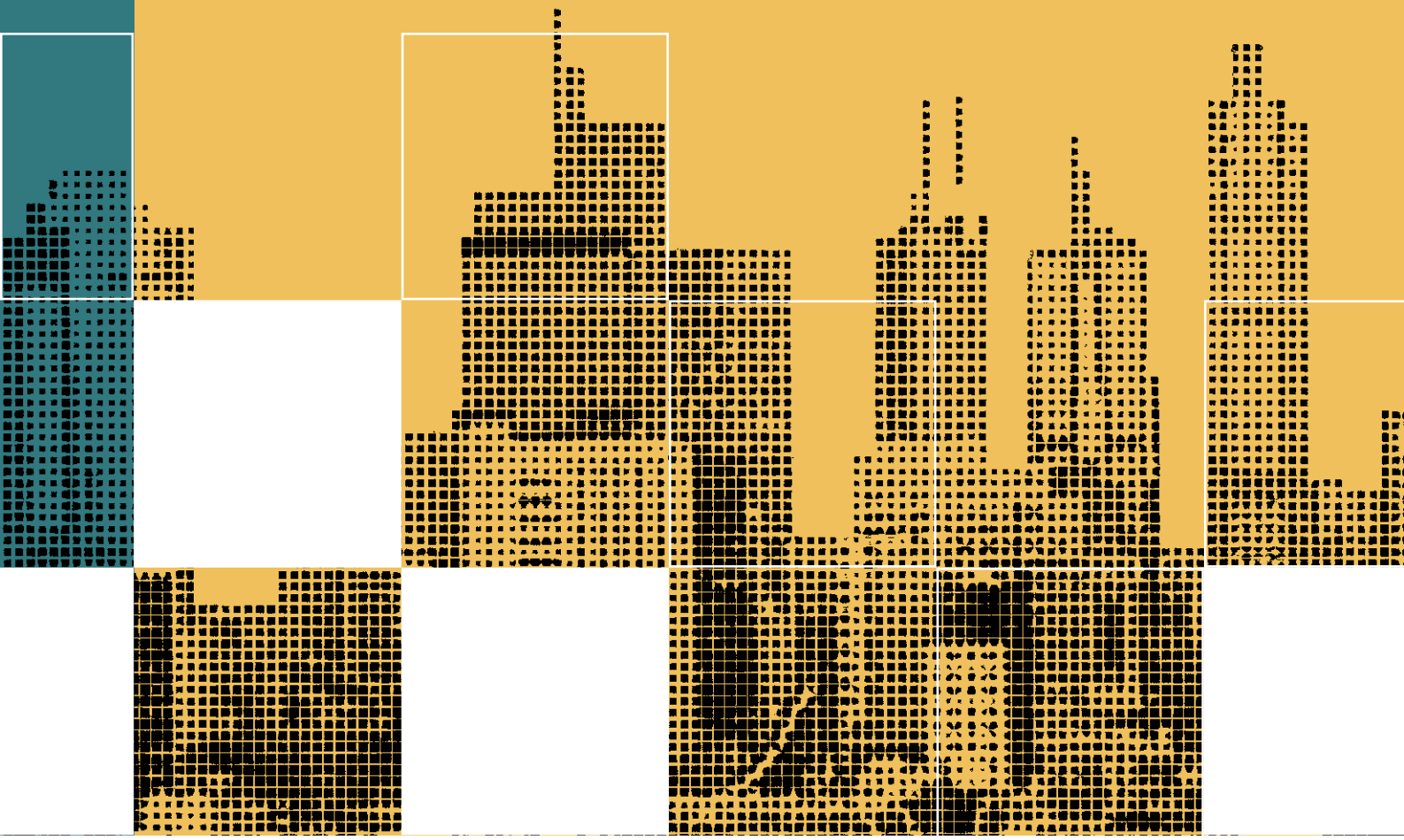
ROYAL COMMISSION
INTO THE BUILDING AND
CONSTRUCTION INDUSTRY

Workplace Regulation, Reform and Productivity **in the International Building and Construction Industry**



DISCUSSION PAPER FIFTEEN

REPORT PREPARED ON BEHALF OF UNISEARCH LTD, UNIVERSITY OF NEW SOUTH WALES FOR THE ROYAL COMMISSION INTO THE BUILDING AND CONSTRUCTION INDUSTRY
NOVEMBER 2002

Workplace Regulation, Reform and Productivity in the International Building and Construction Industry

Discussion Paper 15

**Paper prepared on behalf of Unisearch Ltd,
University of New South Wales
for the
Royal Commission into the Building and Construction Industry**

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1 Background

In his opening statement Commissioner Cole stated that baseline studies and background papers would be published for comment by interested parties. This, as the fourteenth paper, compares workplace regulation, reform and productivity in the international building and construction industry.

This paper has been developed for discussion purposes only. Although the paper has been read and considered by the Commissioner, and approved by him for release as a discussion paper, it should not be assumed that any of the views expressed represent the provisional or final views of the Commissioner. In particular, the reference in the discussion paper to particular evidence given, or submissions made, to the Commission does not indicate that any final view has been taken concerning their correctness. The discussion paper is designed to raise issues enabling responses to be taken into account in the development of the Commission's final report.

This paper provides key background information on the industry and the environment in which it operates. It identifies issues and questions that the Commission will need to consider. *Public input is sought on those issues*. The Commission welcomes comments on all aspects of this paper. Those writing submissions should feel free to comment on any issues relevant to the Commission's terms of reference and should not be confined by the specific issues raised in this paper.

All papers are available on the Commission's website at www.royalcombci.gov.au or by contacting Victoria Elliott on (03) 8650 3249.

Interested persons should provide any written submissions or comments on this paper to the Commission by 29 November 2002. Written submissions should be sent to:

The Secretary
Royal Commission into the Building and Construction Industry
GPO Box 2577
Melbourne Victoria 3001

Unless confidentiality is requested, all submissions will be treated as public documents. A submission with confidential information should have the confidential sections marked and separated. Two copies should be provided — one with the confidential sections and one suitable for public release. If the Commission considers that a submission does not warrant confidential treatment, it will advise the author of the submission of its decision. The author can then agree to publish or withdraw the submission.

1.1 The Royal Commission

By letters patent dated 29 August 2001 issued under the hand of the Governor-General, Commissioner Cole was appointed to inquire into certain matters relating to the building and construction industry. The Letters Patent requires him to

inquire into and report on the following matters in relation to the building and construction industry:

(b) the nature, extent and effect of any unlawful or otherwise inappropriate industrial or workplace practice or conduct, including but not limited to:
    (i) any practice or conduct in relation to the *Workplace Relations Act 1996*, occupational health and safety laws, or other laws relating to workplace relations;
    (ii) fraud, corruption, collusion or anti-competitive behaviour, coercion, violence or inappropriate payments, receipts or benefits; and
    (iii) dictating, limiting or interfering with decisions whether or not to employ or engage persons, or relating to the terms on which they be employed or engaged.

(c) the nature, extent and effect of any unlawful or otherwise inappropriate practice or conduct relating to:
    (i) failure to disclose or properly account for financial transactions undertaken by employee or employer organisations or their representatives or associates; or
    (ii) inappropriate management, use or operation of industry funds for training, long service leave, redundancy or superannuation.

(d) taking into account your findings in relation to the matters referred to in the preceding paragraphs and other relevant matters, any measures, including legislative and administrative changes, to improve practices or conduct in the building and construction industry or to deter unlawful or inappropriate practices or conduct in relation to that industry.

For the purpose of the inquiry, a reference to the building and construction industry does not include the building or construction of single dwelling houses, unless part of a multi-dwelling development.

The Commission is seeking information through a range of sources, including:

- an extensive program of public hearings across the country;
- information provided to the Commission by individuals and organisations;
- private meetings with key stakeholders;
- the work of external consultants;
- investigation and research by Commission staff;
- submissions; and
- workshops on key issues.

Another important aspect of this information will be the submissions and comments provided to the Commission in response to these discussion papers.

1.2 Scope of this discussion paper

The Commission appointed Unisearch Ltd at the University of New South Wales to prepare a discussion paper comparing building and construction industry performance

internationally and workplace reform strategies in several countries. The paper provided by Unisearch Ltd is reproduced in this document.

The discussion paper is divided into two main parts. Part A is an international comparison of construction industry performance. This involves an analysis of eight countries: the G6 countries (Canada, France, Germany, Japan, the United Kingdom and United States of America), plus Singapore and Australia. These countries are examined using four key performance indicators, namely, productivity, cost, time and quality (only in relation to Australia, the United Kingdom and Singapore). The analysis uses various secondary data which was supplemented with primary macroeconomic data on performance indicators.

In drawing this analysis of Part A together, the paper concludes that while Australia is generally well placed in such international comparisons, the building and construction industry performance is lagging behind other industries.

All international comparisons should be treated with caution because of the difficulty in obtaining data that is comparable between countries. The international studies look only at labour productivity because the difficulties in obtaining data limit the validity of broader measures for comparing productivity. Partial productivity comparisons can be misleading. If labour is relatively expensive in one country, construction firms in that country will tend to use more capital to reduce the need to use expensive labour. The impact of this on labour productivity comparisons will be that the country with the expensive labour will appear to be highly productive. In the results presented it is difficult to identify the reasons underlying Australia's ranking relative to other countries.

Part B comprises construction industry reform case studies for three countries: Australia, the United Kingdom and Singapore. These case studies explore the nature and impact of productivity-based reform agendas in these respective countries. The purpose of this approach is to understand how the reform process in Australia compares with reform processes overseas. The study does this by focusing on key government, industry and research reports which have examined productivity and efficiency in the three countries over the last twenty years.

In drawing this analysis of Part B together, the paper concludes that continued improvements in performance in the Australian building and construction industry are important for two reasons:

- the increasing global competition in construction services; and
- the aggressive attempts of other countries to make their own building and construction industries more internationally competitive.

International competitiveness attracts international investment. The paper notes that reform is especially relevant for Australia given its location in one of the world's most dynamic economic regions. This poses special competitive challenges, risks and opportunities for both Australia generally and the industry specifically.

In submissions to the Commission, all interests in the building and construction industry appear to accept the desirability, and perhaps the imperative, of having an

internationally competitive industry in Australia. The terms of reference require the Commission to consider the effects of conduct found to exist in the industry. That includes its effect on competitiveness. Accordingly, in developing its final recommendations, the Commission will have regard to matters raised in this paper. It invites comments on these issues.

Report prepared by
Unisearch Limited
University of New South Wales

on

WORKPLACE REGULATION, REFORM AND PRODUCTIVITY IN THE INTERNATIONAL BUILDING AND CONSTRUCTION INDUSTRY

for

Royal Commission into the
Building and Construction Industry

2002

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Acknowledgements

Authors
Professor Denny McGeorge - University of New South Wales, Sydney.
Professor Martin Loosemore - University of New South Wales, Sydney.

We are very grateful for the assistance that has been provided by the contributors to this report. We would stress however that the opinions expressed are our own and do not necessarily reflect the views of our panel of experts.

Researchers
Jay Rutovitz, University of New South Wales, Sydney.
Sherman Heng, University of New South Wales, Sydney.

Contributors
Dr David G Proverbs, University of Wolverhampton, UK.
Gerard de Valence, University of Technology Sydney, Australia.
Professor Roy Morledge, The Nottingham Trent University, UK.
The Staff of the Building and Construction Authority, Singapore.

Abbreviations

ABCB	Australian Building Codes Board
ABS	Australian Bureau of Statistics
ACIC	Australian Construction Industry Council
AFFC	Australian Federation of Construction Contractors
APCC	Australian Procurement and Construction Council
ASCE	American Society of Civil Engineers
BCA	Building and Construction Authority (Singapore)
BEC	Building Employers Confederation (UK)
BIT	Building Industry Taskforce (Australia)
BLF	Building Labourers Federation (Australia)
BOT	Build Own Transfer
BPF	British Property Federation
BSC	Basic Skills Certificate (Singapore)
C21	Construction 21 (Singapore)
CACS	Centre for Advanced Construction Studies (Singapore)
CAD	Computer Aided Design
CBPP	Construction Best Practice Programme (UK)
CIB	Construction Industry Board (UK)
CIC	Construction Industry Council (UK)
CICE	Construction Industry Employers Council (UK)
CIDA	Construction Industry Development Agency (Australia)
CIDB	Construction Industry Development Board (Singapore)
CIDC	Construction Industry Development Council (Australia)
CIEC	Construction Industry Employers Council (UK)
CIJC	Construction Industry Joint Committee (Singapore)
CIPFA	Chartered Institute of Public Finance Accountants (UK)
CITB	Construction Industry Training Board (UK)
CONQUAS	Construction Quality Assessment System (Singapore)
CORENET	Construction and Real Estate Network (Singapore)
CPPM	Capital Project Procurement Manual (Australia)
CPSP	Construction Policy Steering Committee (Australia)
CRS	Contractors Registration System (Singapore)
CSS	Centre for Strategic Studies (UK)
CTAS	Construction Technology Assessment Scheme (Singapore)
D&B	Design & Build
DISR	Department of Industry, Science and Resources (Australia)
DITAC	Department of Industry, Technology and Commerce (Australia)
DOE	Department of Environment (UK)
DoS	Department of Statistics (Singapore)
DPWS	Department of Public Works and Services (Australia)
DQI	Design Quality Indicator (UK)
DTLR	Department of Transport, Local Government & the Regions (UK)
EC	European Community
EDC	Economic Development Committee (Australia)
ENR	Engineering News Record
ESD	Ecologically Sustainable Development
FCAPP	Foresight – Construction Association Program Panel (UK)
FIDIC	Federation Internationale Des Ingeniurs-Conseils
GDP	Gross Domestic Product

HDB	Housing Development Board (Singapore)
IC	Industry Commission (Australia)
ICT	Information and Communication Technologies
IDEA	Improvement and Development Agency (UK)
IDS	Innovation Development Scheme (Singapore)
IiP	Investment in People (UK)
ILO	International Labour Organisation
INTECH	Initiatives in New technologies (Singapore)
IPA	In Principle Agreement (Australia)
IT	Information Technology
JITS	Joint Industry Training Scheme (Singapore)
KPI	Key Performance Indicator
KPIWG	Key Performance Indicators Working Group (UK)
LETAS	Local Enterprise Technical Assistance Scheme (Singapore)
LGTF	Local Government Task Force (UK)
MCF	Maintenance Cost Feedback (Singapore)
M^4I	Movement for Innovation (UK)
MFP	Multi Factor Productivity
MND	Ministry of National Development (Singapore)
MOU	Memorandum of Understanding
MYE	Man-Year Entitlements (Singapore)
NAO	National Audit Office (UK)
NatBACC	The National Building and Construction Committee (Australia)
NCCS	National Certificate in Construction Supervision (Singapore)
NEDC	National Economic Development Council (UK)
NEDO	National Economic Development Office (UK)
NPWC	National Public Works Council (Australia)
NSCG	National Specialist Contractors Council (UK)
NTUC	National Trades Union Congress (Singapore)
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health and Safety
OHS&R	Occupational Health and Safety & Rehabilitation
PPP	Purchasing Power Parities
PQC	Pre-Qualification Criteria (Australia)
R&D	Research & Development
RCBI	Royal Commission into Productivity in the Building Industry in NSW
RCL	Rethinking Construction Limited (UK)
REDAS	Real Estate Developer's Association of Singapore
SAG	Sustainability Action Group (UK)
SCAL	Singapore Contractor's Association Limited
SECG	Specialist Engineering Contractors Group (UK)
SFC	Strategic Forum for Construction (UK)
SLOTS	Singapore List of Trade Subcontractors
SMEs	Small and Medium Enterprises
TFP	Total Factor Productivity
URA	Urban Redevelopment Authority (Singapore)
VA	Value Added
VITB	Vocational and Industrial Training Board (Singapore)

Introduction

Unisearch has been engaged by the Royal Commission into the Building and Construction Industry to undertake an international comparison of Building and Construction industry performance and the effects of workplace reform agendas on the industry. This was a desktop study conducted over a period of seven weeks.

