoria on the use of performance-based codes. On the issue of education and fire engineering, Kip (2004) and Thomas (2004) mentioned that building surveyors were getting involved in fire engineering designs when they were not qualified to make judgements. This could lead to liability concerns in the future.
Foliente (2004) stated:

Performance approach is not the solution for everything, (as much as I would like to think) because it really needs a lot of effort. It requires a lot more from every participant in the process including the technical professionals; it requires a lot more training than we would usually have … The clients also need to be educated (Foliente 2004).

He stated that developing countries have limited knowledge in this area, but their lack of performance knowledge should not be an impediment to their having international contractors constructing high-rise complexes or another ‘Hong Kong international airport’ if the opportunity arose.

Thomas (2004) highlighted that current building designers, surveyors and fire brigade personnel have an ‘emotional attachment’ to the prescriptive codes and have established their own safety and comfort zone in using prescription. There would be a lot of hesitancy in accepting new alternative techniques particularly in regard to the level of risk.

Finally, Foliente (2004) argued that a broader principle of education is the ‘technological diffusion principal’. There are four normal distribution curves. The most influential curve, that referring to opinion leaders, is skewed to the right, indicating that most people have a high level of understanding. This theory is based on the principle that if an interest group can be created, the rest will follow. This type of method is worthy of discussion as it dictates how some policy leaders and researchers think about the dissemination of information. Foliente (2004) stated that ‘the opinion leaders in technology diffusion are the innovators because they are going to be the ones that will pull the others with technology diffusion in modern life’. During the interview the researcher questioned that probably over 95 per cent of builders in Victoria are not going to be part of the graph. Foliente (2004) agreed that this was true anywhere in the world. The researcher questioned whether an examination should be made of how the bottom 95% operate. The reason for the inclusion of this principle is to illustrate that the use of performance-based criteria is very much at the high end of the scale and for the majority of building work their use is diminished. It must therefore be asked why there is a regulatory blanket over the whole of the construction industry when it only applies to a small minority, and why this
enormous effort to promote performance-based building codes is at the top end rather than at the bottom end to improve the quality of work.

It can be concluded that performance-based building codes require further training and education in the construction industry, commencing from the tertiary education level for the architects, building designers, fire engineers and building surveyors. In addition to these professionals, clients would also require training so that they emerge more educated and can clearly specify the building function they seek as well as the technicalities and cost savings which may accrue with alternative fire safety designs.

5.2.8 Role of designer and level of risk

The question of litigation is an issue underlying most decisions under a performance-based approach. There will come a time when the parties will need to defend their choice in making a decision through performance-based codes. Currently there are few examples of work having gone wrong as a result of performance codes so it could mean that buildings are safer, or the industry has been fortunate. Nassau (2004) noted concern the lack of documented tests about the possible risks with using a performance-based codes approach and this creates a liability concern for the near future. When asked whether performance-based building codes put the designer at risk, Nassau (2004) stated, ‘Yes, I think it puts everyone at risk’. It was therefore seen as important for the building surveyor to keep a detailed record of documents. Thomas (2004) stated that a fire engineer/designer needs to maintain a relationship with the building surveyor (provided the surveyor understands the design) otherwise there could be a risk to public safety if an element of the building’s fire system fails or is weakened. The design team needs to be independent of the certifier/building surveyor to enable an unbiased review of the proposal but many certifiers are involved with the design and influencing/directing the design at the beginning of the project. Subsequently there is no further independent check.

Kip (2004) and Thomas (2004) noted that ‘too many building surveyors are making decisions or expert judgements based on the deemed to satisfy provisions, and what they
perceive meets the performance criteria’. This further exposes the building surveyor and often reduces the level of analytical quantification that ought otherwise to have occurred.

Bramwell (2004) provided a legal example from the UK called state-of-the-art defence, which provides a defence if the designer uses current standards. If something goes wrong, they can use state-of-the-art defence, but if they go beyond that standard there is no current liability for it. Carson (2004) noted that the insurance industry may be reluctant to provide insurance on performance-only designs and this is to be watched further.

Building designers are the weaker part of the process as they have not been properly educated how to use performance-based building codes and they therefore rely on the building surveyor to pick up any issues (Nicolas 2004). Architect (2004) indicated there was not much risk for the building designer as the performance components were undertaken by an engineer and signed off by the building surveyor/certifier. The liability on the building surveyor is immense. Balch (2004) noted that the building surveyor signs off and therefore wears the liability for the project.

Kip (2004) also stated that while it was easy to grasp the concept of performance, ‘most could talk the talk, but very few can walk the walk’. At best engineering designs should commence from first-principles analysis with respect to the acceptable level of risk. As a designer the question is what is the risk tolerance versus the acceptable level of risk. The community, however, does not want any risk. The deemed to satisfy provisions provide risks because they may not meet the performance criteria, as there may not be any engineering basis for its existence (Kip 2004). For example, AS1668 part 1, refers to pressure in the stairwell where no smoke can enter. The problem is if the corridor is full of smoke, then how do you get to the stairwell? Under the deemed to satisfy requirements there is no provision for the smoke management of the egress route for Class 2 and 3 buildings. (Kip 2004).

There was a mixed response in relation to the level of public safety. Kip (2004) noted that the value of human life varies between cultures and determines what is an acceptable risk. That will make performance-based approaches different between different countries.
Bretherton (2004) expanded on this concept and stated that performance-based codes are the better option because they explicitly have to state public safety expectations and what is expected to be achieved. Performance-based gives recognition of transparency because accountability can be satisfied and responses given as to why a particular method was chosen. These are seen as more transparent in terms of public policy. However, the public safety and the level of risk in a prescriptive code is predetermined, and there is an implicit public interest with prescriptive codes. The problem that may arise, however, with performance is whether the level of safety chosen was appropriate.

5.2.9 Main reasons why construction companies trade offshore

This question was asked to determine if the key objectives of both the industry and the regulators are the same. The question was focusing on one of the key goals of performance-based building codes as promoted by WTO and that was to promote trade opportunities between countries. The answers to this question should indicate whether the availability of performance-based building codes would aid the construction industry to trade offshore, that is whether performance-based building codes remove trade barriers and therefore should aid in the export of construction products and services.

The reason that the Australian construction industry explores opportunities offshore is because the domestic market offers limited potential for the future. Dempsey (2004) focused on the growth and profit of offshore trade and investment. Architect (2004), noted his company works offshore, because there are opportunities, but they are not due to performance-based codes.

Stubbs (2004), who is responsible for the promotion of construction trade to a variety of countries, advised that ‘if we do not capture international opportunities there is not much industry left in Australia’. He stated that the lowering of the tariff barriers made it imperative for the industry to look for offshore opportunities and that the Victorian Government over the past four years has sponsored trade missions for the Master Builders
Association in Dubai with great results. The Mission\textsuperscript{28} offered members a vast range of building products, services and leading-edge technologies. Other participants in the Mission offered specialist building and construction services. During discussions, Stubbs (2004) advised that the Europeans want to dominate the construction world and in response some organisations have been established with committees to overview the activities on the European market. One of the organisations is called the International Federation of Asian and Western Pacific Contractors Associations (IFAWPCA). This organisation also forms part of the Australian Construction Industry Forum (ACIF).

One of the key methods of securing an international position was through marketing. This was achieved by having the Victorian Government Business Office in Dubai and providing trade opportunities to the building industry. Essentially the activity has little to do with whether or not a country has performance-based building codes. The entrée to the country is more complicated and requires the establishment of a partnership and support mechanism to aid the transition of export opportunities. This is vital in delivering the potential of offshore trade.

Architect (2004) and Dempsey (2004) noted the use of joint ventures to assist in overseas projects. Stubbs (2004) also mentioned that to win a contract in Dubai was to be part of a joint venture with one its local contractors as this ensures that not all the profits leave their country. Some of the key building companies who are currently involved in offshore trade include Multiplex, Hooker Cockram Projects Limited and Baulderstone Hornibrook\textsuperscript{29}.

Foliente (2004) also noted that while the removal of trade barriers assists us in trading offshore it equally allows international companies to compete and threaten our domestic market. He considers that fortunately Australia has a highly innovative workforce and a potential to succeed. Australia should also explore opportunities overseas because of

\textsuperscript{28} Building Products and Services Industry Capability Mission, Victoria, Australia, to Gulf Cooperation Council Countries, 29 November to 15 December 2003

\textsuperscript{29} The MBA has been involved in building up the awareness and the culture of the construction industry in Australia through the presentation of Export Forums. Stubbs (2004) advised that the operation and scale of potential offshore activities for Australian construction industry were huge.
recurring boom-bust cycles here, but that Australia should not just select one trading partner but look at other countries, including Japan.

Nassau (2004), Foliente (2004) and Balch (2004) also referred to the domestic boom-bust cycles and the need to provide diversity in the portfolio for builders. Bretherton (2004) mentioned that the construction industry does not see offshore trade as a market potential. For example, Japan is a great exporter of products but the Japanese do not really work offshore. Construction industries in general do not look at the global market, as this is a cultural issue. It is the suppliers of raw material rather than the construction industries that want to trade offshore. Furthermore Bretherton (2004) identified a number of other problems in trading offshore including:

- the cost and financial outlay
- increased effort
- not a matter of just turning up in a country
- having a strong reliance on domestic suppliers and labour
- the patience required to foster relationships
- the need to establish consortia.

Carson (2004) indicated that the Timber Plantation Association after five years of effort finally managed to secure a contract with Japan to export timber for domestic dwellings. The problem, however, was when the time came Australia was in a boom market and there was insufficient timber to be exported. He provided the example that Canada produces 19 million cubic metres of timber compared with Australia that produces only 3 million cubic metres. So while Australia has had opportunities to export, it is rarely taken up by the industry. Similarly Balch (2004) indicated that a part-time export market is not feasible; either Australia is in or out of it because of the effort required in establishing and keeping a trading relationship. Architect (2004) confirmed this and indicated it is not just a matter of turning up in the country and expecting to be hired. A more prominent presence and cost outlay is needed. Dempsey (2004) stated that often overseas companies do well in Australia because they buy the local company and can continue to trade.
Chapter 5 Discussion of research findings

5.2.10 Performance-based building codes trade barriers

The literature review highlighted this area and identified how prescriptive codes acted as a trade barrier. Prescriptive means that a particular country has identified a particular level of construction which everyone wanting to enter that country should adhere to. In contrast, performance is more generic and the principles can be upheld at the global level. Foliente (2000) stated that member economies that are signatories to GATT have committed themselves knowingly or not to the use of performance requirements. Consequently, prescriptive regulations are a trade barrier because every country is different. It therefore follows that performance codes will not be a barrier to trade.

The majority of the respondents agreed in theory that performance codes remove trade barriers by creating commonality (Dempsey 2004) and making life easier (Architect 2004). But this statement was further qualified by other statements, such as that it is not the only trade barrier that they come across (Carson 2004), or Australia will be worse off if it is another layer of control (Architect 2004), and it is years away before this can happen (Nassau 2004).

Bramwell (2004), in response to the question, highlighted that the WTO is all about the removal of trade barriers, yet performance-based building codes do not necessarily achieve this in its entirety. Essentially performance-based building codes are subject to testing and verification. Even if there are two countries that have the same performance-based building code, there are still other elements that need to fit the jigsaw puzzle. He stated that it is early days in making a decision about the impact of performance-based building codes and the removal of trade barriers. Nassau (2004) also believes that in the current environment the global adoption of performance-based building codes is ‘a long way down the track’. It is a utopian goal to fulfil in the future.

Bretherton (2004) believed that performance-based building codes removed trade barriers but he raised concern of discrepancy in definitions. He considered that the WTO objectives were the removal of trade barriers and trade issues and that this mainly referred to standards applicable to the development of products that could be exported to different
countries and used in the construction process, for example, specifying manufacture of
timber to an agreed set of standards. This would then be used by the country in building
construction. The process would be:

- Performance requirement defines what the timber structure is to withstand.
- Method would call up the ISO – engineering process to prepare the calculation and
  set the benchmark of what can be achieved. The ISO standard is therefore an
  engineer’s quantitative benchmark as part of public policy requirement.
- If it is an import product that is accepted it can still be used under different climate
  conditions. For example, in the USA studs are marked say, 600mm apart, and in
  Japan they are 450mm apart, but it does not stop one from using a 90mm x 45mm
  standard timber.

From this it is possible to achieve a performance-based building code where the
development of the products is based on a quantitative measure that can be used by
different countries in accordance to their performance building standards, such as a
stronger frame for houses in wind prone areas.

Nassau (2004) considered that the developing countries were also part of the global
economy but due to their nature their performance requirements will be different to those
of the developed countries and therefore they are a barrier to trade. The differences will be
in the skill level and expertise, the legal system and social expectations. For example, the
building concern in some developing countries will be on health rather than fire safety.
This has also been supported by Bretherton (2004), who attended a global summit on
performance codes in 2003 where it was mentioned that in South Africa the biggest issue
was to provide a roof over heads, running water and conditions that there should not be an
open running sewer through the village.

None of the fire engineers and building surveyors – Thomas (2004), Kip (2004), Nicolas
(2004) thought that having performance available at an international level would make any
impact on the construction industry. To make performance work at an international level
means that everyone has to quantify from engineering first principles because the industry
benchmarks back to deemed to satisfy provisions. This was difficult to achieve. Balch
(2004) also noted the difficulty to achieve quantification but it is something they are working on in the future.

The builders and architects Dempsey (2004) and Architect (2004) both noted that in theory performance would make it easier but in practice there were other ways of getting around country building codes. Sometimes the building design is sought only at the conceptual stage and all internal/external design requirements and compliance are undertaken by local specialists within that country.

In conclusion performance removes trade barriers in theory but there is more work to be undertaken in definitions and interpretation, testing and verification methods.

5.2.11 Performance codes and offshore trade?

This question provided an opportunity for the respondents to further validate the initial question, which related to ‘what are the benefits of performance-based codes’. It also provided an opportunity for the respondents to mention other ways in which trade is currently undertaken.

The literature provided some evidence that the use of performance-based codes is not widespread and is limited by the number of practitioners that use them for large scale or commercial projects. The majority of the respondents have agreed this to. While the respondents agreed that performance codes will aid the construction industry by providing for innovation and flexibility in design, reducing costs in some cases, they also expressed concern that the actual use of performance-based codes for trading offshore was limited. This is where the theory meets the practice.

Bramwell (2004) noted that in Europe performance-based codes are not being used in most cases. But there is a new structure being implemented in Europe where they have identified six variables of performance. These are identified and then products can apply for accreditation under one of those elements. In addition, there are large organisations established for testing new products. European construction industries also spend more
time and money on research. Bramwell (2004) indicated that some architectural companies have even got their own research units, which is not evident in Australia.

There is nothing stopping Australia from trading overseas now. Carson (2004), Dempsey (2004) and Architect (2004) pointed out that the construction industry has been trading overseas for years with or without compliance to performance-based building codes. It is not the key reason why companies go offshore. Balch (2004) noted that the provisions already allow countries to use other standards with other countries that are trying to achieve the same level of performance objective. For example, Australia can use the NZ Building Code if it is satisfied that the building solution provides the same performance level as the BCA. This principle can also be applied globally. If you are in another country you can use the BCA as long as the performance objective is the same as in their code.

The issue of how much performance is being used is difficult to measure in any one project where some people say that 'it’s still performance-based building because what is being provided meets that level of performance dictated by the client'. This confusion with what actually constitutes performance-based building codes needs to be clearly identified for all jurisdictions.

When asked whether performance-based building codes would assist the industry in trading offshore Nassau (2004) responded, ‘Yes in theory, but whether it would have a substantial effect was another question’ (Nassau 2004). When Australia opens up construction trade with other countries, it leaves itself open to increased competition on domestic shores. However, Nassau (2004) pointed out that if an international company wanted to work in Victoria they would require a builder’s registration. In effect this is a trade barrier to them. The construction company would need to make arrangements to either register their builder or work through a company that is registered. This then may result in insurance and further liability issues. Architect (2004) noted the problem of restrictions in other countries which makes it difficult for architects to operate, yet if those countries come into Australia, they do not have any restrictions imposed on them. Australia is opening the doors to the rest of the world without protection of its own
domestic economy, which could be dangerous, but when Australia trades with other countries additional restrictions are imposed.

5.2.12 Further developments

Towards the end of the questions some of the respondents wished to advise the researcher of the latest development in the area of codes.

Bramwell (2004) noted that Australia and Japan have been working towards mutual recognition of products and services and that this has taken quite a while to achieve. In order for it to work effectively it is up to the two countries to agree on a level of acceptable standards which can also be negotiable. Bramwell (2004) identified that Australia needs to watch the European Construction Products Directive, who are adopting performance-based building codes and mutual recognition. All member states of the European Union have agreed to harmonise their building law and standards of codes to enable one construction products directive for the whole EU. Carson (2004) noted this work and expressed concern that Europe with a significant population can achieve a construction products directive, whilst Australia, with a population of 25 million, is still working out fundamentals.

The Building Commission in Victoria is preparing the building code for East Timor. These codes will be performance-based, which will provide alternative solutions. As the building surveyor alone would not be able to make a decision they have agreed to a panel of three experts to make the decisions.

On the other hand, representatives of the industry have a different view. Principles of theory aside, they do not believe that performance-based building codes will make much a difference. There are more trade barriers than just performance codes. Stubbs (2004) noted that until they decide what code they want to adopt there will not be any universal standard, as there is competition between countries to adopt their own code. Bramwell (2004) and Balch (2004) also agreed that there would not be one universal standard performance code but rather a number of objectives which other countries can meet.
Finally Balch (2004) noted the role of the ABCB and the IRCC in promoting the use of codes between different countries. This is very much within the boundaries of the regulatory authorities. Balch (2004) stated that Japan is rewriting its building regulations based on the Australian BCA, that Singapore has adopted the BCA. Hong Kong is currently working with the ABCB about the development of its fire code. In addition Singapore is the first country to adopt electronic lodgement of building applications, which is complemented by an electronic assessment tool. The Australian building market was contacted about opportunities to develop building products for Japan but only two responses were received. This shows a lack of interest by Australia’s construction industry in becoming involved in offshore activities.

In March 2004 the Minister for Industry, Tourism and Resources issued a press release that greater cooperation will be achieved between Australia and New Zealand through the Trans-Tasman Building Regulatory Reform Council. The purpose is to improve trade in building products and services given the similarities in codes between the countries and a number of building firms operating on both sides of the Tasman (DITR 2004).