This paper is divided into two parts:

Part A is an inter-country comparison of construction industry performance. Included in the international comparison are the G6 countries (Canada, France, Germany, Japan, UK, USA) plus Singapore and Australia. The focus is on key performance indicators in the areas of productivity, cost and time, with a discussion of approaches to quality assessment in three countries. The paper reviews and presents secondary data from a range of Australian and international studies that compare performance between different countries and supplements this with primary macroeconomic data on performance indicators. While the scope of this paper is restricted to high-rise buildings, industrial and commercial buildings, and infrastructure construction, most macroeconomic data is presented for the construction sector as a whole because it is not possible to exclude residential low rise.

Part B comprises three case studies that chronologically document the nature and impact of productivity-based reform agendas in Australia, the United Kingdom and Singapore. Each case study focuses on key government and industry reports and research projects, which have specifically addressed productivity and efficiency in the building and construction industry over the last 20 years. The case studies highlight key players in the reform process, stimulants and impediments to reform in each country and measures, which have been put in place to address the problems highlighted. The case studies share a common structure, which enable comparisons to be made, thereby allowing Australian reform structures, agendas to be placed in an international context.

The analysis of the published reports and data undertaken in Part A demonstrates that Australia is well placed in international comparisons (given the limitations of the data and the inherent difficulties of obtaining accurate international comparisons). However, the industry performs less well, when compared to other sectors. Continued improvements in performance are important because of increasing global competition in construction services and the aggressive attempts of other countries like the UK and Singapore to make their building and construction industries more internationally competitive (see Part B case studies). Reform is especially relevant for Australia given its location in one of the most dynamic economic regions of the world, which poses special competitive challenges, risks and opportunities.

Part A: International Comparison of Construction Industry Performance

1. Overview

There has been considerable interest over the last ten years in comparing the performance of the Australian building and construction industry to that of other countries. This report discusses a range of approaches to measuring performance, followed by an overview of recent international comparisons and rankings. It then discusses the main performance indicators used in international comparisons, and presents time series macroeconomic data on labour productivity and the contribution of the construction industry to the economy. When interpreting the findings, it should be noted that limitations arise from differences in statistical collection methods between countries, differences in local construction methods and operating environments, and the difficulties of converting monetary data to a common currency.

Eight countries have been included for review, the G6 countries, Canada, France, Germany, Japan, the UK, and the USA, plus Australia and Singapore.

There are four primary measures of performance, namely; productivity, cost, time and quality. Ideally a performance measure would include all four. However, most studies to date have concentrated on either productivity or cost because of the difficulty in obtaining useful quantitative information on time and quality.

In terms of cost performance, Australia's building and construction industry has been rated highly in international research comparisons and published series on construction costs. The most common ranking for Australia was second place (across fourteen listed comparisons). In two studies, Australia was ranked highest. While the error margin in most of these comparisons is at least ± 5%, Australia fell within the group of countries with a clear competitive advantage in the majority of studies described.

In terms of productivity, international research comparisons indicate that Australia is on a par with Japan and Germany in value added per hour, performing slightly better than France and the UK, but lagging behind the US, Canada, and Singapore. In value added per employee the picture is similar, with Australia on a par with Japan, performing slightly better than the UK, Germany and France. The US, Canada and Singapore have a clear competitive advantage in both cases, and the small differences between the other countries may not be statistically significant. Both indicators show an upwards trend in Australia over the 10 year period shown.

In the comparisons of construction productivity to other sectors, the contribution of construction to GDP was relatively low in proportion to the workforce employed in construction. The Australian construction sector's contribution to GDP relative to its workforce size was ranked 6th in the cross-sector comparison, approximately equivalent to that in the US. In value added

per hour compared to value added in all sectors of the economy, the Australian Building and Construction industry ranked 4th compared to the other sample countries. Construction value added remains poor compared to the rest of the economy.

There are a small number of studies that give comparative data on time and these have been reviewed, but international quality comparisons were lacking. Consequently, the approaches to quality assessment in the Australian, UK and Singapore construction industries are briefly described. In summary, both the UK and Singapore appear to be further advanced in the development of systematic quality assessment systems, and Singapore in particular appears to have achieved a high level of penetration of quality assessment across the construction industry.

2. Methodologies

There are broadly three approaches for international construction comparisons: pricing studies, macroeconomic studies, and case studies, each with advantages and limitations (Edkins and Winch, 1999). The key elements of international comparisons are comparability and representativeness. It is very difficult to satisfy both criteria simultaneously, and methodological variations generally increase one of these factors at the expense of the other.

Conversion to a common currency is a fundamental issue in all international comparisons that include a cost element. One approach is to use exchange rates. However, exchange rate fluctuations may be a source of distortion in both price indices and in the presentation of Gross Domestic Product (GDP) statistics (OECD 1999), particularly for goods and services that are not traded between countries. For this reason the UN has run the International Comparison Programme since the late 1960s, and the Organisation for Economic Co-operation and Development (OECD) introduced a programme in the early 1980s, to calculate and publish an international index of Purchasing Power Parities (PPPs) to provide a more meaningful currency converter. One of the primary objectives has been to allow comparison of macroeconomic data between countries (Vachris and Thomas, 1999).

Purchasing Power Parities

The PPP index is a method of currency conversion that aims to eliminate the difference in price levels between different countries. The PPP is the amount of local currency needed to obtain the same goods or services that would be purchased by the reference currency, usually US$. When PPPs are given as the conversion rate to US$, the PPP is the ratio of the local currency price to the price in dollars in the US. PPPs are calculated by obtaining local prices for a defined basket of goods and services. PPP's may be used instead of exchange rates for any international cost comparisons. PPPs are also be given as an index value relative to the US$ or to the OECD average.

Included in the OECD PPP survey rounds are 20 construction projects which are priced in different countries. The 'construction PPP' are listed with PPPs for other product groups, and these are aggregated into the PPP for each

country's GDP. The construction PPPs themselves provide an index of relative construction prices for the sample countries, and are frequently used in international comparisons (for example, Pilat 1996, ENR, Hanscomb Means). The validity of the method has been questioned (see Vermande and Van Mulligen, 1998), but the Eurostat survey remains the most extensive annual comparison available.

The calculation of PPPs relies on pricing comparable goods and services that are representative of price levels in the different countries. Reliability depends on the comparability of goods and services, the accuracy of the pricing data and the weight which is given to various expenditures. While it is not possible to determine error margins accurately, it is taken as a rule of thumb that differentials need to be at least 5% to be significant at GDP level, or greater at lesser levels of aggregation (OECD, 1996).

This report uses PPPs rather than exchange rates to present cost and GDP data wherever this is possible. PPP conversion rates obtained from the OECD are used for all countries except Singapore. OECD does not publish PPP conversion rates for Singapore, for which World Bank listings have been used. General PPPs are used when the object is simply to compare monetary values in a common currency, and are most commonly used in this report. Construction PPPs are used for conversion of cost data when the underlying intention is to compare the 'amount of building' against another variable, specifically for value added per hour or per employee.

It should be noted that the use of PPPs does not entirely avoid potential distortion. Countries with relatively strong currencies relative to their PPPs may appear more expensive than those with weak exchange rates relative to their PPPs, although it will tend to improve their comparisons of value added (Edkins and Winch, 1999). Australia's exchange rate is generally weak relative to it's PPP, so the use of PPPs will tend to improve value comparisons and worsen cost comparisons.

Macroeconomic Studies

Macroeconomic studies utilise available statistical data at a national level, usually from national accounts and national industry statistics. They are the most common method for presenting productivity indicators. Such indicators are frequently used to make international comparisons of productivity at an aggregated level, or to trace changes in national performance (for example Pilat 1996, Lewis et al 1996, Access 1999). They have the advantage that time series data may easily be presented, and offer a cost effective way of making comparisons, since data is relatively easy to obtain. However, varying definitions for data sets between countries may undermine their reliability. For example, self employed workers are included in the Australian data used, which may have the effect of underestimating Australia's relative performance if self employed workers are excluded from the other country's total hours. In addition, such comparisons can only reveal differences at a macro level, and may not be of value in analysing causes for differences in performance or informing strategies for improvement (Proverbs 2001). Finally, Croce et al (1999) point out that the use of techniques for determining value added are

inconsistent, even across the Australian construction sector. For example, the double deflation method is used to determine residential and non-residential construction product, whereas the engineering construction sector product is derived using intermediate input methodology. Croce *et al* consider this has led to a significant underestimation of productivity growth in the Australian construction sector, as it assumes that the ratio of inputs to outputs in the industry remains static over time. Furthermore, the treatment of capital ownership and use in the Australian National Accounts generally disadvantages the Australian construction sector, by assigning depreciation and interest expenses to the owner rather than the users of the equipment. Croce *et al* estimate this could result in the construction sector value added being underestimated by as much as 25%, as the sector sources a large amount of capital equipment on a rental basis.

While Croce *et al* do not discuss how these factors affect data collection in the other study countries, the likelihood is that inconsistencies are multiplied when considering National Account data across several countries. The paper also discusses a range of factors that further complicate international comparisons, such as:

- No mechanism to adjust productivity indices or comparisons for quality differences;
- The effects of different levels of training and R&D across different countries;
- The effects of volatility in the business and investment cycle.
- Difficulties in construction industry output price indexes keeping pace with changes in the composition of industry output.

Pricing Studies

The methodology generally adopted in pricing studies is for professionals in each study country to be invited to cost hypothetical buildings from identical drawings or bills of quantities. Pricing studies rely on skilled estimators in each country, and it is expected that even with good data bases of costs available, predictions of tender prices will vary by ± 5% (Davis Langdon Consultancy, 1999). Never the less, this is the basis of the major series available which compare constructions costs internationally (for example, the OECD / Eurostat Construction PPPs). This approach has also been used in many of the smaller and more focused research projects on comparative costs or performance (for example, Langston and Best 1999, Proverbs 2001).

This approach theoretically achieves comparability, but representativeness may be compromised because a particular building style or attribute may be standard practice in one location and not in another. This is sometimes avoided by allowing local variations to be substituted where necessary. However, this is inevitably a trade off with comparability.

Another problem with pricing studies is that countries in which cost overruns are greater or more frequent will tend to be favoured in comparisons based on tender prices rather than actual final cost. Moreover countries where it is normal for contractors to offer savings on tender prices by proposing different building specifications, such as the US and France, will be relatively disadvantaged. In addition, pricing studies are very sensitive to exchange rate fluctuations and to the construction cycle. (Edkins and Winch, 1999)

Despite the problems associated with data collection, pricing studies provide a basis of comparison that may highlight areas of both weak and strong performance, particularly as pricing studies distinguish between different sectors of construction.

Case Studies

In case studies, 'comparable' projects are selected in different countries and various performance indicators, and sometimes other aspects, are compared. This in-depth approach has the advantage of allowing researchers to generate insights into how performance differences arise. It also avoids some of the problems associated with comparing tender prices to actual. However, it is difficult to identify truly comparable projects, and to disentangle the role that real differences play in the variations in performance. The method is also extremely time consuming.

3. Summary of international comparison studies

Fifteen of the international comparison studies or series accessed included Australia, and these are reviewed in detail in Sections 4 – 6. Only one, the Engineering News Record (ENR) Fourth Quarterly Report for 1999, includes all eight countries.

Table 1 presents an overview of the studies that include Australia for each of the performance indicators: productivity, cost, and time. The table shows the ranking of Australia relative to the other study countries, the type of study, and the indicator presented.

It should be pointed out that the various studies use widely different indicators and methodologies to assess aspects of performance; the broad approach used is also summarised in the table. Different aspects of construction are compared and while many of the macroeconomic studies include the whole of the construction sector, price-based approaches are much more restricted in scope, and can be based on just one hypothetical building.

Table 1 International Comparisons and Country Rankings

STUDY	DATA YEAR	TYPE AND RELEVANT INDICATOR	RANKING (for countries included)							
			Au	Jap	Sin	Ger	Fr	UK	US	Ca
PRODUCTIVITY (Note: 1 = highest productivity)										
Competition, Productivity and Efficiency. Pilat, 1996	1990	Macroeconomic. Construction GDP/ person	2	5	-	6	4	7	3	1
What ails Australia Lewis et al, 1996	1980-93	Macroeconomic. Value Added (VA) / hour, Jobs/1000 employed	2	5	-	3	4		1	-
Australian Construction Productivity: International Comparison. Access & WCP, 1999	1993-1996	Macroeconomic study. Value added/ hour	2	4	-	5	-	1	3	-
Construction 21, C21 Steering Committee, 1999	1997	Macroeconomic. VA/ hour, GDP/person, m2/ day	2	1	3	-	-	-	-	-
International cost of construction study, Stage 2. Langston & de Valence, 1999	1998	Case study. Overall performance ranking	5	-	4	1	-	2	3	-
International Construction Study. Langston & Best, 2000	1995-1999	Case study. Ratio of m^2 per month to cost per m^2	2	3	1	-	-	4		-
Competitiveness Indicators in the Construction Industry. Building and Construction Authority (BCA 2002a)	1998	Macroeconomic. VA per hour and per person, US $	5	4	6	1	-	2	3	-
COST PER M ^{2} (Note: 1 = lowest cost)			**Au**	**Jap**	**Sin**	**Ger**	**Fr**	**UK**	**US**	**Ca**
Purchasing Power Parities and Real Expenditures. OECD, 1995, 1999, 2002d	1993 1996 1999	Pricing study (PPP index)	2 3 2	7 7 7	-	6 6 5	5 5 6	3 2 4	4 4 3	1 1 1
International Building Costs, Hanscomb Means	1998	Pricing study Cost/ m^2 (US $)	2	7	-	5	6	4	3	1
Construction 21, C21 Steering Committee, 1998	1998	Macroeconomic, Cost /m2.	1	3	2	-	-	-	-	-
International Cost of Construction Study Stage 1, Page Kirkland Partnership, 1999	1998	Pricing study, Cost/m^2 (Au $)	2	-	1	5	-	3	4	-
International Cost of Construction Study, Stage 2, Langston & de Valence, 1999	1998	As above, 'Big Mac' index	5	-	4	1	-	2	3	-
International Construction Cost Index, Hanscomb Means, 1999	1999	Pricing study PPPs	2	7	-	5	4	6	3	1
Fourth Quarterly Cost Report, ENR 1999	1999	Industry survey data, cost /m^2 US$	3	8	1	6	4	7	5	3
Australian Construction Handbook, Rawlinsons 2002 & 2000	1999, 2001	Industry survey data, cost /m^2 Local currency	3 4	5 5	1 1	-	-	6 6	3 3	2 2
International Construction Study, Langston & Best	2000	Case study, cost per m^2 (PPP)	2	3	1	-	-	4	-	-
Fourth Quarterly Cost Report, ENR 2001	2001	Pricing study (PPP's convert to US$)	2	7	-	3	5	6	4	1
Fourth Quarterly Cost Report, ENR, 2001	2001	Industry survey data, cost /m^2 US$	1	6	2	-	4	2	5	-
TIME (Note: 1 = shortest time)			**Au**	**Jap**	**Sin**	**Ger**	**Fr**	**UK**	**US**	**Ca**
International construction Study, Langston & Best, 2000	1995-1999	Case Study, m^2/ month	2	1	3	-	-	4	-	-
International construction Performance comparisons. Proverbs & Faniran, 2001		Similar to Pricing Study, time	2	-	-	3	1	4	-	-

In general, the picture that emerges is that Australia's performance has been highly rated in comparison to the construction sector elsewhere. The most common ranking for Australia is second place (in fifteen listed comparisons); in two comparisons Australia was ranked highest. Australia was ranked third, fourth or fifth in the other six comparisons listed (it should be noted that the same study may appear under different indicator headings).