Balch (2004) noted that the biggest problem is that the BCA was prepared to support qualitative rather than quantitative solutions, but that the technology is not there to transfer qualitative into quantitative measures. Most of the solutions for the fire systems are being considered in a quantitative form, and there is a strong directive to introduce quantitative performance criteria.

5.2.13 Conclusions from the in-depth interviews

This chapter outlined the research method, explored some of the key questions related to the role of peak organisations responsible for the development of regulations and reported on the in-depth interviews conducted with various representatives.

The research method selected was an in-depth interview which allowed for inductive research into the realistic perceptions of representatives from organisations and from the
industry. The inductive method allowed the participants’ comments to be reflected in the
development of policy and their views on problems or difficulties with the use of
performance-based codes elicited. On the issue of globalisation, the respondents agreed
that there was an overall thrust to achieve similarity and make trade easier. The regulators
mainly responded in terms of uniformity of controls (Nassau 2004) and consistency of
interpretations (Bramwell 2004, Balch 2004). The construction industry representatives
mainly referred to improving trade relations and working opportunities (Carson 2004,

The literature review proposed both of the scenarios above and showed that globalisation
was a catalyst for the consideration of policies to achieve global similarities (Hart 1998,
Deroukakis 2000, Stiglitz 2002), and that through globalisation the industry should
consider export policies to promote trade (WTO 2004). The literature review
demonstrated how harmonisation could be achieved through similar building contracts
between countries but also highlighted the difficulties related to different legal systems for

Cost savings have been addressed as an integral output in the development of building
The fire engineers noted that a performance-based decision by providing flexibility in the
On the other hand in terms of the total cost of the building it was noted by Foliente (2004)
that cheaper does not always equate to a better building and there is a need to look at the
value of the building given its life span. The literature review found limitations in the
material on the cost savings and the use of performance design for the total building. The
literature also found that data and empirical evidence on the economic and trade impact of
standards and conformity assessment were limited (Wilson 1997). However, it is noted
that there were some studies undertaken in the area of cost savings in the use of alternative
fire systems.

In conclusion, the researcher was provided with a significant amount of data regarding the
development of performance-based building codes and their use by the industry. From the
widest perspective the information suggests that while in theory a globally similar code would be advantageous, there is nothing that prevents the industry working offshore. The problems that emerge include the size of the Australian market and not having the capacity, capability or the resources to promote ourselves offshore. Promoting our activities offshore is one issue, the other is that Australia does not have protection from companies coming in and competing. This places our construction industry at risk if it is relying on the domestic economy for work opportunities.

5.3 ISSUES ARISING FROM THE LITERATURE RESEARCH

5.3.1 Summary of the findings

The key issues which emerged from the literature review included:

- Globalisation has resulted in the consideration of similar building principles in contract law, regulations and products
- Growing international pressure towards the adoption of performance-based building codes by developed countries
- Performance-based building codes will require increased skill levels and expertise
- Performance-based codes have been stated to provide innovation and reduce costs
- Global organisations have a pivotal role in developing research and to review the implementation of performance-based building codes
- Caution as to whether performance-based codes are a tool for international trade or a regulation for the public safety of buildings
- That performance-based codes will have an effect on the competitiveness of the Australian construction industry.

While there is an assumption that performance-based codes are improving ‘our world in a number of ways’ (Witt 2003), there appears to be a lack of research and justification how this is being achieved and measured. The key authors have advocated that performance will result in innovation and cost savings but there was limited additional evidence to prove that this can be demonstrated through case studies. There has been work undertaken in fire research and design which demonstrates that the use of performance codes results in
innovations and cost savings (Meacham 1999, Thomas, B. 1999, Thomas, R. 1999). Overall, the construction industry has been slow to pick up innovation (PriceWaterhouseCoopers 2002, De Valance 2001).

In Australia the research has shown that the use of performance codes by another country is not the justification for the construction industry to trade offshore. It may make life easier (Architect 2004, Dempsey 2004) if the requirements were similar to the BCA but it certainly would not be a key factor in choosing to export a project to that country.

Assumptions made by the regulators on behalf of the construction industry on the use of performance-based codes include:

• That international performance-based codes are applied to all countries developed, developing and emerging, whereas these codes have been adopted only by developed countries identified in the literature review. This therefore has an impact on trade potential given that some of Australia’s trading partners are not developed countries.

• A well-trained and educated industry that has the comprehension to use subjective and discretionary provisions without fear of risk. Litigation with the use of performance-based codes has not been adequately researched. The research participants (Carson 2004) noted that getting insurance might be an issue in the future. The other important feature is that all interviewees, even the regulators observed that there has been inadequate education in the use of performance-based building codes.

• That construction industries are venturing into new grounds because performance codes allow them to. This is a naïve assumption as global construction companies usually have a head office or are part of a joint venture or alliance where designers from that country are already familiar with that country's building code (Architect 2004, Dempsey 2004). Globalisation allows the trading company to have designers from the country they are trading with. Multinationals have offices in many countries where local professionals can be used (Tieder 1998).

• Performance-based codes are uniform throughout developed countries but in fact different countries have varied elements of quantitative provisions which relate to
those countries’ national jurisdiction. This implies that performance codes are not being compared equally and therefore their impact will have different repercussions. For example, what Australia refers to as a performance-based code, Canada refers to as the objective-based code and what we call performance criteria, Canada calls performance (Balch 2004).

- Performance-based codes will improve the competitiveness of the construction industry but have shown little evidence of how such will be achieved.
- That the World Trade Organization Technical Barriers to Trade is a vehicle for promoting trade and the adoption of performance-based codes. This organisation has been used as the catalyst to adopt performance-based building codes by participating WTO countries. The purpose of the WTO was to promote trade but there is a number of options in the agreement of how this can be achieved. The other options available to the industry in the use of performance is mutual recognition of products and service (Wilson 1997, Hart 1998) which did not receive much consideration in the literature and yet provides a greater scope for international adoption if the objectives and functional statements were globally applied.

Similarly, the use of performance by the building industry is of concern. The regulators consider that Australia has performance-based codes, the problem being the degree to which are exercised. Some of the interviewees, and a survey conducted by the CSIRO (1999), indicated that the use of performance is limited and many projects are designed on the deemed to satisfy provisions which do not always satisfy the performance objectives or the performance design parameters (Kip 2004, Thomas 2004, Nicholas 2004, CIB TG37 2004). The following section addresses the key findings in more detail.

5.3.2 Benefits and weaknesses of performance-based building codes

Figure 1 summarises the benefits and weaknesses of performance-based building codes as derived from the literature review and in-depth interviews. As can be seen, for almost every benefit there is a disadvantage, although it should be noted that these are merely elements for consideration rather than a broad conclusion.
In response to the problems with performance, there was overall agreement that the definitions and interpretations mean different things to different people (Balch 2004, Kip 2004, Thomas 2004). There was also confusion as to the responsibilities of organisations in the development of standards and the development of regulations (Carson 2004). Further problems arise from the amount of qualitative and quantitative criteria in performance-based codes, and whether the deemed to satisfy provisions are a prescriptive part of the code (Nassau 2004, Nicolas 2004).

Other difficulties were the extra effort required to use performance-based codes (Foliente 2004), and the problems with enforcement and administrative back up when performance decisions are made (Bramwell 2004, Nassau 2004). Stubbs (2004) also advised that there

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**Figure 21 Summary of benefits and weaknesses of performance-based building codes**

<table>
<thead>
<tr>
<th>BENEFITS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower construction costs</td>
<td>Increase costs by independent certifiers reports</td>
</tr>
<tr>
<td>Cheaper options for fire engineering</td>
<td>Increase cost of professional liability</td>
</tr>
<tr>
<td>Develop a single market</td>
<td>Building codes may be similar but the legal system is still different in countries</td>
</tr>
<tr>
<td></td>
<td>Difficult to measure performance</td>
</tr>
<tr>
<td>Enable innovative designs</td>
<td>Designers will not favour sharing innovative ideas, each project will be considered differently by certifier</td>
</tr>
<tr>
<td>Consistency in interpretation</td>
<td>Discretion does not result in consistency (Nassau)</td>
</tr>
<tr>
<td>Less legal advice due to greater clarity</td>
<td>Lack of legal precedent in decision making</td>
</tr>
<tr>
<td>Less fragmentation between states and countries</td>
<td>Different interpretations being applied</td>
</tr>
<tr>
<td>Provides for uniformity of qualifications</td>
<td>Level of operational expertise is questionable</td>
</tr>
<tr>
<td></td>
<td>Requires a registration/qualification system</td>
</tr>
<tr>
<td>Transparency in regulations</td>
<td>Prescription provided certainty</td>
</tr>
<tr>
<td>Reduce the cost of appeals</td>
<td>Increases litigation costs</td>
</tr>
<tr>
<td>Improves ability to trade offshore</td>
<td>Makes little difference to the construction industry</td>
</tr>
<tr>
<td>Removes barriers to trade compared to prescription which created a barrier</td>
<td>Removing trade barriers through performance codes does not make that much of a difference</td>
</tr>
<tr>
<td>Increases flexibility in design options</td>
<td>Flexibility in designs results in uncertainty and enforcement difficulties</td>
</tr>
<tr>
<td>Improves public safety</td>
<td>Decreases public safety</td>
</tr>
<tr>
<td>Self assessment and peer review</td>
<td>Greater enforcement role of local authorities</td>
</tr>
<tr>
<td>Appropriate for all buildings</td>
<td>Mainly used in the commercial construction sector or one off designs</td>
</tr>
</tbody>
</table>
was a problem in obtaining further information on performance codes thereby limiting their use in practice. He also questioned the issue of which country’s standard would eventually be used. Architect (2004) was also concerned that the introduction of yet another layer of controls would cause concern. Dempsey (2004) advised that performance appears successful in theory but it is not vital in practice.

The practitioners (Kip, 2004, Thomas, B. 2004, Nicolas 2004) noted that other practitioners are only using expert judgement appraisal to offset various deemed to satisfy components in the belief they are using performance-based codes. This approach is problematic and potentially dangerous unless administered by very informed and competent people. The interviewees from the industry highlighted the problems in the use of prescription and that there were few qualified practitioners able to competently apply the analytical principles of a performance code. Other issues from using only the deemed to satisfy provisions is that they do not always meet the performance objective. In a recent international final report about performance-based codes the CIB admitted that ‘there is a disconnection between standards, performance criteria and verification methods referenced by the regulations and the qualitative performance or functional objectives found within the regulations’ (CIB TG37 2004 p.7). It was also found that standards, performance criteria and verification methods have requirements that do not match the objectives of performance (functional or objective-based) regulations, and that there is a heavy dependence upon prescriptive solutions. The CIB also argued that ‘this reliance occurs because it has been difficult to quantify the existing prescriptive methods and there is a lack of technological achievement in many areas’ (CIB TG37 2004 p.7).

One of the benefits of prescription is that people interpret it in the same manner. It provides a bottom line benchmark which has been tested and tried (Thomas 2004). Further, Thomas (2004), Nicolas (2004) and Kip (2004) stated that in terms of satisfying performance the design team would need to test the final product with specific measures to ensure that it satisfied the purpose for which it is to be used. Designing from first principles was important in terms of achieving acceptable levels of public safety. These interviewees considered that public safety received a more informed consideration with
performance-based code rather than prescription. The available literature review did not consider the problems with the use of a performance-based building code.

5.3.3 International development of performance-based codes

The Inter-jurisdictional Regulatory Collaboration Committee (IRCC) was the main motivation behind the creation of International Council for Research and Innovation in Building and Construction (CIB) Technical Group TG37. This group embarked upon (Performance-based Building) PeBBu and obtained funding from the European Union to manage performance-based code related work. These are the key organisations responsible for reviewing the development of performance-based codes and how best they can be applied globally for improving public safety in developing countries and to promote trade.

In support of the increasing use of global provisions, recently Harcourt (2004) found that:

‘Evidence from the World Bank shows that among developing countries the nationals who embraced globalisation and opened their markets to trade and investment did much better than those who ran closed-economy regimes.’ (Harcourt 2004 p.2).

Thus economic activity and growth was faster in those countries who had demonstrated and embraced global challenges. As well as considering the world as a whole there needs to be commitment. Standards are a vital part of the building regulations in most countries. However, it takes five years to complete an industry-wide standard (Verlag 2000).

Balch (2004) indicated that much of the international work is developed with a future vision in mind. These operations can take years to ferment and therefore there needs to be planning for the future. Balch (2004) stated that offshore trading cannot be a part-time business, you are either in or out. As an organisation it is important to maintain a vision and be prepared when the opportunities for trade arise.

The movement towards international standards to achieve harmonisation may dictate a particular method that may not be suitable across all cultures, but if written in performance terms could be more readily adopted and understood. (CIB TG37 2004). This qualitative part of the process has opportunities for further international development.
In conclusion the development of international performance codes requires the industry and the regulators to be prepared for the future and to consider the advantages and disadvantages of any opportunities to promote offshore trade.

### 5.3.4 The beneficiaries of international performance-based building codes

At this stage, the regulators are the beneficiaries. The theory is stronger than the practicality at this stage. The regulators do not have to risk their product margins and trade offshore. Statistics have shown that the Australian construction industry has not embraced a strong export trade culture although this figure is increasing. Some limited opportunities to trade offshore where provided by the ABCB who were seeking tenders for a project in Japan but only received two contenders. Carson (2004) indicated that the Timber Plantation Association after 4 years of work managed to secure a contract to export timber to Japan. Unfortunately when the time came, Australia was in its housing boom stage and there was no timber to export. Also Carson (2004) noted that Boral and CSR had previously exported to Japan through local offices but due to the pressures from internal domestic contractors had to withdraw their operations at a loss. Architect (2004) indicated that Japan was a closed market and there were very few opportunities for Australian contractors. This is now changing and Japan is looking to adopt a code similar to the BCA.

So who are the beneficiaries? Some of the regulators say the client, but are they really aware of how to require the levels of sophistication for a performance design? The use of the term ‘client’ has become a current focus of the literature (Foliente 2000, Prior & Szigeti 2003). But this requires a large education shift to the public realm and a very different marketing strategy than to a target audience of practitioners within the building industry. If the client is the ultimate beneficiary then they should at least know more about performance-based codes and how they can be used for innovative and cost efficient designs. The preference would be to identify the user as the beneficiary because they will be occupying the building and taking advantage of its design and safety features.
In the short term the beneficiaries of performance-based codes may be the regulators who are preparing society for the future and in the longer term the users and the clients will benefit. But while it is the regulators then it does not create awareness by the users and therefore fails to be received and acknowledged.

5.3.5 Barriers and drivers for off-shore trade

One specific research question that was considered but not asked of the interviewees was the obvious: whether anyone had consulted with the representatives of the construction industry to determine the mechanisms in which they operate and whether performance-based codes would have an impact on their offshore operations. Rather, a similar question was raised: whether the construction industry was represented in committees at the international level. The responses to this question indicated that they were represented through building association members on national and international committees. It therefore must have been the lack of research into the industry where there appears to be a substantial gap.

A number of reports conducted by the DISR (1998, 1999) DITR (2004) and PriceWaterhouseCoopers(2002), lead the researcher to conclude that Australia is a weak participant on the international scene compared with counterparts in the UK, the USA, Europe, China and Japan. Earlier reports and policies encouraged a critical analysis of the construction sector’s operation and the final evaluation report concluded that overseas trading by the Australian construction sector is weak.

In summary in 1999 Australia had 1.6% of total world GDP. In 1999 Australian building and construction materials, products and systems were worth $3.2 billion and exports by the sector were increasing. Australia has two companies in the top 225 companies with offshore profits (ENR 2003), but it was noted that these companies were primarily engaged in civil works such as pipelines and bridges.

The interviewees who were engaged in the construction sector indicated that there are many other trade barriers that are faced by a company wishing to trade overseas. Architect
(2004) and Bretherton (2004) noted that it is not just a matter of landing on their shores and starting a business. There is a need to have a contact company overseas who can oversee the business operation and monitor tenders and progress. Also there is difficulty in winning contracts when the company is unknown. A number of considerations were put forward by the interviewees:

- Many countries required the industry to be part of a joint venture with a local company (Dempsey 2004, Stubbs 2004)
- The profession had to be recognised by that country, say in Japan, to enable operation
- Financially the company had to be viable to support an overseas joint venture (Architect 2004, Bretherton 2004)
- Importance of research and development to ensure Australia has a competitive edge in innovation (Foliente 2004)
- It cannot be a part-time business and requires staying power (Balch 2004)
- Companies need to obtain business licences in some countries
- Some countries prohibit the entry of building products, thereby requiring the use of domestic products by their own market

These barriers can have an enormous bearing on a company's decision to trade offshore and therefore by the industry is reluctant to embrace the concept. The use of performance-based codes by a country therefore becomes insignificant with the scale of other operational barriers that the industry has to deal with to enable operation.

The Centre for Strategic Economic Studies (2000) noted that building and construction is one of the more rapidly growing segments of world trade and this demand is driven by factors including the international harmonisation of standards and protocols. Therefore while there are other barriers to trade the harmonisation of codes would have some benefit.
5.4 A THEORETICAL MODEL

Despite the significance of attaining similar building regulations at the international level to promote trade between countries, their development and use is more recent and currently being debated by organisations such as the IRCC, the Eu-PeBBu and the Aus-PeBBu.

Several reports have been presented to provide guidance on developing and understanding the best method to achieve a model suitable for adoption CIB TG37 2004, Prior & Szigeti 2003, Beller et al. 2001, Meacham 1999, Thomas R. 1999.

Despite all the studies, the terminology used in the area of performance-based codes and objectives is still rather confusing and is not well established. The term performance-based includes both qualitative and quantitative variables. There is no agreement that the core measure should be based on qualitative principles alone, with the countries adopting their quantitative measures to demonstrate compliance. Despite a number of frameworks being developed, the models are quite similar in their method.

5.4.1 Development of the conceptual framework

The final part of the analysis will present a theoretical model which could be considered in the further development and refinement of policies that seek to achieve international similarity in performance-based codes. Bryman (2001) stated that deductive theory represents the commonest view of the nature of the relationship between theory and social research. Furthermore the information derived from this research is qualitative and enables theoretical dimensions to emerge from the data and information. Bryman (2001 p.20) described qualitative research as that which embodies ‘a view of social reality as a constantly shifting emergent property of individuals creation’.