The error margin in most of these comparisons is at least ± 5% as described in Section 2. However, as will be seen in Sections 4 and 5, although this means that there is usually no clear distinction between adjacent rankings, Australia falls within the group of countries with a competitive advantage in the majority of studies described.

4. Productivity

Productivity comparisons are generally based on macroeconomic data, and use one or more of the following measures:

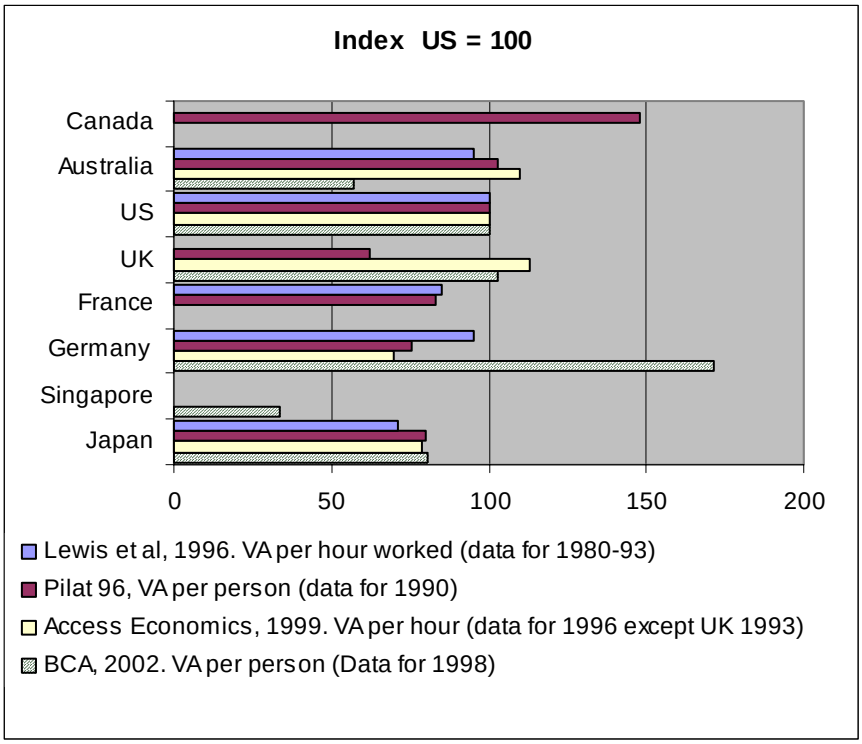
- Value added / employee or per hour worked;
- Construction volume / employee or per hour worked;
- m^2 / employee or per hour worked;
- Percentage of construction GDP/ percentage of construction employment.
- Employment / thousand in workforce.

All of these measures have been used to measure productivity (see Table 1), with the exception of employment / thousand in the workforce. The indicators listed measure *labour* productivity by comparing total output (value added) to only one input, in this case labour. However, increases or decreases in output per unit of labour may be the result of changes in capital intensity, changed working practices, or of technological change, and the listed indicators give no information about which factors are causal. This is important in international comparisons because relatively capital-intensive countries will tend to appear more productive in measures of labour productivity, and fare less well in measures of capital productivity. For this reason, a preferable indicator is total factor productivity (TFP), also called multi factor productivity (MFP). TFP combines both labour and capital productivity, and measures their respective contributions to total productivity. However, the considerable difficulties in establishing or obtaining comparable data for TFP and MFP methods mean that labour productivity is much more commonly used in international comparisons (Shreyer and Pilat, 2001). Indeed, even if data was available, comparisons would be problematic due to varied definitions of capital inputs. This is controversial in all international economic comparisons because estimates embody a wide variety of assumptions on asset life and depreciation (Shreyer and Pilat, 2001). The treatment of capital within construction is further complicated by the fact that capital stock may be held outside the construction industry, as the use of rental equipment is widespread. This has the effect of reducing apparent capital intensity, and depresses the total value added assigned to the industry in national accounts

(Croce et al, 1999). It is likely that effects may be uneven across the countries compared in our study.

International Productivity Comparisons Reviewed

Figure 1 Four international comparisons of productivity



Seven of the international comparisons of productivity included Australia. The results of the four that used macroeconomic data and included the US are shown in Figure 1. The four studies are *Competition, Productivity, and Efficiency* (Pilat 1996), *What Ails Australia* (Lewis *et al* 1996), *Australian Construction Productivity: International comparison* (Access Economics and World Competitive Practices 1999), and *Competitiveness Indicators in the Construction Industry* (BCA 2002a). Lewis *et al* (1996) and Pilat (1996) present the data as part of a general discussion of productivity across all economic sectors, while the Access Economics (1999) study presented a range of data specifically concerning the Australian construction sector. The Building and Construction Authority (BCA 2002a) study is a very brief table presenting indicators and is the only one to use exchange rates to convert local currencies.

In three of the four studies shown, Australia is on a par with the US, and generally performing better than Japan, Singapore, Germany and France. The indicators published by the Singapore BCA in 2002 give a contrasting result, with Australia in 4th place with productivity only 60% of US. The BCA's use of exchange rates rather than PPPs explains part of the discrepancy, as the use of exchange rates for conversion will tend to reduce the value added for countries with weak currencies relative to the US dollar.

Construction 21, Re-inventing Construction (Construction 21 Committee 1998) – this is a Singapore Government report which aimed to address the problems in the Singapore construction industry and give a strategic direction to structural change within the industry. The international comparison data presented was a very minor part of the study. The results have not been included in Figure 1 because the C21 report did not report data for the US. The figures presented are in general agreement with the BCA figures. Japan is presented with productivity approximately 1.7 times that of Australia, the reverse of the position shown in Lewis *et al*, Pilat, and the Access Economics report.

International cost of construction study, Stage 2 (Langston & de Valence, 1999) - this study is Stage 2 of a pricing study based on 7 hypothetical projects carried out for the Department of Industry, Science and Resources (DISR), and analysed the data collected in Stage 1. An overall performance ranking was produced, starting with the basic cost data from stage one, and adding in contextual factors by means of a weighted evaluation matrix. A range of seventeen contextual factors included issues such as the regulatory framework, innovation, environmental considerations, and industrial disputes. These factors were assigned a country score and a weighting according to the considered opinion of the researchers, and the ratio of this 'value score' to the cost index derived from Stage 1 gave the overall performance ranking. The costs from stage 1 were also converted using the 'Big Mac' index, a version of the PPP index based solely on the price of a Big Mac in each of the countries. Although the validity of this approach is debatable, Australia fared very badly in this assessment, ranking 5th out of the six countries included.

International Construction Study (Langston & Best, 2000) - this study aimed to determine the relative position of Australia in relation to international construction practices. The methodology was survey based, and analysed cost and time data relating to real projects between 1994 and 1999. Key data collected was net cost, time to construct, floor area, and basic information on the design context which was used to derive weightings to adjust for variations such as the extent of internal fit out, the level of energy efficiency, or the extent of landscaping. A total of 78 responses were received, spread over twelve countries, including four of the countries included in this report. Performance (here taken as a productivity indicator) was described in terms of m^2 per month/ cost per m^2.

Table 2 Performance index for high rise office buildings

	Sample size	**m^2 / month**	**Cost / m^2** (US$ using PPPs)	**Performance index**
Singapore	8	1644	747	2.20
Australia	6	1767	913	1.94
Japan	19	1971	1672	1.18
UK	8	1396	2327	0.60

Source: Langston and Best, 2000

The measurement of time took no account of such factors as the numbers of employees or overtime worked, and was simply the time taken to complete the project. These factors would be reflected to some degree in the cost per m^2, although the disparity of wage levels between different countries means this would vary considerably between countries. However, this remains one of the few attempts to integrate both time and cost into a productivity indicator.

Productivity Time Series Data

Figures 2, 3 and 4 present time series data on productivity for all the study countries. Figure 2 presents value added per hour worked in the construction sector. Figures 3 presents value added per employee, which is the total contribution of the construction sector to GDP divided by the total construction labour force. Values for GDP and value added have been converted from local currencies using PPPs.

The construction sector PPP has been used for the comparisons of value added per hour and per employee (Figure 2a and Figure 3), because the aim is to compare the 'building produced' per hour. However, the construction PPP is not available for Singapore, so the general PPP has been used to convert Singapore data.

The construction PPP conversion rates for Australia was consistently lower than the general PPP conversion rates from 1990 -1999 by an average of 6%. This means that the value added per hour and per employee for Australia is underestimated by using general PPPs. Figure 2b presents value added per hour using the general PPP for currency conversion, and shows the effect of using general rather than construction PPPs.

It should be noted that in addition to the error of at least ± 5% resulting from currency conversion, there may be data collection inconsistencies between countries. All the comparisons should therefore be viewed with caution. For example, there is uncertainty regarding the inclusion of self-employed contractors, which can skew per person indicators. The Australian data presented includes self-employed workers, so it is possible that Australia may have been disadvantaged relative to some of the other countries in this review.

Figure 2a Value added per hour worked, 1990 –1999 (construction PPP)

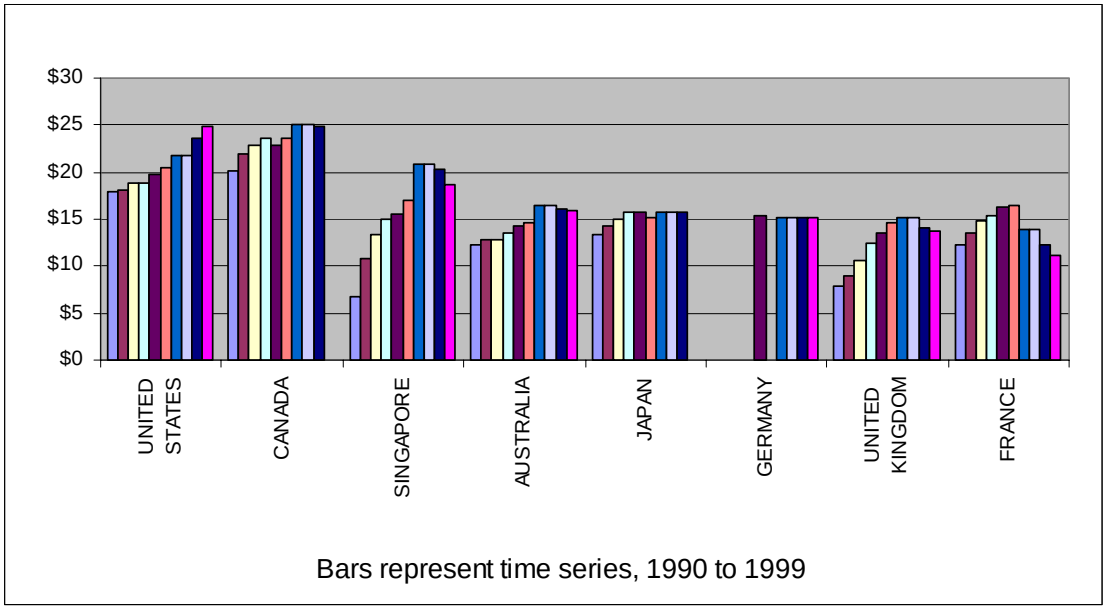
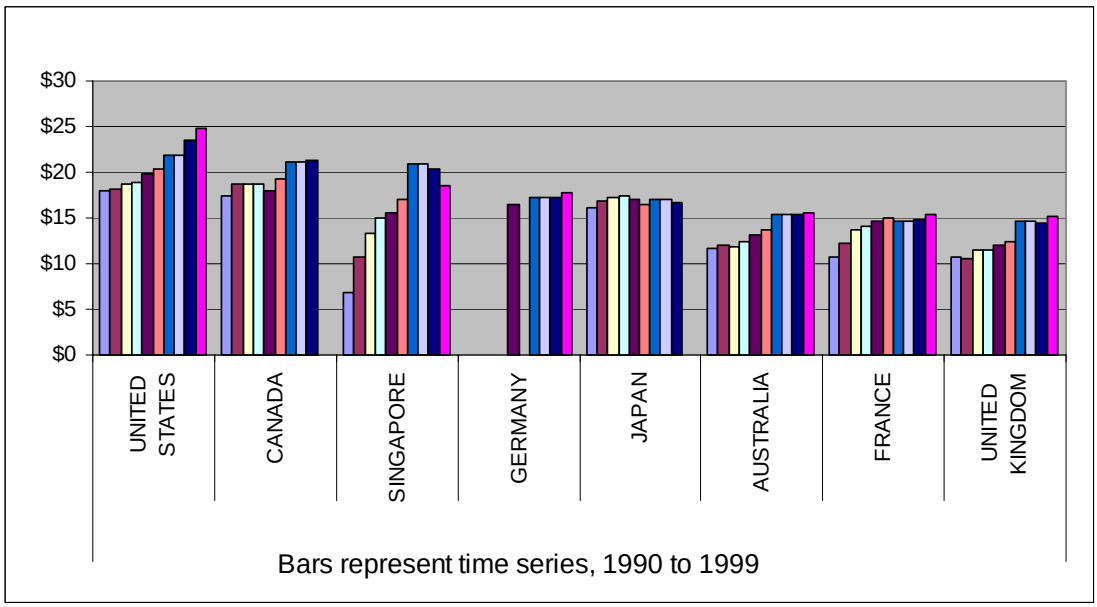