A theoretical framework is based on the findings in the literature review and the information provided by the interviewees. The data identified that there are three key stages to the development of international performance-based building codes. The first stage includes the inputs from key areas including environmental and cultural issues, social
and industry needs and economic policy considerations. On the social and industry needs including education, CIB TG37 (2004) provides confirmation that:

Generally the success of performance-based building regulations is based upon the rigour of the supporting regulatory system. This system includes public policy, education, technology and general infrastructure such as product approval and certification. CIB TG37 (2004 p.6)

Economic policy would include the role of the World Trade Organisation, review of protection policies on grounds of national interest, and global risk management which would include a risk analysis in the development of and use of performance-based codes for trade. At present there appears to be limited literature which identifies global risk management policies on the use of performance-based codes when trading offshore.
The centre of the model suggests one international codes organisation and regulatory framework. Currently, there is a number of different organisations each with similar objectives to promote trade. It creates confusion to have different bodies working on similar issues and yet still unable to resolve some of the key matters that have been
identified by the interviewees, such as definitions, lack of verification models, reliance on
prescriptive codes and liability concerns: the code should reflect the broader interest of the
construction and design industry. The input into the single regulatory framework should
include research and development which would supply the test methods and design guides
and the government policy issues including building regulations, trade objectives and
protection policies.

The final stage is the performance system, where qualitative and quantitative measures
have been clearly separated. The information from some of the interviewees led the
researcher to consider that one international performance-based building code in its
entirety is an unlikely achievement (Nassau 2004, Balch 2004 and Bramwell 2004). There
are concerns with the status and interpretation of definition by different countries
irrespective of the problems that can arise with quantitative measures. The qualitative part
of the performance system, which is based on the Nordic system and outlined in Chapter 2
includes objective and functional statement, and alignment of consistent terminology. The
qualitative elements can express the needs of society for policy makers and building
owners to communicate their expectations. In addition, the model also includes the
consideration of mutual recognition statements. Hart (1998) indicated the reasons at the
beginning of Chapter 5.

In addition, the WTO Technical Barriers to Trade Agreement (2004) supports the
proposition that if one country can demonstrate that it meets the criteria and complies with
the principal objectives of another country then it could be adopted. There is therefore a
connection in the model to trade promotion in the acceptance of process and products.
This could also be achieved through mutual recognition.

The quantitative part of the model is that which is applied to the countries individually.
The quantitative part is where the design occurs (Meacham 1999). It contains verification
methods in the form of test standards and design method that enable assessment against
performance criteria. There was an acceptance by the CIB in its final report that there is a
dilemma with performance regulations in that for the design and construction to occur
something measurable must ultimately be provided. Some countries like the UK have
preferred not to include quantitative issues in legislation due to a reluctance to burden parliament with a 350 page document (CIB TG37).

The final section is the performance evaluation, implementation and monitoring. This is also part of the research which should be undertaken by the regulators to ensure the successful adoption of the program, and measures program effectiveness.

5.5 CONCLUSION

The key research question considered was whether the development of international performance-based codes has had an impact on the construction industry in terms of trade. The related questions investigated included the identification of benefits and problems with performance-based codes and whether their integration would affect trade. As part of the research, the questions identified the drivers to trade offshore, the difficulties faced by the industry and whether international performance-based codes would increase trade through the removal of trade barriers.

Overall the researcher considered that the issue of global trade and the relationship to performance-based codes was too premature, particularly for the construction industry, to respond to effectively. While the participants who worked for regulators agreed with major policies for the removal of trade barriers through the use of performance-based building codes, the practitioners in the industry thought otherwise. This information is further validated by the contextual information in the literature review.

The following section concludes the research and the findings.
CHAPTER 6 CONCLUSIONS AND RESEARCH RECOMMENDATIONS

6.1 INTRODUCTION

Building regulations are in a state of transition with a move away from prescriptive regulatory measures to a performance objective. The literature reviewed a number of studies and papers supporting the move to performance-based building regulations. The key reasons for this support include greater opportunities for innovative and flexible designs and to improve trade across international boundaries. The regulators and international organisations have taken a leading role in this area based on the amount of work that has been published. The economic development of a country is further improved when it can successfully demonstrate a strong export market. There are opportunities in the building and construction industry to export building contextual design, building products, project management skills, project design and construct.

Although the issue of globalisation has been addressed, there was less information available on the process of international regulatory reform for the building and construction industry. In addition, existing material has limited reference on the effect of these reforms for the construction industry. Similarly, the literature for the construction industry mainly focuses on competitiveness, economic development and contracts rather than performance-based codes. There appears to be little effort being made by the regulators to acknowledge the impact of the codes on the users or beneficiaries including clients and the construction sector.

The concluding chapter is structured into a number of key headings which justify the research by restating the research objectives and the research problems.

6.2 FULFILMENT OF RESEARCH OBJECTIVES

There were two research objectives: firstly, to investigate the development of performance-based codes at the international level and its benefits in particular as a tool to remove trade
barriers and secondly, to evaluate whether performance-based building codes would help Australia’s construction industry to penetrate world markets.

A comprehensive review of the literature revealed that performance-based codes are being promoted as a tool to remove trade barriers. The interviews with the regulators further validated this information and enforced the need to remove trade barriers. While all the interviewees noted the perceived benefits, a number of weaknesses were also identified. Results of the practitioner respondents highlighted the limited use of performance-based codes by the industry and therefore its limited impact in offshore trading. The information led the researcher to holistically determine that, at this stage, the use of performance-based codes would have little impact on Australia’s offshore trade. Therefore, while in theory performance codes could remove non-tariff barriers to trade, in practice, performance codes have their weaknesses for global interpretation and the construction industry was also confronted by number of other barriers.

6.3 FULFILMENT OF THE RESEARCH QUESTIONS

The key research problem is whether the international development of performance-based codes would assist the Australian construction industry to trade offshore. The research addressed three underlying research sub-questions:

- What are the perceived benefits and weaknesses of performance-based building codes, in particular as a tool to remove trade barriers?
- How will the international development of performance-based building codes affect the construction industry?
- What are the lessons for Australia?

The research questions were all fulfilled as elaborated below.

6.3.1 What are the perceived benefits and weaknesses of performance-based codes?

The literature review found there were benefits with the introduction of performance-based building codes such as innovation, cost savings and design flexibility, and that
performance-based codes could ease regulatory trade barriers. The in-depth interviews concurred that there were benefits such as achieving commonality, innovation, design flexibility and efficiencies but also that there were problems with performance-based codes.

To answer the research question, in-depth interviews were undertaken with key organisations responsible for the development and introduction of performance-based codes, and with practitioners who work with the codes. The results of the interviews indicated there was confusion over the interpretation and definition of the codes and for whom they were prepared. Some believed the codes were for the building surveyor, others the fire engineer, or the architect. Other respondents considered the development of performance-based codes were for the client who was able to exercise a level of knowledge capable of requesting some of these requirements. A key outcome was that few parties concurred over who had responsibility for the implementation of performance-based codes. Significantly, there was concern with:

- the level of use and professional expertise in the application of performance designs
- the level of knowledge required by different practitioners in the process
- industry reliance on deemed to satisfy provisions, because they were more secure
- limited product availability, and
- achieving different testing and verification methods to determine performance compliance.

The research concluded that, while the regulators are addressing the issues related to the use and development of performance codes as an aid to trade, the construction industry opinions reflect that the knowledge and application of performance codes are lagging behind. Given the state of understanding of the current codes, they were shown not to have a significant impact on trade for Australian construction industry. Furthermore, it was found that, notwithstanding the benefits of having similar performance-based codes throughout the world, there are many other barriers which the construction industry faces when trying to trade offshore. Conversely, Australia does not have any conditions on overseas tenderers wanting to contract for work in Australia. An obvious conclusion is
that this lack of protection leaves Australia vulnerable and exposed to global competition when it is not in a position to successfully compete itself. Also, due to the problems of international interpretation of the objectives and functional statements, the codes in their current state do not create the confidence necessary if they are to be used as a trading tool.

All of the respondents agreed that there were benefits from the adoption of performance-based codes. In particular support was given to innovation and cost savings by Kip (2004), Thomas (2004), Nassau (2004), Foliente (2004), Bretherton (2004), Bramwell (2004), and Balch (2004). In seeking examples of innovation, the respondents indicated that innovation could be derived in fire protection and design systems, which also reflected costs savings. The literature review revealed that there were cost savings in fire systems (both active and passive systems). However, the literature also indicated that there were limitations in innovation due to inadequate research and the subsequent lack of empirical data that can be practically utilised. Development budgets are also inadequate particularly in Australia (De Valance 2001; PriceWaterhouseCoopers 2002). There was a general lack of literature on case studies and the development of innovation in the construction industry. Rather there was an implied assumption that because prescriptive codes provide restrictive rules in a design sense, the operation of a more liberal approach, as demonstrated in performance-based building codes, will achieve more innovative designs (Foliente 2004; Balch 2004).

The analysis indicated that there are problems in the use of performance-based building codes in terms of their use and as a tool for trade. Problems have been identified with definitions, interpretations, lack of legal precedents, dependence by the industry on deemed to satisfy provisions, increasing costs of independent certifiers reports, product-testing costs and liability concerns. These are not small issues and need to be reconsidered. In addition the authorities/regulators should be advancing the area of knowledge in the formulation of performance design levels and verification and deemed to satisfy provisions. The monitoring of performance should also provide further case studies on the most efficient way to achieve innovative design and these should be provided to the industry for consideration through a journal subject to commercial confidentiality of
Chapter 6 Conclusions and Research Recommendations

designs. The industry should try to achieve cost-efficient ways to construct sustainable buildings for the future.

The literature review illustrated that the regulators appear to be at the forefront of change in the development of an international regulatory framework but have failed to keep the industry informed of the developments. Notwithstanding that there were representatives from the construction industry on committees, the information has not trickled down to the construction sector. The regulators have exceeded the competence of the industry and at this stage it is more important for the industry to be made aware of the opportunities presented by performance-based building codes.

6.3.2 How will the international development of performance-based building codes affect the construction industry?

The research analysed the current thinking about the implementation of performance-based designs, the views of people in prominent organisations, and explored related issues. The literature review described the impact of globalisation and the consideration of harmonious global policies. The role of the WTO is to promote trade and to assist countries with product export and market compliance. The philosophy is that global trade will positively influence trade opportunities for countries.

The research found that the WTO has the responsibility to promote trade. The literature review (Foliente 2000) suggests that statements from the TBT Agreement were applied to the further enhancement and adoption of performance-based codes. What is not clear is the extent and meaning of the interpretations. For example, the WTO TBT Agreement states that performance should be used for technical products, but this has been interpreted to mean broader activities including all building codes. What is needed is a review of policy and meaning of the WTO Agreement as it relates to the building and construction industry. There are opportunities within the TBT Agreement for countries exporting products and services to demonstrate compliance to core objectives which may then be accepted by the receiving country. Further research should be undertaken to investigate these possibilities.
More recently there has been acknowledgment that performance-based codes are not always available to developing countries and that they are mainly adopted in developed countries. This has presented two key areas of concern. The first is that developing countries are of a global concern as their building control standards are not at an acceptable level and there are human lives at risk with bad building faults in particular as a result of natural disasters. The CIB TG37 (2004) has recognised this as an issue.

The second concern is the limitation in trade, in particularly for Australia, whose trading partners are recognised as developing countries (Caton 1999). As it stands these countries do not have performance-based building regulations and yet Australia maintains trade with them. There is some doubt that a performance-based code would make such a difference when Australia’s products and services are taken offshore. Therefore the original objective of performance to promote trade is eroded because it is not applicable in all countries.

In responding to the research question, the research has found that performance-based codes, in isolation of all other barriers, have a better chance of removing trade barriers than a regimented prescriptive code. The difficulty is that such measures mean different things in different countries. While prescription has been removed as an impediment to trade because of its reliance on static measurement, the lack of measurements under performance make it just as difficult for the construction industry to work with. From the regulators the conclusion that can be drawn is that performance-based codes will remove trade barriers but the construction industry has a different opinion. A question to the interviewees related to why the construction industry wants to operate offshore. The clear response was to expand the market, to increase profits and to trade offshore given limited and boom-bust opportunities in the Australian sector. These factors have been identified as drivers for trade (OECD 2001, DISR 1999). The response by the majority of practitioner interviewees highlighted the adoption of performance-based codes would make very little difference at the international level. Some respondents indicated that in theory it would appear that the use of similar codes should simplify the process. However, given the difficulties with consistent interpretation this will not be achieved in the short term.
Chapter 6 Conclusions and Research Recommendations

The final part of the analysis presented a theoretical model which could be considered in the further development and refinement of policies that seek to achieve international similarity in performance codes and ensure its successful use and application in Australia. The model highlighted the inputs required and acknowledged that international codes could be restricted to performance objectives and mutual recognition with the qualitative component to be referred to the country. It was noted by a number of interviewees that a single international code was unlikely.

There are opportunities for harmonisation of common principles between countries. The theoretical model also provides opportunities for mutual recognition. The WTO TBT Agreement must be reviewed to determine the parameters of acceptance and compliance between countries.

6.3.3 Lessons for Australia

Consideration of the literature review and the information from the interviewees enables a number of propositions to be considered by the Australian construction industry and the Australian Building Codes Board. While Australia is a leading country with the technical development of performance-based codes, the same cannot be stated of our export potential. There are two matters which will drive performance-based design and which advance the holistic development of performance into the future: firstly, the economic benefits and efficiency that should be identified by the use of performance designs; and, secondly, the ongoing advancement of performance engineering by professionals within the industry. This advancement rests on further research and the use of empirical data and the limiting the continual upgrades to the deemed to satisfy provisions in the BCA.

There are offshore markets and opportunities but the majority of companies are inexperienced and not interested in supporting the costs of exploring a global market if they risk poor returns. The Building Code of Australia is a comprehensive tool to be used by the industry and can also provide the framework for international codes. But the limited use by the industry and the reliance on prescriptive codes rather than tackling performance considerations means that Australia’s construction industry is not making the most of
opportunities nor at the forefront of adopting the BCA in its entirety. The research has found here are other lessons:

- Government policy should focus on supporting the need for further research and development and innovation. Companies should be encouraged to undertake more research with products, processes and designs.
- Some interviewees expressed concern that Australia does not provide any restriction on trade yet when an Australian company embarks overseas they come across a number of barriers which restrict Australia’s trade potential. In particular, the example was provided for architects and registration. Consideration should be given to protection policies and registration of building practitioners.
- Australia is a small participant in the global export market and is therefore vulnerable where it could be difficult to compete with multinational companies. The concern is that if Australia had open trade these companies could come into Australia, buy companies and move profits offshore. The government should be more aware of these issues and the risks.
- Australia has introduced performance-based codes but there are uncertainties about the qualitative tests and verification methods. There is also a concern that performance-based codes are not being used effectively. The ABCB should review the education strategy and undertake further research to ensure that there is clarity in the use of codes and prescriptive deemed to satisfy provisions and assist in determining the qualitative methods to support designs.
- Australia is not prepared for the consequences in using performance-based codes. There needs to be further research undertaken in the area of risk litigation and the use of performance codes. There also needs to be further discussion with the insurance companies to determine the risks in making performance decisions.
- There needs to be further clarity in performance-based codes regarding for whom they are written. There is an assumption that the codes are mainly for fire design issues.
- A broader research question that could be addressed in the future is whether governments should pursue national interests in a world where the principal organisations have a global rather than a national interest.
6.4 FURTHER IMPLICATIONS

While the research questions above have been responded to, there remain additional issues which have to be further explored by the regulators with the support of the industry. These issues have arisen out of the research and include performance risks and litigation issues, issues related to the philosophy of public safety versus global trade and the education and expertise in the building industry.

6.4.1 Performance risks and litigation

Performance-based codes are not clearly understood and the interviewees also acknowledged the unknown risks. There is a lack of depth in the interpretation of performance-based decisions (Foliente 2004) and there have been few legal cases from which to gauge how performance-based codes are argued in the courts due to limited testing (Nassau 2004). The implementation of a performance approach requires the ability to resolve liability issues and this is subject to coordination by the CIB (Prior & Szigeti 2003). Some insurance companies such as in the UK are considering limiting the level of risk in the use of performance (Bramwell 2004). Carson (2004) noted that some insurers might even pull out of the market if performance is not adequately considered. The fire engineers indicated that the potential risk can be significantly reduced if the use of performance design is based on engineering first principles (absolute quantification) (Nicolas 2004, Kip 2004). The architect stated that the risks are greater for structural service and fire engineers rather than for architects.

6.4.2 Public safety versus global trade

At this stage there was little evidence from the interviews to suggest that public safety is jeopardised due to performance-based building codes. The interviewees indicated that the basis of design from first principles enables public safety concerns to be at the forefront of design (possibly in a greater way than prescriptive regulations would enable). The risk and litigation from ambiguous interpretations and lack of verification methods to test systems are, however, yet to be tested in the courts. The IRCC should be monitoring this area to
ensure that the social interest of public safety remains at the forefront of building regulations as distinct from the economic interest of trading offshore.

### 6.4.3 Education and expertise

A major concern identified by the respondents was the lack of education, training and professional development on the use of performance. There was overwhelming acknowledgment that this is a major policy issue for the future. In 1996, when the Building Code of Australia was introduced, there were a number of seminars around Australia about the use of the BCA. In addition there was additional training provided by the ABCB, and the professional associations into the use of performance. Some education institutions picked up additional training on the use of performance-based building codes (Balch 2004). The use of performance requires an increase in expertise in the knowledge base of the user. Some interviewees advocated that performance is design initiated by the client (Foliente 2004; Bramwell 2004). This would certainly require additional training to be provided to the community sector. The building and construction industry would also require additional training because it is neither understood nor practiced by some of the building surveyors or architects (Kip 2004, Nicolas 2004). The natural advancement or evolution of performance engineering and use of performance designs by the building industry can only occur with the corresponding advancement of engineering expertise, otherwise the industry could stagnate.

### 6.5 RECOMMENDATIONS AND OPPORTUNITY FOR FURTHER RESEARCH

#### 6.5.1 Review of global policies related to performance-based building codes

This research has shown that the regulators have extended their understanding of performance-based codes beyond the technical capacity of the users and the industry in terms of knowledge and use. For the benefits of performance-based codes to be fully realised and understood by the industry reliance of deemed to satisfy requirements should be reviewed. This has been demonstrated in the expertise required to comprehend the use of the codes, the difficulties in interpretation, problems with verification, reliance on
deemed to satisfy provisions and the concern over the limited use of the provisions. It is recommended that the international organisations IRCC and CIB undertake further research into these problems.