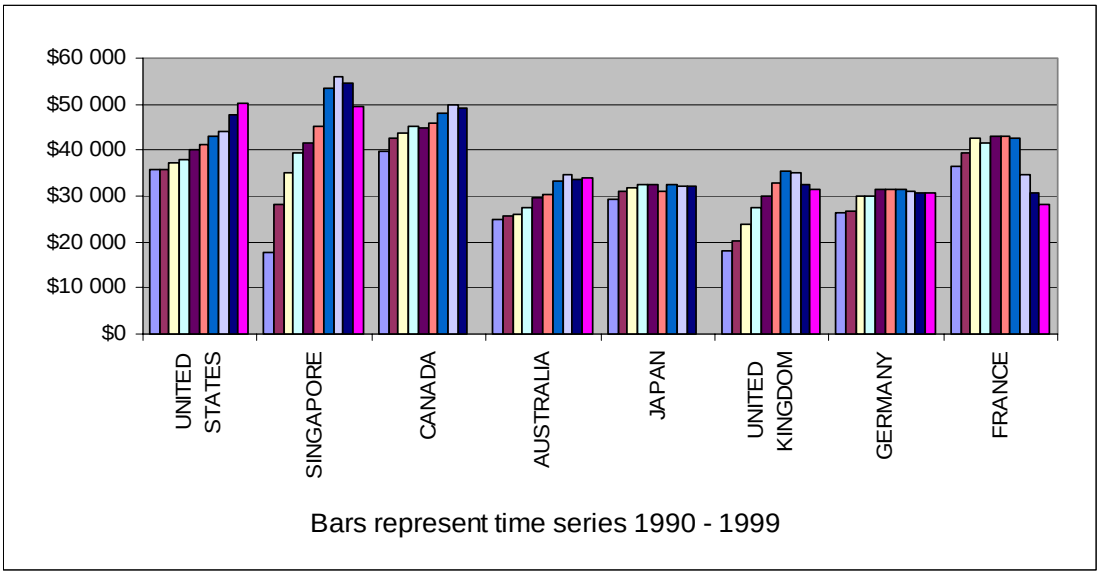
Figure 2b Value added per hour worked, 1990 –1999 (general PPP)



Notes Figure 2

Figure 2a – currency converted using construction PPPs except Singapore, for which the general PPP used.
Figure 2b - currency converted using general PPPs.
Construction PPPs: OECD 1992 Table 1.5, OECD 1995 Table 1.11, OECD 1999 and 2002d Table 12. Years intermediate to benchmark years (1990, 1993, 1996, and 1999) are calculated by averaging the 3 yearly variation.
General PPPs: OECD countries 1990–1999 OECD 2002a, Singapore and all 2001 PPPs from World Bank 2002
Construction Value Added: OECD countries from OECD 2002b; Singapore: 1990-1995 figures from UN 2002, 1996-1999 figures from Singapore Department of Statistics (DoS), 2002.
Hours worked: All countries from ILO 2002a (all multiplied by 52).
Construction labour force: Australia - Australian Bureau of Statistics (ABS) 2002a (employed) and ABS 2002b (self employed) added together; US, Canada, France, Japan, Germany and UK from OECD 2002c; Singapore 1990, 1995, 1998, 1999 from Singapore Department of Statistics (DoS) 2002, 1991-94 and 1996-97 from Ofori 2002.

Figure 3 Value added per employee, 1990 – 1999



Notes Figure 3

Currencies converted using construction PPPs (except Singapore): OECD 1992 Table 1.5, OECD 1995 Table 1.11, OECD 1999 and 2002d Table 12. Years intermediate to benchmark years (1990, 1993, 1996, and 1999) are calculated by averaging the 3 yearly variation. Singapore PPPs from World Bank 2002

Construction Value Added: OECD countries from OECD 2002b; Singapore: 1990-1995 figures from UN 2002, 1996-1999 figures from Singapore Department of Statistics (DoS), 2002.

Construction labour force: Australia - Australian Bureau of Statistics (ABS) 2002a (employed) and ABS 2002b (self employed) added together; US, Canada, France, Japan, Germany and UK from OECD 2002c; Singapore 1990, 1995, 1998, 1999 from Singapore Department of Statistics (DoS) 2002, 1991-94 and 1996-97 from Ofori 2002.

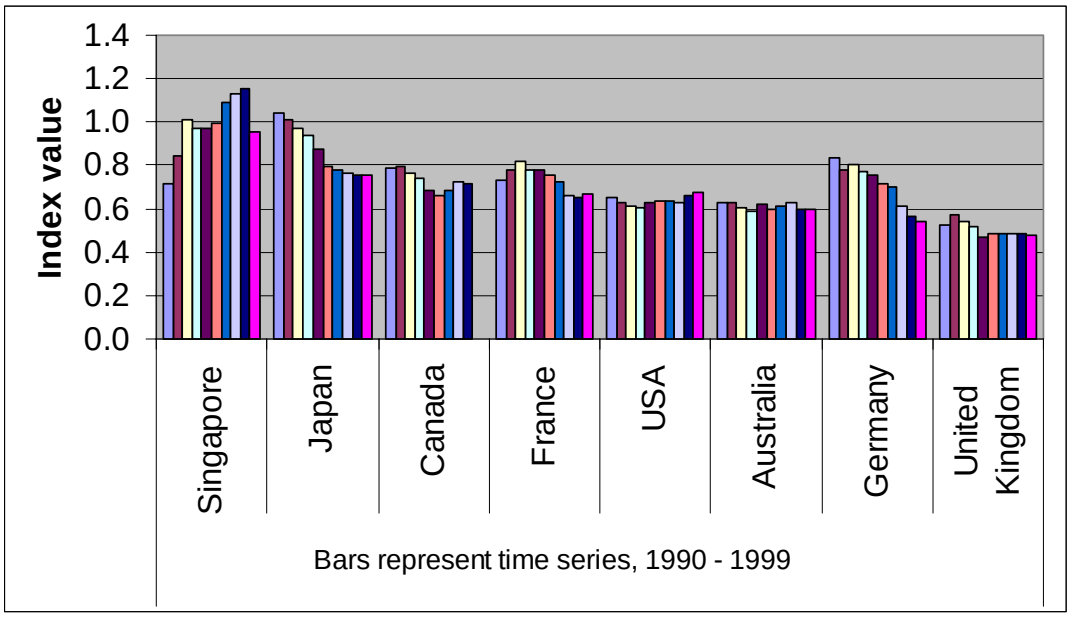
There is further uncertainty because of inconsistencies in the 'hours worked' data between countries. These are generally collected by either labour force surveys, which tend to overestimate hours, or by enterprise surveys, which tend to underestimate hours (Shreyer and Pilat, 2001). The hours worked data used in the comparison presented here all come from the International Labour Organisation; data for Australia and Japan is based on labour force surveys, while data for Canada, France, Germany, Singapore, the UK, and the US are based on enterprise surveys (ILO 2002a). The value added for Australia and Japan may therefore in fact be higher than is shown in Figures 2a and 2b.

Australia is ranked fourth in both value added per hour worked and value added per employee. The USA, Canada, and Singapore have a clear competitive advantage. Australia is on a par with Japan and Germany in value added per hour, with a slight advantage over France and the UK, and on a par with Japan in value added per employee, with a slight advantage compared to Germany, France, and the UK. Both indicators show an upwards trend over the 10 year period shown.

Figure 4 shows the ratio of construction contribution to GDP to construction contribution to employment, comparable to the indicator presented in the Construction 21 report (C21 Committee 1999). The index is the following:

$$\frac{\text{Construction as \% of GDP}}{\text{Construction as \% of employment}}$$

Figure 4 Ratio of Construction % GDP to % employment, 1990-1999



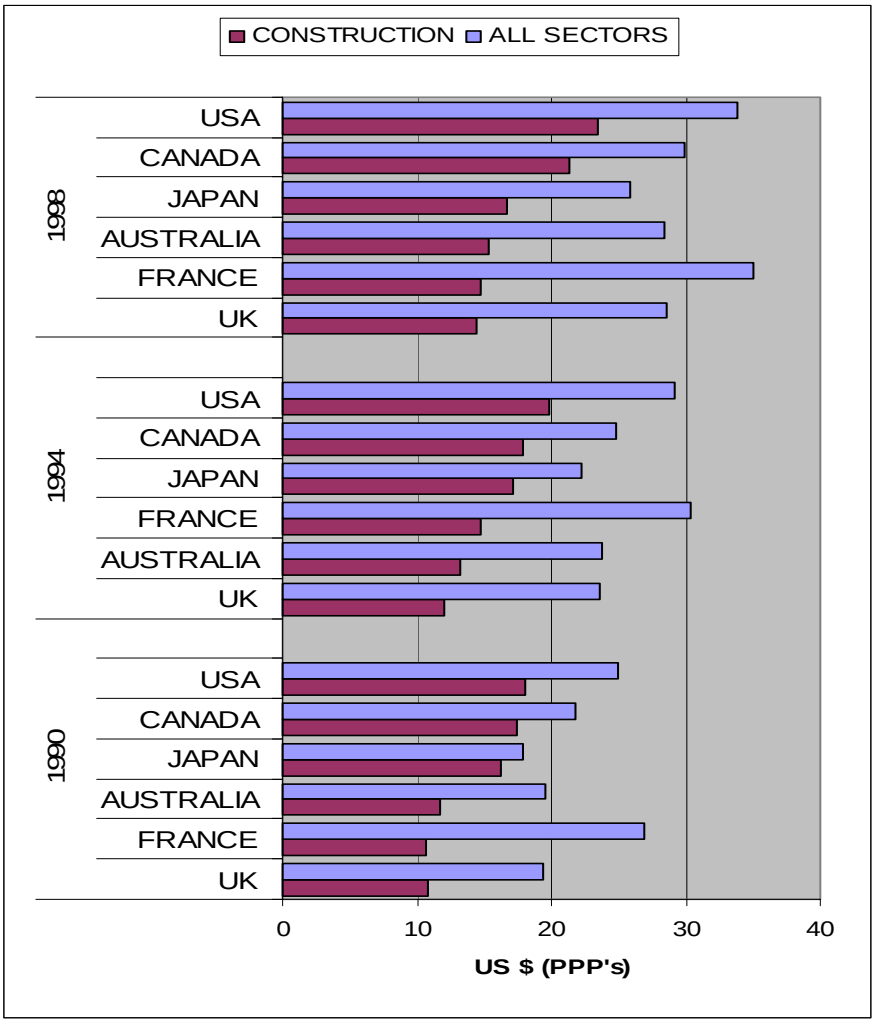
Notes Figure 4

Currencies converted using general PPPs (OECD from OECD 2002a, Singapore PPPs from World Bank 2002)
Construction Value Added: OECD countries from OECD 2002b; Singapore: 1990-1995 figures from UN 2002, 1996-1999 figures from Singapore Department of Statistics (DoS), 2002.
Construction labour force: ABS 2002a (employed) and ABS 2002b (self employed) added together; US, Canada, France, Japan, Germany and UK from OECD 2002c; Singapore 1990, 1995, 1998, 1999 from Singapore DoS 2002, 1991-94 and 1996-97 from Ofori 2002.
GDP: OECD countries from OECD 2002b (GDP at market prices, output approach), Singapore from Singapore Department of Statistics (DoS) 2002b (GDP at Current Market Prices)
Total labour force: ILO 2002b (figure used is sum of male and female employment in ILO)

A higher index value corresponds to higher productivity of construction relative to the rest of the economy. A value of 1 would represent the situation if construction contributed to GDP in exact proportion to the number of workers employed in the industry. Internationally this is the exception rather than the rule, and Australia seems on a par with the other countries included in this report. Construction is generally labour intensive and undercapitalised compared to manufacturing, which may be one reason why GDP per worker is relatively low.

This relationship between labour productivity in the construction industry to labour productivity in all sectors of the economy is borne out by the data presented in Figure 5, value added in construction compared to value added for all sectors. The construction value added is without exception lower than value added for all sectors. In all countries except Japan and France the differential has worsened slightly over the three years presented (1990, 1994 and 1998). Australia, the UK and France are roughly equivalent, with construction value added between 40% and 50% of all sector value added; in US and Canada the figure is between 70% and 80%. In Japan, construction value added has gone from 91% in 1990 to only 65% of all sector VA in 1998.

Figure 5 Value Added per hour, all sectors and construction



Notes Figure 5

Currencies converted using general PPPs from OECD 2002a

Construction Value Added: OECD 2002b

Construction labour force: Australia - Australian Bureau of Statistics (ABS) 2002a (employed) and ABS 2002b (self employed) added together; US, Canada, France, Japan, and UK from OECD 2002c;

Construction Hours worked: Australia ABS 2002c (quarterly reference weeks averaged and multiplied by 52); US, Canada, Japan, and UK from ILO 2002a (all multiplied by 52); France from OECD 2002c.

GDP: from OECD 2002b

Annual hours worked: Annual average hours all sectors (ILO 2002c) multiplied by total labour force (ILO 2002b) (figure used is sum of male and female employment in ILO)

5. Cost

The most common indicator presented in international comparisons of construction is cost/ m^2, with costs commonly presented either in US$ or as an index value with US = 100. Costs are generally obtained by pricing studies, in which a common set of specifications is costed in the sample countries. Section 1 set out some of the problems with this approach, in which it is difficult to simultaneously achieve comparability and representativeness.

A further complication is that performance criteria may vary from country to country, so that there may in fact be significant differences in theoretically

identical buildings. A detailed case study of the differences between UK and the US construction prices showed that the major price differential arose because of differing performance criteria for identical buildings in the two locations (Lynton, 1993). There had initially appeared to be a 40% cost reduction in the US, but this became non significant when it was the exercise was repeated using identical performance criteria. One study by Davis Langdon Consultancy (1999) attempted to overcome these difficulties by proposing a methodology which identifies the price differentials which arise from different specifications for the same building, rather than from it's construction. The method has validity, but is even more resource intensive than standard pricing studies.

Table 1 summarised the results from 14 international comparisons, including 3 one-off research projects, 1 report, and 10 annual or three yearly series. In nine of these Australia ranks in first or second place among the countries included in this report; in four studies Australia is ranked 3rd or 4th. The exception is Langston & de Valence, 1999, in which Australia is ranked in last place.

Various construction cost series that include Australia are readily available, including:

OECD Purchasing Power Parities – this index has been produced since the early 1980s at approximately three yearly intervals, and gives purchasing power parities for all OECD, European Union, and thirteen other countries. The purpose is to provide internationally comparable price and volume measures of GDP and its component expenditures. Construction is included under 'gross fixed capital formation'. In order to derive the construction PPPs a pricing exercise is undertaken in each country based on up to 20 projects; in the 1999 round EU countries generally priced 15, while non-European countries generally priced 9, all based on bills of quantity. The 20 projects include 9 residential buildings (1 apartment block), 5 non-residential buildings, and 6 civil engineering projects (OECD 1999).

Hanscomb Means Report: produces both an international construction cost index and an industrial building costs survey. The index values are relative to US prices, and are based on an input pricing method using 26 items from all trades to estimate the overall costs of the building. Prices are 'in place', including labour costs and all overheads but excluding taxes. Local materials may be substituted as appropriate. The building costs survey shows actual costs per m^2 in US $ for industrial buildings excluding land cost, design, management fees, furniture and equipment. Specifications include local variations.