6.5.2 Research and development

The government and the building industry should be encouraged to undertake their own research and development into products and services. Australia has shown that it is capable of producing innovative concepts and the government and private industry should continue this task in the building industry by providing funding to undertake research of a practical nature which can be used by designers as part of an empirical data base. Information has shown that Australia is behind European cities in the amount of money allocated for research and development. It is therefore recommended that the construction sector, designers, architects and engineers allocate additional funding for research and development of products and services for the international market. It would be timely to undertake another survey to determine the extent of the use of performance-based codes.

6.5.3 International regulatory framework

The IRCC charter is for the development and adoption of performance-based codes, but there is no corresponding organisation that responds to and coordinates the trade and export needs of the building and construction industry at the global level. While Australia’s export potential is improving, it is still below that of other developed countries. It is recommended that the WTO TBT Agreement be reviewed in detail to determine the range of provisions and opportunities that are currently available to promote trade. It is also recommended that an international organisation monitor this information and how countries can use it.

It is recommended that an organisation review the impediments to the construction industry and its ability to trade with other countries. In addition this should be complemented by an international building journal where the industry and those related could share knowledge and discuss the use of regulations and information on innovation
and technology. While competition is regarded as a healthy way in which to operate an economically viable business there would be concern if much of our local work was undertaken by foreign companies at our expense.

6.5.4 The removal of trade barriers

It is recommended that if Australia is to remove trade barriers for the construction industry through the use of performance-based building codes, then consideration should be given to the other major impediments outlined in the research. The government should undertake further research to assist the construction industry in entering countries and aid licensing and registration arrangements.

6.5.5 Performance risks and litigation

The risk of litigation in the future remains a concern to practitioners who have made designs using performance-based codes which have required some discretion in the decision. The risks are associated with the final approvals by building surveyors in Australia. It is important that these practitioners have full-recorded details for their decisions on performance-based codes in case of future litigation.

It is recommended that there be some major case studies undertaken on what types of risks are possible and how they can be minimised. This should also be part of a global risk management strategy by the global organisations who are promoting the use of performance-based codes.

6.5.6 Public safety versus global trade

The underlying principle in the development of any building regulation should be to protect the health and safety of its inhabitants, the people who are to occupy the building. This is a primary goal for the legislation and is also a primary concern in the performance-based models. The practitioners during the interviews maintained that public safety was not at risk when using performance-based codes if they are developed on engineering first
principles. It is recommended that public interest policy principles be at the forefront of building regulations and that the philosophy to adopt an international agenda to promote trade be evaluated.

6.5.7 Education and expertise

In order to take advantage of performance-based codes, the tertiary education sector should be including performance-based approaches for students. Some tertiary education institutes are already undertaking this role. While the majority of the Building Code of Australia is related to fire regulations, this understanding must extend beyond the limited number of fire engineers. It is vital that the clients, the designers including architects and engineers are aware of the use of the provisions and their meaning. This will mean defining what expertise is required. It is recommended that users of the codes be clearly identified and that an education strategy at various levels of competence be developed for those groups. The delivery of analytical and quantification of performance criteria should be at the forefront of education particularly for building surveyors, architects and project managers. In its current state the education of performance-based principles is an impediment to the advancement of performance designs in the future.

6.5.8 Problems and the use of performance-based codes

There should be regular audits in the use of performance-based codes and their application by building authorities. In addition the regulators should be advancing the area of knowledge in the formulation of performance levels and verification and deemed to satisfy provisions. The monitoring of performance should also provide further case studies on the most efficient way to achieve innovative design and these should be provided to the industry for consideration through a journal or newsletter. The industry should try to achieve cost-efficient ways to construct sustainable buildings for the future.
6.6 CONCLUSION

In theory, the removal of trade barriers should assist the construction industry to trade offshore. This is based on the assumption that if the requirements were the same, processes for design, testing and acceptance would not need to be repeated. In practice, however, the research has shown that there are other problems associated with the development of performance-based codes, and the difficulty is applying a universal quantitative measure across countries. Some of the authorities also concurred by acknowledging that it was unlikely that there will be one global performance-based building code. The theoretical model showed the qualitative component could be adopted globally, but that it would be difficult to globally assimilate the quantitative aspects of the code in the short term.

The construction industry in Australia is not a key performer in global construction trade compared to other countries although its export market is improving. The other issue is that participants within the Australian construction industry are faced with other barriers, thereby limiting their potential to trade successfully. These impediments, such as entry into another country, licensing, registration, joint ventures and profit sharing and problems with the definition and interpretation of performance-based building codes, will further stifle the industry in the short term. It is therefore important that the issues in the use of performance-based codes be considered at the national and international level. The key goal for all participants is to promote a successful building industry that takes advantage of the regulations and to ensure that all issues related to the use of performance-based building codes are resolved to enable an easy transition.
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APPENDIX A INTERVIEW QUESTIONS

In your opinion what is globalisation and what does it mean for the construction industry? How is the construction industry in Australia performing overseas?

What are the benefits of performance-based building codes?

Why is their introduction regarded as important?

What problems do you see with the introduction of performance-based building codes?

Do you believe that performance-based codes result in cost savings for the construction industry?

Who in your organisation is responsible for the incorporation of performance designs in a construction project?

How does the construction industry work within other countries?

How will the role of the building designer be affected through the use of qualitative performance-based codes? Does it improve innovation?

Does the use of a performance-based building code put the designer at greater risk?

How does the use of performance-based codes aid the construction industry?

Is the construction industry represented on international and national committees in respect to the development of performance-based building codes?

What are the main reasons construction companies chose to trade offshore?

It has been stated that performance codes will assist in the removal of trade barriers?

Have you found any change in the use of performance-based building codes with another developed country who is using performance-based building codes? Please describe the advantages and disadvantages?

How will standard building regulations between developed countries aid improvements to the construction industry?

How do performance codes enhance the construction industry in terms of offshore trading?
APPENDIX B  PEAK AND INTERNATIONAL ORGANISATIONS FOR
THE DEVELOPMENT OF GLOBAL STANDARDS

ISO

The International Organisation for Standardisation (ISO) was founded in Geneva and provides for quality standards that are adopted voluntarily worldwide (Blair 1999). At present there is no globally accepted international standard for building control. Notwithstanding that there has been some movement towards international uniformity of performance-based building codes, the issue of a model for the administration of a legislative system has not been considered in depth. One of the most significant issues that must be considered is the cultural barriers and differences to enable one standard to be adopted worldwide. This will probably be the main element which determines the appropriateness of models in different countries.

Australian Standards provide an example of the quality of building products and materials used in construction. ISO quality standards are one of a number of recognised approaches to quality management. The ISO 9000 series of standards provides an internationally recognised method of ensuring quality.

OECD

The Organisation for Economic Cooperation and Development (OECD) became established on 30 September 1961 to promote policies designed to:

- achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability, and to contribute to the development of the world economy
- contribute to sound economic expansion in member as well as non-member countries in the process of economic development; and
- Contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations. (OECD 1992).
In 1995 OECD members recognised that regulatory reform is often based in public sector reform. A report OECD Recommendations on Improving the Quality of Government Regulations, urged member countries to take steps to improve the quality and transparency of regulations issued by all levels of government.

The OECD has recognised that the increasing complexities of world economies and globalisation have resulted in further competition in countries. Regulation reform is required to improve and update regulations to meet changing needs. Regulations which are obsolete may result in substantial costs or inefficiencies being imposed. (OECD 2000) [www.oecd.org/subject/regreform/economy.htm](http://www.oecd.org/subject/regreform/economy.htm)

**The European Commission**

In June 1992 an updated report was prepared on the process of establishing new legislation and standards for the European building services industry as implemented by the United Kingdom. Gregory and Crampton (1992) outlined the structure of European legislation and described the technical approvals structures which are used for measuring compliance. The purpose of the national law is to facilitate the free movement and the use of ‘fit’ products throughout Europe and to make it illegal to sell goods, which are not ‘fit for use’.

The European Commission began a process of ‘harmonising’ each state member’s building regulations into the European building regulations. Although nine Eurocodes have been developed they do not at that time cover building services. It is noted that harmonisation has commenced for liability indemnity and insurance in the construction industry but without much success (Lavers 1999).

Unfortunately the harmonisation process has not occurred, because the differences that existed in liability reforms did not impose a barrier to trade nor require additional consumer protection. The role of the European Commission in considering reforms of the building administration system is vital to the implementation of any uniform standards. Uniform building systems will certainly remove the barrier for trade and will
provide a form of consumer protection when liability laws are introduced through the building system.

**The European Union**

The European Union (EU) is the result of a process of cooperation and integration which began in 1951 between Belgium, Germany, France, Italy Luxembourg and the Netherlands. The EU today has fifteen member states and has prepared the fifth enlargement towards eastern and southern countries.

The European Union’s mission is to organise relations between the member states and between their people in a coherent manner and on the basis of solidarity. The main objectives are:

- To promote economic and social progress (single currency was launched 1999)
- To assert the identity of the European Union on the international scene
- To introduce European citizenship
- To develop an area of freedom, security and justice
- To maintain and build on established EU law

There are five institutions including the European Parliament, the Commission, and the Court of Justice, Court of Auditors and the Economic and Social Committee.

The European Commission embodies and upholds the general interest of the Union and is the driving force of the Union’s institutional system. Part of its agenda is to represent the Union on the international stage and negotiate international agreements, chiefly in the field of trade and cooperation.

One of the key relevant areas to be considered in line with this thesis is the EU competition policy, which is regarded as essential for the completion of the international market. The EU competition policy seeks to encourage economic efficiency by creating a climate favourable to innovation and technical progress. It also makes it possible to ensure that any anti-competitive practices by companies or national authorities do not hinder healthy competition. ‘The *raison d'être* of the internal market...
is to allow firms to compete on a level playing field in all Member States. The EU competition policy must guarantee the unity of the internal market and avoid the monopolisation of certain markets by preventing firms from sharing the market via protective agreements. Markets can come to be monopolised as a result of restrictive agreements or company mergers. It attempts to prevent one or more firms from improperly exploiting their economic power over weaker firms (abuse of a dominant position). In http://europa.eu.int/scadplus/leg/en/lvb/126055.htm

CIB


The CIB was established in 1953 with the support of the United Nations as an association whose objectives were to stimulate and facilitate international cooperation and information exchange between governmental research institutes in the building and construction sector, with an emphasis on those institutes engaged in technical fields of research. At that time an implicit objective also was to help rebuild the European infrastructure for building and construction research following the Second World War.

The CIB has developed into a worldwide network of over 5000 experts from about 500 member organisations who exchange information in over 50 CIB commissions covering all fields in building and construction related research and innovation. The purpose of the CIB is to provide a global network for international exchange and cooperation in research and innovation in support of an improved building process and of improved performance of the built environment.

The scope of the CIB covers the technical, economic, environmental, organisational and other aspects of the built environment during all stages of its lifecycle, addressing all steps in the process of basic and applied research, documentation and transfer of the research results, and the implementation and actual application of them.
The objectives of the CIB are to be: a relevant source of information concerning research and innovation worldwide in the field of building and construction; a reliable and effective access point to the global research community, and a forum for achieving a meaningful exchange between the entire spectrum of building and construction interests and the global research community.

In achieving its objectives the CIB shall promote for international benefit appropriate collaboration with other international and national organisations.

The CIB has a number of task groups and working commissions around the world on a variety of different issues. It is interesting to note that there is no working party to review the globalisation of the construction industry. Rather the most relevant working parties are those related to the Geography of Culture and W87 Post-Construction Liability and Insurance, which relate to an international aspect of construction insurance.

While the CIB promotes itself as the centre of research, there are issues arising in respect of how they are able to implement change in the regulatory and political environment. Structures of government require policies to be prepared and supported to be given through higher government structures. Much of the work of the CIB is research and awaits implementation by government authorities.

CIB is available on http://www.cibworld.nl/pages/gi/pages.pastpres.html

BRANZ

The Building Research Association of New Zealand (BRANZ) is an independent, unbiased technical information organisation on a wide range of building-related matters. For example, BRANZ Fire Engineering and Testing section is recognised for its fire testing and fire safety consulting services, and for research into the behaviour of building material and systems in fire, by regulatory bodies in many countries, including Australia, Hong Kong, Singapore, Malaysia and New Zealand.

BRANZ appraisal service appraises building products and systems for their fitness and purpose and compliance with the building codes of Australia and New Zealand.
BRANZ appraisal certificates take into consideration all relevant performance requirements of the Building Code of Australia (BCA96) or the New Zealand Building Code (NZBC). BRANZ provides an important role in at least standardising products.

If the accreditation test were provided for building products that could be used globally, there would be significant cost savings to the manufacturers, who could avoid having the test undertaken for product compliance in different countries.

The issues of one standard one test has been as a means to improve cost efficiency has been discussed in the section under ISO.

**Consortium of European Building Control**

In 1992 the Institute of Building Control responded to a suggestion of the European Commission and formed the Consortium of European Building Control. This body relates to the activity within the EU countries where the basic building control responsibility is the examination of plans for new, extended or altered buildings together with site inspections during construction to ensure compliance with national regulations, codes and standards, mainly for health and safety purposes. The consortium provides a forum for the dissemination of information and exchange of views, and the development of European objectives associated with building control. Its strategy is to reflect a ‘unified opinion’ and adoption of the ‘one-voice’ theory. (website www.building-control.org/consort.htm)

**International Code Council**

The International Code Council (ICC) in the United States of America was established in 1994 for the purpose of providing a single set of comprehensive and coordinated national model construction codes. The founders of ICC are the Building Officials and Code Administrators International Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International Inc. (SBCCI). Previously these three codes bodies represented the model codes used throughout the United States. The adoption of a single code over three regional codes has demonstrated the need for portability of knowledge and consistency of
requirements, and enhancement for innovative research which complies with a single code. The theory is a single set of codes may encourage States and localities that currently write their own codes to begin adopting the International Codes without technical amendments (in http://www.intlcode.org/abouticc.htm).

The ICC in the International Codes document states under provision 1.3.1:

the provision of all codes shall be consistent one with another so that conflicts between the codes do not occur. Where a given subject matter or code text could appear in more than one code, the ICC Board shall determine which code shall be the primary document.

It should be noted that the ICC is a model code for the United States rather than a model code for the world. The code demonstrates the logistics of a country to see the benefits of a single building code which will provide consistency in application and to increase the quality of building work.

IRRC

The Inter-jurisdictional Regulatory Reform Committee is comprised of representatives from 10 countries. Their charter is to examine the performance-based regulations with a view to standardising the provisions for use by those countries and internationally. As previously mentioned, performance regulations alone do not constitute the globalisation of building activity; it is merely a standard for building regulations which would make dealing with the country easier if the regulations were the same. They have described their purpose as:

The purpose of the Inter-jurisdictional Regulatory Collaboration Committee is to advance, at an international level, framework, guidance and support documents on construction related regulatory environment issues relative to development, implementation and support of performance-based regulatory infrastructure, education, and technology issues related to merging the successful implementation and construction of construction related performance-based regulatory systems. The intent is to advance a common understanding of the international regulatory environment, to provide the exchange of information and to facilitate a more open environment of inter-jurisdictional common in the areas of building design and construction. www.ircc.gov.au
The International Council for Building Research Studies and Documentation (CIB) at the request of the National Research Council, Canada (NRCC), commissioned a task group to review the development of performance-based regulations internationally and to identify the common features of such regulations. The inter-jurisdictional group was formed in late 1993 after several teleconferences were held between representatives of ABCB, ICBO, NRCC and SFPE (Society of Fire Protection Engineers).

The benefits of the group are to:

- Provide a forum for promoting a common understanding and a framework for performance-based building regulatory system development
- Provide guidance and support material for countries
- Promote the pooling of resources on an international scale to aid research and development of commonly needed components of a performance-based regulatory system
- Provide economic benefit to countries embarking on performance-based regulatory development, by providing guidance and support material, thus minimising duplication
- Provide a forum for those with experience in building regulatory system reform, from both the technical and regulatory perspectives to foster the exchange of ideas and the development of best practice
- Create a potential medium for inter-jurisdictional trade. It was recognised that the lack of regulatory harmonisation can affect the ability of jurisdictions to adopt standards and to import or export products, systems and skills.

( in www.irc.nrc.ca/ircc/report98/ )

The IRCC has advocated in 1998 that the growing trend around the world is to introduce performance-based codes as central to improving efficiency in the construction industry. In this regard performance requirements are viewed as encouraging innovation and flexibility without strict prescription. Performance-based building codes encourage new techniques and practices, leading to expansion and increased efficiency. This promotes investment in the industry, which in turn increases national GDP.
NCSBCS

The National Conference of States on Building Codes and Standards represents the States’ building code and safety interests. At a conference held October 2000 consideration was a given to federal agencies and the impact of the building regulatory process in the area of international trade. The issues involved understanding what actions need to be taken to decide which competitive versions of model construction codes to adopt and how information technically can enhance the effectiveness and efficiency of the building regulatory process. The international committee discussed the need for the states to promote the adoption and the use of US codes and standards to oversee and facilitate both US trade and economic development in various parts of the world. During a two day forum in Puerto Rico in October 2000 a declaration of cooperative action was issued calling for the nations in the region to develop and adopt uniform construction codes throughout the region, and educate and train enforcement and construction personnel for effective code enforcement. The purpose of the collective action was also to reduce the vulnerability to national disasters by providing assistance.

www.ncsbcso.org/

The Australian Building Codes Board

In 1994 all States and Territories of Australia signed an Inter Government Agreement to establish the Australian Building Codes Board (ABCB). The ABCB’s mission is to provide for efficiency and cost effectiveness in meeting community expectations for health, safety and amenity in the design, construction and use of buildings through the creation of nationally consistent building codes, standards, regulatory requirements and regulatory systems.

Notwithstanding that there has been some movement towards international uniformity of performance-based codes, the issue of a model for the administration of a legislative system has not been considered in great depth. Also, the issue of culture and different degrees of economic success may create the different barriers in the adoption of one standard or model building codes by countries.
The ABCB operates a national product certification scheme, which enables the ABCB to issue a national certificate of conformity. The scheme is available to all product manufacturers. The government is committed to ensure that cost effectiveness of the national scheme will be monitored to ensure that it does not impose a burden on manufacturers.

The Australian Government has over arching responsibility for the development of national policies and a regulatory framework through the Building Code of Australia. The States and Territories have their own legislative and administrative systems relating to building regulations and planning controls. The States together with the Commonwealth have developed the performance-based building code, the Building Code of Australia 1996 (BCA96). The States implement the BCA through the State building legislation, in particular the provisions for the performance-based technical standards.
APPENDIX C  LIST OF INTERVIEWEES