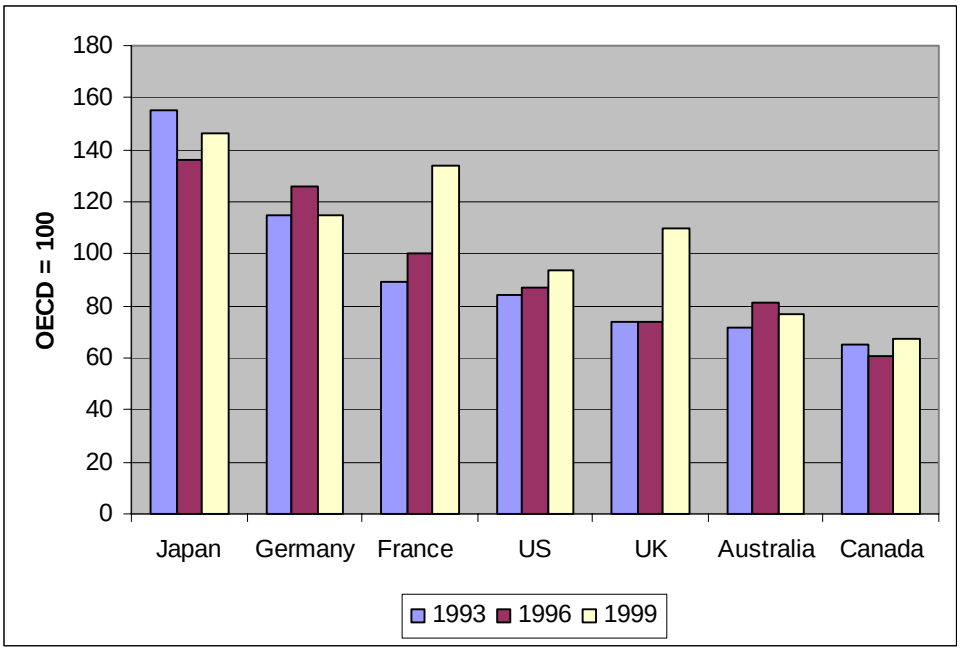
Engineering News Record: presents an annual report in December, containing a construction Purchasing Parities Index for industrial buildings based on the Hanscomb Means Report, and an international commercial and industrial building costs survey based on an industry survey carried out by Gardiner and Theobald Inc.

Rawlinsons: gives a low and high cost per m^2, in local currencies, for a range of building types, including various specification offices, apartments, industrial buildings, and shopping centres.

Figures 6 and 7 shows the OECD PPP construction indices for 1993, 1996, and 1999, with OECD as 100. The 1993 index is separated into different building types (residential, non residential and civil engineering), unlike the later indices, and is shown in detail in Figure 7.

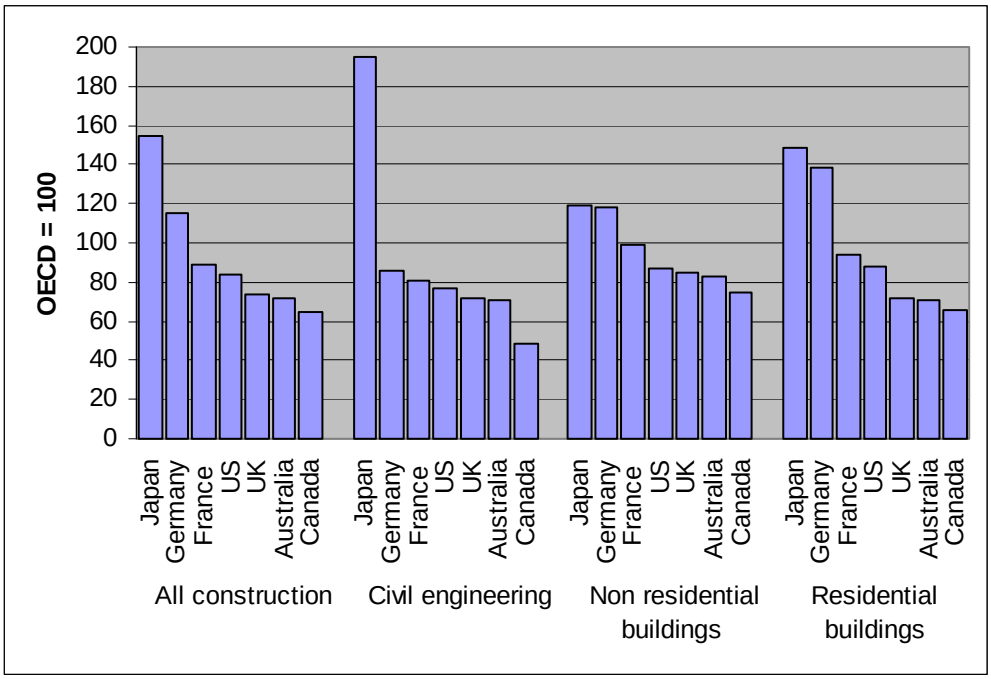
Australia is ranked second, generally on a par with the UK, in the indices for each year and for every building type in the 1993 data. It should be remembered that a minimum 10% difference is needed to be significant.

Figure 6 OECD Construction cost PPP index for 1993, 1996, and 1999



Note: data from OECD 1995 (Table 1.6), OECD 1999 (Table 11), OECD 2002d (Table 11)

Figure 7 OECD PPP construction cost index (1993) by building type



Note: data from OECD 1995, Table 1.6

Figure 8 Industrial Building cost / m^2 index, 1999, 2000, 2001

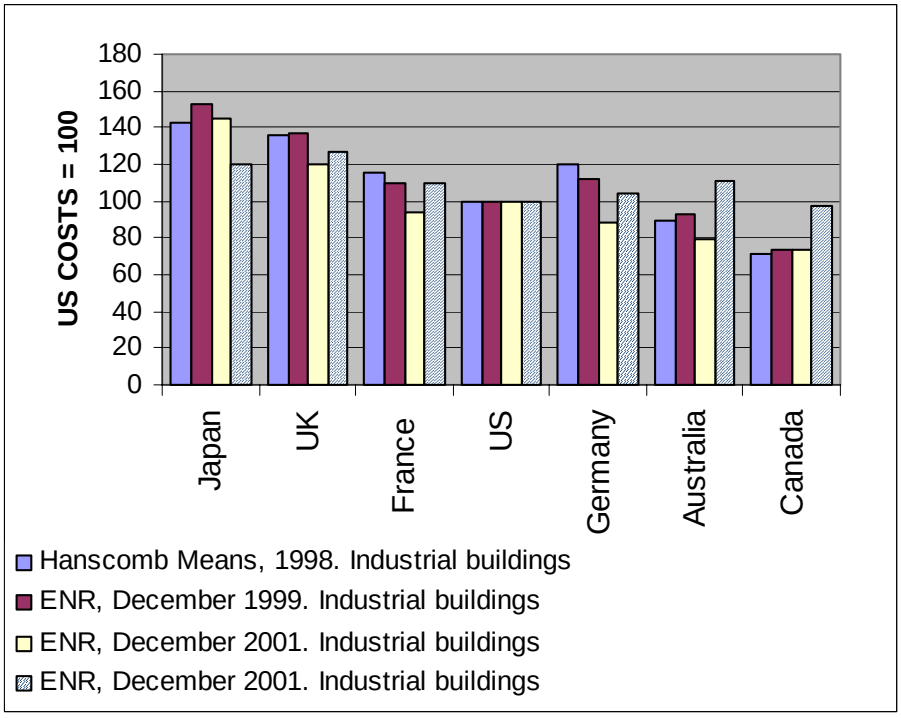
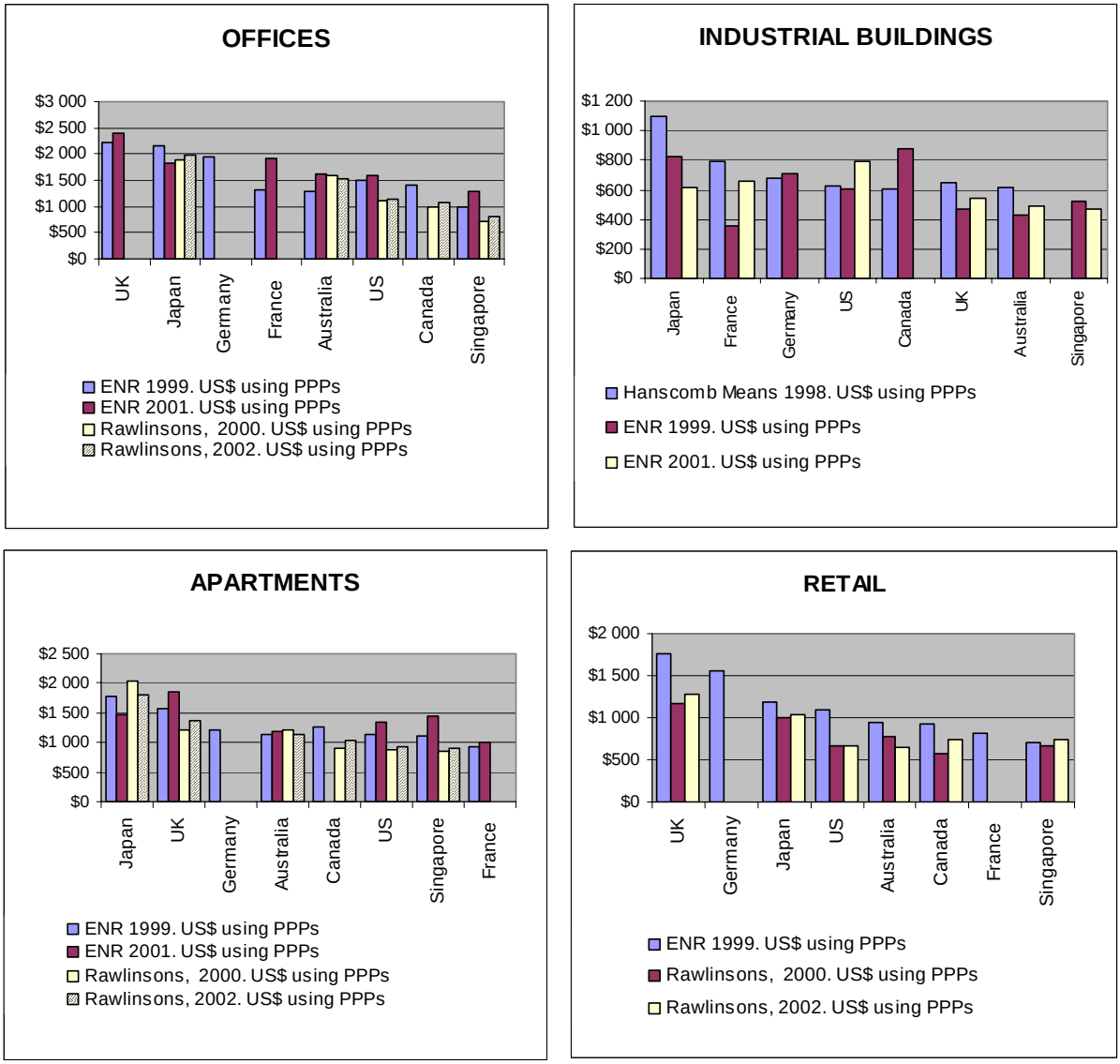


Figure 8 shows the Hanscomb Mean and ENR industrial buildings PPP indices for 1999, 2000, and 2001. It will be seen that the two 1999 indices show quite some variation. However, Australia's relative ranking remains at second place in each index.

Figure 9 Cost per m^2 for a range of building types



Notes Figure 9:
Costs - were converted back to local currencies and then to US$ using general PPPs. ENR costs converted using exchange rate for 3/12/01 and 26/11/99 (the dates used by ENR); Hanscomb Means costs converted using rates from OECD 2002e (except Singapore). Singapore exchange rate from World Bank 2002.
ENR – all prices are average of low and high for each type and location; number of storeys vary from country to country (Singapore the highest at 25 storeys). Offices include air conditioning.
US costs (ENR) are average of low and high for five different locations in 1999, and seven different locations in 2001.
Rawlinsons – cost shown are the average of the low and high cost listed. Office costs are for 10-20 storeys, fully serviced; apartment costs are for high standard, excluding air conditioning; retail is for supermarkets, fully serviced but excluding cool rooms.

Figure 9 presents data from the various series published annually for building costs. In order to remove distortions associated with exchange rates, costs are converted to US $ using PPPs; this required conversion back into local currencies using published exchange rates for the ENR and Hanscomb Mean information.

The series are based on quantity surveyors costs from each country, and are for buildings typical in that country. There may be very wide variations between buildings and conditions being compared; for example, the ENR series gives costs for a 25-storey office block in Singapore but a 4 - 6 storey block in France. Different locations may also be included; for example, the Rawlinsons data for Australia relates to Sydney, while the ENR data is for Melbourne. The comparisons should therefore be treated with caution.

Australia is generally within the group of countries with lower costs per m^2. For office buildings, Australia ranks 2nd or 3rd in the ENR series and 4th in the Rawlinsons series; for industrial buildings Australia ranked 2nd in all series. For retail buildings, Australia is ranked 4th in the ENR series, and either 1st or 4th in the Rawlinson series. For apartments, Australia is ranked 2nd or 4th in the ENR series, and 4th or 5TH in the Rawlinsons series. The differences between the five countries with the lower costs apartments and retail buildings are generally not statistically significant.

International Cost of Construction, Stage 1 (Langston and Best 1999): this study was the first stage of an international comparison of construction costs carried out for the DISR by the Page Kirkland Partnership (Page Kirkland Partnership 1999). The project was a pricing study in which seven hypothetical non-residential projects were costed on the basis of bills of quantities; some problems were identified with the representativeness of the buildings in the sample countries. Prices were converted to Australian dollars using current exchange rates. Australia ranked 1st or 2nd for each project type except the petro-chemical facility, for which it was the most expensive. The weakness of the Australian dollar was identified as one of the reasons for the strong competitiveness of the Australian estimated prices.

International cost of construction Stage 2 (Langston and de Valence)
Australia ranked last (out of five countries) in this research. The study analysed the data collected in Stage 1, and converted the costs using the 'Big Mac' index (literally the number of Big Macs, priced in local currency, that it would cost to build each project). The use of the Big Mac index reversed the cost relationships: Singapore and Australia, rather than ranking 1st and 2nd, ranked 4th and 5th in each case. Results using the Big Mac conversion were substantially different to those that would be obtained using the PPP conversion, and it has been argued that the Big Mac is far from a standard item across the sample countries (Croce et al, 1999).

International Construction Study (Langston and Best 2000): this research was based on data from actual high rise commercial office projects since 1994; the methodology is described in Section 3. Returns were received for twelve countries including Singapore, Australia, Japan and the UK. The cost per m^2 for these were Singapore \$747/m^2, Australia \$913/m^2, Japan \$1672/m^2, and the UK \$2327/m^2. Currencies were converted to US dollars using PPPs.

Construction 21, Re-inventing Construction (C21 Committee 1999) presented cost/m^2 data for Australia, Singapore, and Japan in Singapore \$, sourced from the ENR fourth quarterly cost review, December 1998. This data is

reproduced below in Table 3. Australia is the lowest cost for prestige apartments and industrial buildings, but more expensive than Singapore for high rise apartments.

Table 3 Costs per m^2 for apartments, offices & industrial buildings (S$)

	Australia (Melbourne)	Singapore	Japan
Luxury apartments, high rise	S$ 1,835	S$ 1,637	S$ 4,209
Prestige offices, high rise	S$ 1,997	S$ 2,212	S$ 6,008
Industrial buildings	S$ 666	S$ 1,133	S$ 2,608

Source: C21 Committee 1999, citing data from ENR 21 December 1998

6. Time

Only two of the international comparison studies accessed include an analysis of time to completion or time over-runs, despite the fact that time predictability has been identified as a Key Performance Indicator for construction projects (Movement for Innovation 2000). These two studies are summarised below.

International construction performance comparisons: a study of 'European' and Australian contractors (Proverbs & Faniran 2001). This study used the pricing methodology to collect data on construction performance, by asking contractors in different countries to respond to model building documents by answering survey questions and submitting a programme of work. The building was a high rise *in situ* concrete framed structure. The respondent firm sizes varied considerably, from firms with turnovers of <$50m - >$450m. The table below shows the number of respondents in each country, and the mean, minimum, and maximum completion times.

It should be emphasised that these times are planned, and therefore take no account of time over-runs. This could introduce serious distortion as it has been reported that only about 30% of projects are completed in time in Hong Kong, and up to 75% of UK projects can be seriously delayed (Xiao and Proverbs 2002).

Table 4 Planned construction times for model high rise building

Country	**No of respondents**	**Mean completion time (weeks)**	**Minimum completion time (weeks)**	**Maximum completion time (weeks)**
France	14	13	7	22
Australia	14	15	7	21
Germany	10	18	14	25
UK	31	22	9	38

Source: Proverbs & Faniran 2001

Australian firms were ranked 2nd, after France; their maximum time was 1 week faster than the mean time estimated by the UK firms. A statistical

analysis of the data showed that the differences were highly significant (Proverbs & Faniran 2001*)*.

A similar project (Xiao and Proverbs, 2002) compared planned construction times for Japan, the UK, and the US for another high rise concrete model building. Although Australia was not included, the UK was roughly equal to Japan, and a great deal faster than the US. This implies that Australia would also have mean planned completion times faster than both the US and Japan.

International construction Study (Langston and Best 2000) this research was based on data from actual commercial office projects since 1994; the methodology is described in Section 3. Data was collected on the time taken to complete the project in months, and the floor area, so that m^2 per month could be calculated. This figure has not been adjusted to take into account numbers of workers, hours of work, overtime, etc. The m^2 per month are given for the five countries included in this report and also for the additional seven countries surveyed.

Table 5 Time performance of 12 countries (m^2 per month)

	m^2 per month
China	2,536
Malaysia	2,535
Hong Kong	2,507
New Zealand	2,176
Philippines	2,013
Japan	**1,971**
Australia	**1,767**
Singapore	**1,644**
UK	**1,396**
Thailand	1,240
Vietnam	834
Bahrain	776
Mean	**1,783**

Source: Langston and Best, 2000

Australia's time performance was very close to the mean for the 12 sample countries; Australia is ranked 2nd out of the 4 countries included in this study.

7. Quality

There appears to be a striking absence of international comparison studies on quality in the construction industry. Very few studies have presented any comparison of quality between countries, and we could find none that included Australia. The measurement of quality in the construction industry is extremely difficult, despite the fact that professionals within the field are generally able to recognize quality at an individual building or component level (Low, 1993). Agreement on methodologies for assessing construction quality at even a national level is at its early stages.

This section therefore presents a brief overview of some approaches to quality assessment and control, and then summarises the initiatives in three of the study countries, Australia, Singapore, and the UK. Part B gives a more detailed presentation of quality assessment in the context of the reform agendas in the three countries.

The main approaches to quality assessment include:

- *Benchmarking* – the systematic use of objective comparisons, both internally and between enterprises. The key to benchmarking is the identification and use of key performance indicators (KPIs) (Karim *et al* 1997), and a key indicator of quality is usually the extent to which the customer requirements are met.
- *Quality Assurance (QA) – the ISO 9000 family of standards:* are internationally recognised generic quality management standards. The aim is to demonstrably put in place, systems for quality management across all types of enterprises and organisations. Such systems document the procedures to be followed to ensure that client requirements are met, and generally require make explicit the chains of responsibility and events to ensure customer satisfaction. ISO 9000 quality management systems also incorporate a programme of continuous improvement.
- Specifically designed quality assessment schemes, such as CONQUAS in Singapore (see below)
- Awards schemes organised by either the public or and private sectors, to reward excellence in building and design.

Approaches to quality in Australian construction

The Construction Industry Development Agency (CIDA) was established federally in 1992, and introduced the concept of Pre-Qualification Criteria (PQC). With separate specific criteria for contractors, subcontractors and consultants, the idea was that clients would have a framework and methodology for selecting the most suitable firms (CIDA 1995). The PQC aimed to provide a systematic set of tools for assessing the financial and technical capabilities of industry service providers. The main PQCs were based on performance in:

- *Technical Capacity* - a demonstrated capability to undertake the work.
- *Financial Capacity* -meeting capital adequacy requirements.
- *Quality Assurance* - accreditation of a QA plan.
- *Time Performance* - track record on previous projects.
- *Occupational Health and Safety* - use of safety plans and training.
- *Human Resource Management* - workplace relations.
- *Skill Formation* - training of the workforce.

On a state level, the New South Wales Construction Policy Steering Committee (CPSC) was set up to implement the recommendations of the 1992 Royal Commission into Productivity in the Building Industry in NSW. The CPSC's work was published as the Capital Project Procurement Manual (DPWS 1996), and endorsed the principles of benchmarking and Quality Assurance.

The DISR in combination with Ernst and Young initiated GlobalConstruct, with the aim of providing a web based global benchmarking tool for the construction industry. The initiative stemmed from the *Building and Construction Industry's Action Agenda - Building for Growth* announced by the Australian Government in May 1999 *(*DISR 1999). During the first three years, the intention is to conduct a web based study to inform the development of the benchmarking tool. The website is available (GlobalConstruct 2002), but it is unclear how much progress has been made on obtaining benchmarking data. The indicators to be used chiefly concern financial and other management, and aspects such as knowledge management and innovation, and client satisfaction. Direct indicators of building quality are not included.

Approaches to quality in UK construction

The two major initiatives towards quality assessment and improvement in the UK are benchmarking and demonstration programmes to encourage best practice. There are also various government financed schemes to allow the industry free or subsidised access to advice from the Best Practice Programmes.

The Construction Task Force**,** headed by Sir John Egan, was set up in 1998 to advise, from the client's perspective, on the opportunities to improve the efficiency and quality of delivery of construction. The Task Force established a series of national Key Performance Indicators (KPIs) and targets, several of which relate directly or indirectly to quality (both product quality and service quality). These KPIs were further expanded and refined after the establishment in 2001 of the Strategic Forum for Construction (chaired by Egan) and were published in 'Rethinking Construction – Accelerating Change (SFC 2002). The KPIs aim to provide the means to make comparisons between projects.

The Movement for Innovation (M^4I) was also established in 1998, and works in conjunction with the Strategic Forum for Construction to encourage best practice by disseminating lessons learned from a large number of demonstration projects through its Demonstration Projects Cluster Program. Table 6 below, reproduced from the M^4I 2nd Anniversary report (Movement for Innovation 2002) illustrates how the demonstration projects rate against the 'Rethinking Construction – Accelerating Change' targets and the industry in general. Three of these KPIs specifically relate to quality measures, viz client satisfaction with the product, client satisfaction with the service and defects.

Table 6 Performance results from UK Demonstration projects

KPI	Measure	Egan Target	Industry 1999	M^4I Result
Client Satisfaction -product	% scoring 8/10 or better	N/A	73%	81%
Client Satisfaction -service	% scoring 8/10 or better	N/A	63%	76%
Defects	% scoring 8/10 or better	78%	65%	69%

Source: $M^4$1 2002

A further UK initiative is the Design Quality Indicator (DQI), an assessment tool for the evaluation of the design quality of buildings. Development has been led by the UK Construction Industry Council. The DQI has been developed to complement the existing set of performance measures from 'Rethinking Construction', in particular the KPIs which assess the delivery of the building. The DQI assessment is based on a short questionnaire designed for use by everyone involved in the production of a building. The DQI is applicable throughout the construction process – from inception and design through the occupied building. Respondents evaluate design quality with reference to the categories 'Build Quality', 'Functionality' and 'Impact'. From July 2002 the Construction Industry Council is launching a pilot scheme, and intends that a fully web-based DQI will be publicly available in May 2003.

Approaches to quality in Singapore construction

Singapore has a systematic, government led quality programme in the construction industry. The Construction Quality Assessment System or CONQUAS was developed in 1988 by the Singapore BCA in conjunction with other major public sector and industry bodies. The objectives are:

- To have a standard quality system for construction projects;
- To make quality assessment objective by measuring constructed work against standards and specifications and using a sampling approach;
- To enable cost effective and systematic quality assessment.

The Singapore Zero Defects Campaign launched in the same year (1988) was a joint effort between major government agencies, professional institutions and trade associations.

CONQUAS sets out standards and a scoring and weighting system for various aspects of construction, to lead to a 'total quality score' or CONQUAS score for a project. The system specifies the number of sampling points, locations, and the required standards. Each item gets a pass or fail, which are aggregated into a total score after applying various weightings for the type of building and the specific building costs (BCA 2000).

The CONQUAS premium was launched in 1989, which allows firms achieving consistently good CONQUAS scores to put a 5% premium on public sector projects. In 1993 this premium was extended to civil engineering projects. Private firms were also beginning to use CONQUAS scores to determine bonus payments to subcontractors.

The use of a systematic scoring system allows quality standards to be traced over time, for individual firms and for the whole sector. It also enables performance comparisons to be made. Since the launch of the CONQUAS in 1989, more than 1,700 public and private building projects with total contract value exceeding S$ 59 billion have been assessed by the BCA. The industry average CONQUAS score improved steadily from 67.9 in 1989 to 76.5 in 2001 (BCA 2002b)

The BCA publish the scores obtained by individual projects, and the annual average of scores obtained in various categories of buildings. This allows comparison of particular projects to the average, and of different firms. (BCA 2002c)

The BCA also gives annual Awards for Construction Excellence, in order to give recognition to construction projects judged to have demonstrated performance excellence in Singapore.

Part B: Construction Industry Reform

1. Overview

Part B provides a summary of information that is necessary to facilitate an understanding of how the reform process in Australia, compares with reform overseas. It should be read within the context of other Royal Commission Discussion Papers one to eleven but particularly paper nine – *Recent Reviews of the Building and Construction Industry*.

Part B comprises three descriptive case studies that explore the nature and impact of reform agendas in Australia, the United Kingdom and Singapore. Although different in size, these countries were chosen because of their similar industry structures and practices, yet markedly different reform philosophies. A case study approach was chosen because it enabled the construction of detailed, chronological accounts of reform agendas, key players in the reform process, stimulants and impediments to reform and, measures which have been put in place to address such impediments. The limitations of case study research primarily relate to the small sample size, which is the sacrifice for the richer insights gained. The alternative was to look in more shallow terms, at reform agendas across a wider range of countries but it was felt that in this part of the discussion paper, quality of understanding was more important than quantity of data. The largely qualitative nature of the case studies provides a valuable and complementary contrast to the quantitative data presented in Part A of this discussion paper.

One of the problems in conducting case studies is deciding what to include. While each country has pursued different reform agendas, the case studies focus on major government and industry reports that have specifically addressed productivity and efficiency in the Building and Construction Industry. Each case study spans the last 20 years, although where relevant, earlier reports are also included.

The approach taken in constructing the case studies was to consult internationally recognised experts who have been involved in reform processes in each country. We are very grateful for the assistance that has been provided by these people over the seven-week period given to construct this discussion paper. Each case study is presented in a similar way, enabling contrasts and similarities to be drawn.

The main reports studied in each case study are listed in the Table 7, and the main observations to emerge are listed below. These are not meant to be exhaustive and many more differences and similarities emerge from the detailed text of the case studies.

Main observations:

- International comparisons of reform agendas are complex because of the need to consider the social, cultural, political, organisational and regulatory differences that influence the way that Building and Construction Industries in different countries operate.

- The cyclical nature of the supply and demand for construction products is such that apparent improvements in industry performance may be due more to the general economic climate than to improved industry practices. There is a need to recognise the economic factors that lie behind the issues addressed in any performance review of the Building and Construction industry. For example, if the flow of work to the industry is less than the capacity available, a number of consequences would likely follow (Latham 1994):

    - firms will reduce their staff, or may close altogether;
    - fee bids by consultants will become extremely keen, and may not allow the successful bidder to make any profit out of the commission;
    - tender prices submitted by contractors will be uneconomically low, with adverse effects on all participants in the construction process;
    - training and education will suffer;
    - little money will be available for research and development or for enhancing the public image of the industry.

- It has been easier to trace building and construction industry reform strategies in the UK and Singapore, than in Australia. This may be partly due to the inherent differences between the centralised structure of government in the UK and Singapore and the Australian Federal system. It may also be related to the fact that the Australian governments at both Federal and State levels have been less interventionist in their approach to Building and Construction industry reform than the UK and Singaporean governments.

- The goals of industry reform in each country are broadly the same and have been driven by similar concerns over relatively low productivity, cost efficiency and performance predictability. The intention of reform strategies in each country has been to produce a construction industry that has a high level of productivity growth, is competitive relative to other industries, and is capable of successfully competing in the international arena.

- In general, all three countries have focused on improving productivity and cost effectiveness through greater attention to: quality; training; technology uptake; pre-qualification; certification; process improvement; contractual reform; improved industry relationships; better quality systems and procedures; higher exectations of performance; more R&D and innovation and more flexible working practices. Australia appears to have placed greater emphasis on industrial relations reform than the UK and Singapore. Singapore has placed a relatively strong focus on skills

development, quality benchmarking, prefabrication, mechanisation and technology uptake. In recent years the UK has shifted its emphasis to benchmarking performance in a range of areas, breaking down the confrontational culture of the Building and Construction Industry and to improving its sense of social responsibility to its workers and the environment. Previously, in the UK, the focus had primarily been on contractual and procurement reform. While contractual and procurement reform still exists, this significant change in emphasis appears to have been driven by a realisation than many of the industry's problems are fundamentally behavioural in nature.

- While reform agendas seem similar across the UK, Singapore and Australia, important differences emerge when one considers the process by which these agendas have been implemented. In particular, the Australian governent provides relatively fewer incentives, guidance and support to implement reform, than the UK or Singaporean governments. This has resulted in a lack of momentum towards meaningful and quantifiable change in the Australian Building and Construction Industry, particularly in recent years.

- Other differences between Australia, UK and Singapore can be seen in the nature of the reforms being advocated. While all three industries appear to suffer similar problems and have similar structures (although not in scale), reforms in Australia are more market-driven than they are in the UK and Singapore. These different approaches are clearly grounded in the different political systems and philosophies of each country. The assumption underlying market-based reform is that competition will drive firms to innovate in order to improve their own performance relative to their competitors. The government then takes the initiative in driving social reforms that have no direct competitive benefit to companies, such as in Occupational Health and Safety (OHS). However, there are currently numerous institutional, cultural and organisational impediments to prevent market-based reform working effectively in the Australian building and construction industry (Loosemore et al 2002). These include the broad range of disparate bodies which represent the industry's many interests, the complexity of regulations which seek to control the industry's practices, a culture of poor industrial relations, poor risk and opportunity management practices, a negative public image, confrontational contractual and employment practices, a largely uneducated client-base, unwieldy supply chains and a negative attitude towards R&D.

- A major difference in bringing about meaningful reform appears to be the existence of a determined and committed champion, who has a clear industry vision and who can rally disparate industry groups to follow it. In the UK, Latham and Egan have adopted this role and appear to have made a significant difference to a previously unresponsive industry.

- There has been considerable repetition in Australian reform reports over the years, which suggests a lack of progress in achieving meaningful change. This is not the case in Singapore or in the UK, particularly in

recent years where reforms have been followed up by a strong, clearly planned and sustained implementation strategy to deliver the outcomes sought. It is clear that reform reports alone are not enough to bring about meaningful change in performance. They must also be backed up by a continuous, concerted and consultative implementation strategy which is supported by all key industry stakeholder groups.

- The UK and Singaporean Governments have given much stronger emphasis to establishing industry wide goals, key performance indicators (KPIs) and targets. The UK, in particular, encourages continuous improvement through national KPIs which have been mutually agreed by industry stakeholders. While some quarters in the UK industry have criticized the targets for being arbitrary and too ambitious, they have been accepted by most, and the existence of clear targets appears to have provided a focus for achievement that does not exist in the Australian Building and Construction industry.

- The publication of the Latham report in 1994 and the subsequent creation of the Egan task force in 1998 has marked a period of sustained effort on the part of the UK government to achieve a cultural shift in the industry. Singapore, with its recent launch of its C21 best practice program is also actively pursuing and refining its reform agenda. In Australia, there would appear to have been no major report, which has provided a unifying focus for collective reform.

- The UK and Singaporean governments have placed considerable emphasis on demonstration projects and rewards for best practice. In particular the Singaporean government has, over a number of years, provided financial incentives to companies who have a good track record through its CONQUAS-Premium Scheme. The BCA now openly acknowledges that the government is prepared to pay a premium for high quality work by giving tender advantages to firms that consistently achieve high CONQUAS Scores. The pre-qualification/preferred contractor approach adopted by state governments in Australia may be considered to fulfil a similar function but the use of tangible competitive incentives to encourage higher quality work is not widely evident.

- There are significant and important differences in the way that the UK, Singapore and Australia manage the reform process. This has potentially important lessons for helping to build and sustain the future competitiveness of the Australian Building and Construction industry. For example, an overview of initiatives in the UK and Singapore, shows a distinct focus on goals, key performance indicators and industry-wide targets, driven by a central coordinating authority with accountability for construction industry performance. In Australia, there is no central focus of responsibility and accountability for reform, which is inherently a political process involving diverse and discrete interest groups (DISR 1998). In this sense, it is not surprising that the penetration and effectiveness of Australian reform agendas appears to be less than in the UK and Singapore, as does the sense of momentum and direction towards

sustainable performance improvements. The single point of responsibility appears to be a critical difference that has enabled the UK and Singapore to make greater strides towards reform than Australia. This momentum is reflected in the successful development and application of developmental programs and tool such as CONQUAS and CORENET in Singapore and Building Down Barriers, Constructionline, Achieving Excellence Program and the Movement for Innovation in the UK.

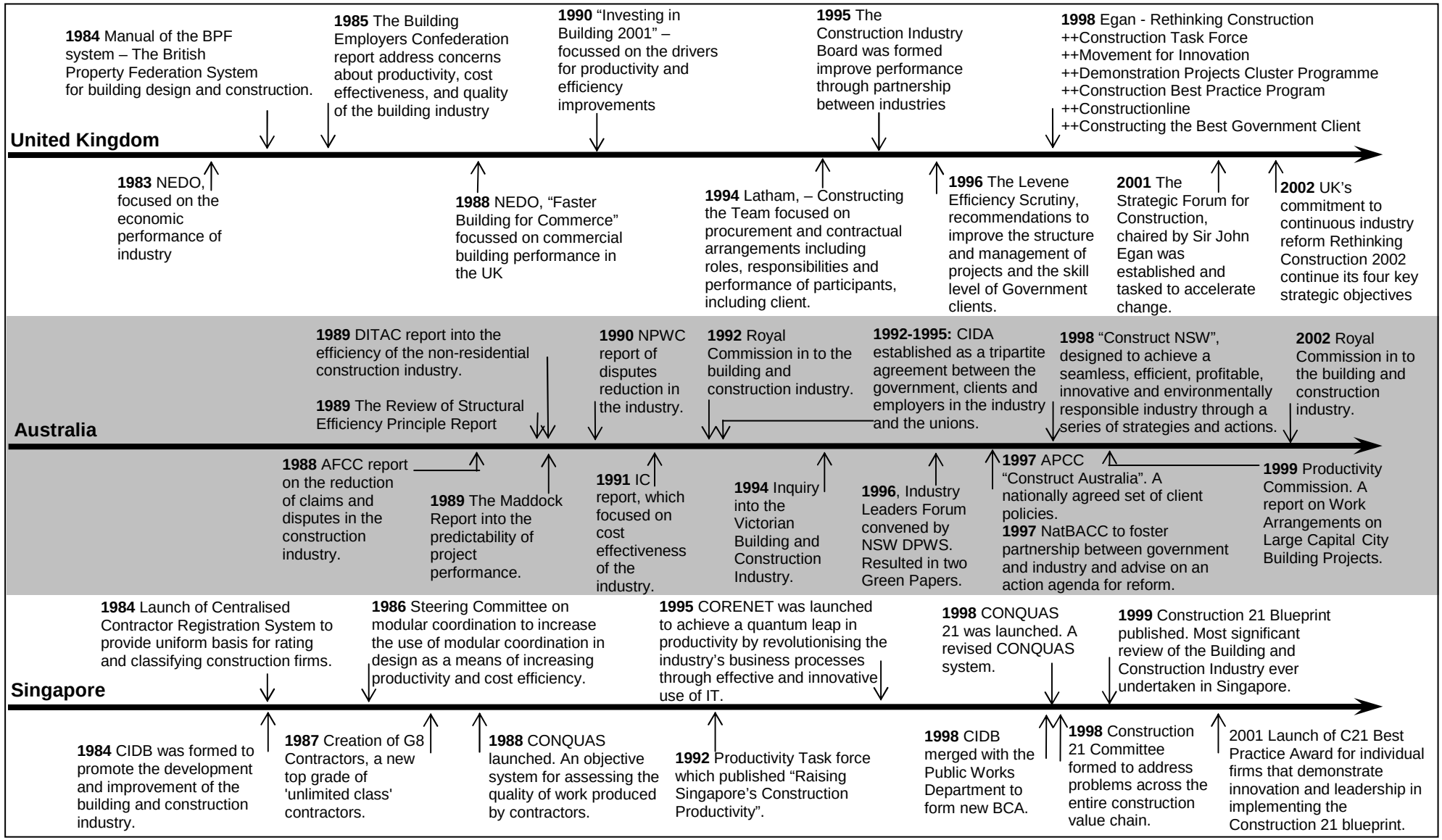
- Although a centralized industry regulator may be difficult to achieve in Australia, a strategically coordinated national plan with measurable targets and clear accountability for meeting them, would appear to be important to achieving a successful and consistent reform agenda. It is well established that reliance on the state as a key driver of reform has advantages, particularly in terms of avoiding the confusion that can arise from multiple drivers (Steedman 1993). For example, by representing a single point of responsibility, authority and accountability for building and construction industry reform, the Strategic Forum For Construction in the UK and the BCA in Singapore appear to be able to instill, in industry players, a far greater sense of urgency and sensitivity of relative performance levels than is evident in Australia. For example, the BCA Annual Report effectively represents an annual reform agenda for the industry and is a visible source of benchmarking data which communicates the health and performance of the Singaporean industry. Similarly, the UK has a raft of reform agencies and groups producing benchmarking data under the aegis of Rethinking Construction 2002. These groups include the Movement for Innovation; the Housing Forum; the Local Government Task Force; the Respect for the People Steering Group and the Construction Best Practice Programme. As with Singapore, UK national Key Performance Indicators are regularly moved upwards in a commitment to continuous improvement.

- As a counterpoint to the above, it is worth noting that the reliance on a centralised approach as a key driver of reform also has disadvantages. For example, it has been argued that with government being a monopoly provider of direction, innovation and diversity can suffer and the industry can find it difficult to cater for all clients' needs (Wolf 1988,). For example, the Singapore experience shows that despite considerable advances in many areas of the Singaporean Building and Construction Industry, a sustained and multi-pronged approach to increase construction productivity, has produced variable improvements over the last 20 years (Debrah and Ofori 2001).

- Attempting to establish a direct causal relationship between construction reform initiatives and improved industry performance is highly problematic. Not only have these issues remained largely un-researched in any rigorous sense, but there are many concurrent factors that influence productivity and efficiency at any one point in time. This is not to say that the impact of reform strategies cannot be identified, but that quantifying the outcome of initiatives is fraught with difficulty. Indeed, commentators such as Gyles (1992), Latham (1994) and Egan (1998) have been critical of the lack of quantitative data relating to construction industry performance.

Performance data which does exist is challengeable. For example whilst there is little doubt that the demonstration project approach, which has been heavily promoted in the UK by the M^{4}I (Movement for Innovation 2002), is having an impact on the industry, the methodology used to quantify demonstration project outcomes is a mix of factual and anecdotal evidence which is assessed in peer review sessions by members of the M^{4}I cluster groups.

Table 7 Chronology of reports and initiatives in the building and construction industry of UK, Australia and Singapore



2. Case Study – Building and Construction Industry reform in Australia

Background

Contemporary reform in the Australian Building and Construction Industry can be traced back to the late 1980s when Australia experienced a major building boom. During this period, private sector expenditure on capital equipment rose by nearly 8% a year and expenditure on non-dwelling construction rose by over 10% a year. Building activity reached a record level in 1989-90 as total construction activity (at average 1989-90 prices) increased from $33.8 billion in 1986-87 to a peak of $41.3 billion in 1989-90 before declining to a value of $33.6 billion in 1991-92 (de Valence 1999).

By 1988 the Building and Construction Industry had reached its capacity to meet demand. While credit availability remained easy, interest rates rose to historically high levels, increasing the demand for speedy construction, and heralding the widespread use of innovative procurement strategies. Major clients such as Defence, began to develop their own performance-based contracts, and the first wave of Japanese investors entered the construction industry bringing new procurement methods with them (de Valence 1999). The goal was more predictable outcomes than the industry had been providing, and by the end of the decade, fixed-price contracts had become the norm throughout the non-residential building and construction sector. This shifted greater levels of risk to contractors, who became far more vulnerable to industrial action, and prepared to buy off possible disruption to their projects. Furthermore, new methods of procurement were not well understood and the consequence was increased disputation and declining levels of trust between industry stakeholders (Barda 1995).

Although the industrial relations problems of the late 1970s and the early 1980s had abated in most States, new tensions emerged due to acute skill shortages in the building and construction industry. This led to inexperienced site management, and poorly trained operatives in critical areas. By the end of the 1980s, the industry was in crisis and unable to deliver predictable project outcomes. A looming recession and the beginnings of the devastation of the commercial property markets in 1990, ironically provided an opportunity to reverse the slide (Barda 1995).

A Brief History of Building and Construction Industry Reform in Australia

The Reform Agenda –1980s

The origins of reform in the Australian Building and Construction Industry can be traced back to four key reports in the late 1980s. These were; The **Australian Federation of Construction Contractors** report on the reduction of claims and disputes in the construction industry (AFCC 1988); **The Maddock Report** into the predictability of project performance (Maddock

1989); **The Department of Industry, Technology and Commerce** report into the efficiency of the non-residential construction industry (DITAC 1989); and **The Review of Structural Efficiency Principle** report of the Commonwealth Government which represented a radical overhaul of Australia's award systems and the first moves towards a system of decentralized enterprise bargaining (DIR 1989). Collectively, these reports established the need for, and direction of, labour market reform as a catalyst for productivity and efficiency improvements in the Australian Building and Construction Industry. The philosophy underpinning these reports was that a more flexible and highly skilled labour force was required to improve the efficiency and competitiveness of the industry and to provide workers with access to more varied, safer, secure, fulfilling and rewarding jobs (de Valence 1997). Prior to these reports, the Commonwealth and State Governments had become increasingly concerned about industry malpractices and in response, had deregistered the **Building Labourers Federation (BLF)** by legislation in Commonwealth industrial relations jurisdictions and territories. The Commonwealth Government had also introduced a Code of Conduct for all contractors, lessors and developers of Commonwealth construction projects (IC 1998).

The Early 1990s

The early 1990s also saw the Commonwealth and State Governments (except NSW and the Northern Territory), industry associations and unions sign the construction industry **'In Principle Reform and Development Agreement'**. This ran until June 1995 and expressed a commitment by all parties to achieve substantial measurable reform in the industry (IC 1998). The 1990s also saw a spate of more focused government reports, which sought to investigate the industry's problems further. This included: the **National Public Works Council's** report on dispute reduction in the industry (NPWC 1990); The **Industry Commission's** report, which focused on the cost effectiveness of the industry (IC 1991); and **The NSW Royal Commission's** reports into productivity and industrial relations in the New South Wales Construction industry (RCBI 1992, 1992a, 1992b). The Royal Commission's report made 62 recommendations covering illegal activities, practices and conduct that were found to significantly affect productivity and efficiency in the Building Industry, and the **Construction Policy Steering Committee** (CPSC) was established in NSW to implement the recommendations.

Royal Commission into Productivity in the Building Industry in NSW - 1992-96

The Royal Commission into Productivity in the Building Industry in NSW (RCBI) issued its 5,000 page Final Report in May 1992. To implement the recommendations, the Construction Policy Steering Committee (CPSC) was established from the Department of Public Works, the Roads and Traffic Authority and other State agencies, with no private sector involvement except for ongoing discussions with the industry. Its primary responsibility was to develop a Code of Practice to be implemented by all government agencies which would then drive reform within the Building and Construction Industry. The Royal Commission emphasised that the Government should use its

power as the major client of the industry and, at the same time, exercise its regulatory responsibilities to bring about industry reform.

The CPSC was made responsible for a thorough overhaul of Government standards and policies, and the development of consistent building, consultant and contractual policies, standards and practices to be employed by all government agencies. The focus was to be on client-led change, and whole-of-government approach to capital works procurement, which required consistent capital investment and contractual policies. The CPSC aimed at cultural reform, which would induce a greater degree of customer focus and the adoption of a cooperative approach to capital project procurement. Its ultimate goal was to achieve a commitment to best practice and continuous improvement throughout all levels of an organisation from top management to site operatives. CPSC reform was structured around the three issues of *best practice*, *industrial relations*, and *anti-fraud*. Its vision for the construction industry was: to make it internationally competitive; capable of achieving a 20% productivity improvement within 5 years; to respect the paramount right of clients within the bounds of equity for other participants; and make it capable of achieving new standards in industrial relations, occupational health and safety, industrial research, training, education and development.

The CPSC's work was published as the **Capital Project Procurement Manual** (CPPM), which incorporated two main policy initiatives, namely; the *Code of Practice for the Construction Industry* (CPSC 1996a) and the *Code of Tendering for the Construction Industry* (CPSC 1996b). The Codes established standards of behaviour that had to be observed by any contractor, subcontractor, consultant or supplier wishing to do business with the government. They also outlined what was expected of public sector clients in their dealings with the industry and what was expected of employer and industry associations and unions operating in the industry. For example, the above stakeholders were expected to adopt a cooperative, non-adversarial approach in all business dealings, maintain highest standards of OHS and environmental management, communicate openly and honestly with each other, comply with legislation and applicable awards and to operate with honesty and fairness in tendering and other aspects of business. The codes also prohibited collusive practices and required those wishing to tender on government projects to demonstrate a commitment to best practice and continuous improvement.

The two major objectives of the CPPM were to define minimum levels of acceptable behaviour, and to provide goals that facilitated higher performance from both individuals and organisations. The CPPM was meant to offer a pathway to make the industry more productive, efficient and attuned to the demand and need of clients. It specifically addressed standards of behaviour, promoted cultural change in the industry and the pursuit of enterprise bargaining.

Reform strands in the CPPM emphasised *industry culture* and *relationship initiatives*. This required a long-term cultural change in attitudes, work practices, skills, workplace relationships and overall industry management

practices. Two management tools the CPPM endorsed were benchmarking (to provide the framework and the targets that an enterprise must pursue to achieve Best Practice), and Quality Assurance (which provided process and systems to minimise waste, error and rework). In the area of relationship initiatives, the CPPM looked at general conditions of contract, partnering initiatives and alternative dispute resolution techniques. These would bring about a consistent approach to the administration of construction contracts, and encourage the employment of management processes to overcome the traditional adversarial and litigious nature of the industry. Other procurement initiatives included buildability and factors affecting life cycle costs.

The NSW strategy was mirrored in Victoria and Western Australia. Both States adopted Codes of Practice requiring contractors and subcontractors to meet defined standards on industrial relations and tendering.

Inquiry into the Victorian Building and Construction Industry - 1994

Victoria also had it own inquiry into the building industry by the **Economic Development Committee** (EDC 1994) which looked at: corruption in tendering practices; evidentiary powers of parliamentary committees; and productivity reforms. The report argued that an atmosphere of uncertainty and intimidation operated within the Victorian Building and Construction Industry, creating a confrontational culture that accepted inefficiency and corrupt practices as the norm. The industry was also found to be unable to agree on productivity objectives and reforms, unable to improve its productivity record and too willing to agree to union demands for the sake of short-term financial survival. Union practices came under particular scrutiny and were said to threaten potential productivity gains through demarcation disputes, intimidating employers and corruption in balloting processes on union elections. The EDC report found that a small number of enterprise bargaining agreements had produced small productivity gains but that such gains were difficult to quantify and mainly technologically driven. It recommended that union activities be investigated further by the **Building Industry Taskforce (BIT)** for illegal and criminal activity and that regular reports be produced for the minister on their performance. The BIT was also required to be a source of reference for employers on legislative provisions and to undertake a monitoring and auditing role to inspect any projects where allegations of unlawful demands were being made.

The Construction Industry Development Agency - CIDA 1992-95

In 1992, The **Construction Industry Development Agency (CIDA)** was established by the Hawke Labour Federal Government as a tripartite agreement between the government, clients and employers in the industry and the unions. CIDA's mission was to implement the Construction Industry Reform Strategy, which was based on: the introduction of performance standards for contractors; rationalisation of contractual relationships; and more effective management practices. A tripartite consultative body oversaw four working groups developing reform strategies, which followed a general

industry policy that targeted workplace reform across four areas, namely: skill formation; industrial relations; contracts; and industry development.

The four working groups recommended the establishment of a sunset agency funded by the Commonwealth Government for three years, tasked with the development of a **Code of Conduct** to regulate the terms by which public sector clients would procure services from the industry. Priorities were the establishment of commercially measurable performance standards as the basis for selecting contractors for major projects and the restructuring of industrial relations to accommodate a radical change in skill formation policy and delivery. The use of demonstration projects was proposed as the way to introduce reforms to the industry (CIDA 1992).

In 1991 an **'In Principle Agreement' (IPA)** was sent to industry organisations, with the draft framework for the Code of Conduct. The industry was asked to endorse the agreement and provide financial support. The IPA identified fourteen key issues:

1. Better project definition, including more complete contract documentation;
2. Introduction of commercial performance standards for contractors and registration of pre-qualified contractors;
3. Rationalisation of contractual relationships, especially the allocation of risk between the parties;
4. More effective management practices, including project management, design of work packages and selection of subcontractors;
5. Improved technical efficiency and capability, including a significant lift in research and development effort;
6. Improved export performance;
7. More efficient and flexible work practices and arrangements;
8. Improved education arrangements for management and employees for award restructuring;
9. A career structure for workers;
10. Improved training for management and workers;
11. Improvements in safety standards and working environment;
12. Improved security and continuity of employment for workers;
13. Strict adherence with award and agreement provisions;
14. Substantial reduction in lost time.

With funding from 1992-93 to 1994-95, CIDA began developing a detailed Business Plan with a vision and mission statement. CIDA's mission was to be a catalyst for real and measured change in the Australian Building and Construction Industry, through the provision of leadership, motivation and the development of a culture of learning and continual improvement. By setting up challenging performance standards and undertaking consultation with industry stakeholders, CIDA aimed to identify factors for success and remove barriers to change. The ultimate objective was to bring about a self-sustaining and dynamic process of continuous reform in the industry which would ensure its international competitiveness into the future. CIDA's vision statement aimed for a world-class industry that delivered customer requirements in many different ways. These included continually improving performance standards,

continual improvement in the quality of the working environment, utilising and extending the skills of people working in the industry, and exceeding international best practice to create a global customer base (CIDA 1993).

CIDA's Business Plan grouped its activities into five areas, namely; *Project Delivery*, *Best Practice*, *Industry Development*, *Skill Formation* and *Workplace Reform*. To bring about change in each area CIDA established twenty **industry action teams**, involving some three hundred people from over one hundred organisations (See Table 8). CIDA also conducted its own surveys and research, on issues such as security of payment, restrictive work practices, the structure of the industry, and the time and cost performance of projects.

Table 8 CIDA Action Teams

A Project Delivery
A1 Project Initiation
A2 Project Management
A3 Contractual Relationships
A4 Security of Payment

B Best Practice
B1 Code of Practice
B2 Performance Measurement & Databases
B3 Strategic Management
B4 Model Projects and Enterprises

C Industry Development
C1 Research and Development
C2 Export
C3 Regulation Reform
C4 Industry Representation
C5 Future Structure of the Industry

D Skill Formation
D1 Skill Formation
D2 Equal Employment Opportunity

E Workplace Reform
E1 Workplace/Enterprise Bargaining
E2 Award Restructuring
E3 Health and Safety
E4 Review of Employment Benefits
E5 Restrictive Practices

Pre-Qualification Criteria (PQC) were the major outcome of the effort put into CIDA and were designed to lift the performance of the whole construction industry for the benefit of clients. With separate specific criteria for contractors, subcontractors and consultants, clients would now have a framework and methodology for selecting the most suitable firms (CIDA 1995). The PQC were the first systematic set of tools for assessing the financial and technical capabilities of industry service providers, and were a clear message to the industry that clients wanted predictability of project time, cost and quality outcomes. Above all they wanted an objective assessment of the capacity of a contractor to undertake and complete a project. The rationale was that if the PQC resulted in better selection of contractors based on improved efficiency, reliability and competitiveness, then the overall capability of the industry in project performance, risk management and skill formation would be improved.

The main PQCs were based on company performance in:

- *Technical Capacity* - a demonstrated capability to undertake the work.
- *Financial Capacity* -meeting capital adequacy requirements.
- *Quality Assurance* - accreditation of a QA plan.
- *Time Performance* - track record on previous projects.
- *Occupational Health and Safety* - use of safety plans and training.
- *Human Resource Management* - workplace relations.
- *Skill Formation* - training of the workforce.

Three additional criteria were:

- *Claims Performance* - the ability to settle claims and disputes.
- *Compliance with Legislative Requirements* - the rule of law.
- *Management for Continuous Improvement* - strategic management.

CPSC and CIDA Compared

Working independently, both CIDA and the CPSC developed similar visions of reform for the Building and Construction industry. Neither vision included a time-frame for reform, however the CPSC vision did have a quantifiable goal where the CIDA vision identified no specific targets A major difference between the two visions was that the CIDA vision concentrated more on people and processes than the CPSC vision, which focused on the development of better management systems and on closer relationships between clients and contractors. In this sense, they complemented each other. However, they also required very different changes to take place within the industry.

For example, to conform to the CIDA's vision of a more dynamic, innovative and trusting work culture required a greater integration of the construction supply chain and increased opportunities for pre-tender input from all parties, especially contractors. Strategic alliances, partnering arrangements, simplification and greater fairness in traditional adversarial contracts and more transparent working practices, also lay at the core of the CIDA vision. Finally, CIDA's vision of a construction industry which harnessed and extended the skills and creativity of its employees, depended upon improved human resource management practices and structural changes which addressed deficiencies in education and training in the industry.

As with CIDA, the CPSC vision was an industry that was internationally competitive, providing a better service to customers. The changes considered necessary to achieve the CPSC goal of a 20% productivity increase in five years were wide ranging. In particular, the CPSC vision included a stable industry with an appropriate blend of participants as one of its goals, with firms implementing quality systems and using measures such as benchmarking and buildability. Furthermore, progression towards an industry capable of achieving new standards in industrial relations, occupational health and safety, industrial research, training, education and development, were largely

based on the resolution of industrial relations based inefficiencies and improved tendering practices.

States Codes of Practice and National Building Code – 1994

In 1994, the States of Victoria, Western Australia, South Australia and the Northern Territory introduced Codes of Practice, which applied to government construction work and to the private sector in Western Australia.

A national approach to building codes and standards was also established by the creation of the **Australian Building Codes Board (ABCB)**. This was a joint initiative between the industry and all levels of government. The ABCB had responsibility for developing and managing the national standards known as the Building Code of Australia. In 1996, a nationally consistent performance-based Building Code of Australia was published (IC 1998).

NSW Green Papers - 1996

In 1996, an **Industry Leaders Forum** was convened by NSW Department of Public Works and Services (DPWS) to provide suggestions on construction industry reform policy and its implementation in 1995-96. This resulted in two Green Papers, which began a new phase in reform where a leading client undertook strategic planning for the industry. The first Green Paper was entitled 'The Construction Industry in NSW: Opportunities and Challenges' (DPWS 1996) and the second Green Paper was the 'Security of payment for subcontractors, consultants and suppliers in the New South Wales Construction Industry' (DPWS 1996a).

In many ways, the first Green Paper (DPWS 1996) echoed and reinforced the sentiments of earlier reports by referring to best practice, benchmarking etc. Industry process improvement was also re-emphasised, as was the building and construction industry's increasing exposure to international competition. It was essential that industry processes kept pace with global developments and performance standards, yet the majority of industry enterprises had yet to initiate any meaningful steps toward continuous improvement (DPWS 1996). This was despite having available, tools like the CPPM guidelines on benchmarking and workplace reform and the CIDA guidelines on continuous improvement and best practice approaches.

While the Green Paper re-iterated many issues raised in earlier reform agendas and reports, it also differed in advocating a systems-based approach to reform founded on the systematic documentation, implementation and monitoring of workplace procedures. In essence, the Green Paper was based on the premise that effective relationships and processes, during all stages of a project, are underpinned by effective exchange of information. The Green Paper argued that the wider use of continuous improvement processes could substantially lift the quality of outcomes through best practice criteria dealing with such issues as teamwork, ecologically sustainable development, quality management, cooperative contracting and relationships, and business excellence. Other industry wide processes were discussed such as design

management, buildability, off-site fabrication, dimensional coordination and reducing design and construction complexity. The industry's up-take of IT was also addressed as a means to improve the flow of communication between all parties. A plan was produced which would identify IT capability at various industry levels, set tiered performance goals for different sized DPWS contracts, and establish an implementation strategy that would progressively increase performance goals. The Green Paper also addressed wider ethical issues such as the construction industry's poor record in occupational health and safety (OHS) and environmental management. This was said to add significantly to the costs of production and to have a wider social and ethical impact. In response, a systems-based approach was advocated in both areas to establish the basis for accrediting and monitoring contractors at company and project levels. The idea of ecologically sustainable development (ESD) was also introduced.

The second Green Paper DPWS (1996a) addressed the issue of full and late payment along the building and construction supply chain, as an impediment to world-class performance and productivity. It blamed the problem on poor ethical conduct, deficient management skills, weak financial backing and an adversarial culture. There have been numerous other reports on security of payments in Victoria, Queensland and Western Australia. These identified similar problems and are discussed in detail in another Royal Commission Discussion Paper.

The NSW DPWS followed up on the Green Papers by releasing 'A Perspective on the Construction Industry in NSW' (DPWS 1997). This document outlined the major development initiatives targeted by NSW for the industry, which included stricter pre-qualification processes and criteria, sequential contracting and value adding procurement. Policies on IT, OHS and benchmarking followed over the next two years.

Construct Australia - 1997

The State Public Works Departments that formed the NPWC, restructured to form the **Australian Procurement and Construction Council (APCC)**. The APCC revised and repackaged the NSW Green Paper as 'Construct Australia: Building a better construction industry for Australia' (APPC 1997). This document represented a significant milestone in that, for the first time, Australia had a nationally agreed set of policies that major clients in the State public sectors would, in their various ways, attempt to implement. Central to these policies was the role of the client. APCC (1997) contained the following recommendations:

- *Integration* - the industry must provide a strategic alliance platform for organisations to offer combined products and services;
- *Relationship management* - all participants must minimise risk through the maintenance of high quality relationships along the supply chain and the alignment of all participants' objectives;
- *Single source solutions* - the single supply source should comprise a smaller number of service providers formed into a

consortia/partnership/alliance that will supply packaged solutions that extend beyond the familiar range of construction/development services provided by the industry today and will include participants from other industries e.g. finance, healthcare etc.;

- *World markets* - clients will require higher standards of service and new approaches to business relationships; participants will compete and partner with world class companies;
- *Client interface* - there will be new approaches to risk sharing and more open relationships, as advanced information technologies provide the linkages that integrate all business activities as clients focus increasingly on service delivery and longer term relationships as part of the virtual organisation which will exist;
- *Strategic focus* - participants will need to adopt a strategic focus in business development which will create the future rather than being reactive to demand;
- *Resource management* - participants will need to address human, technical and financial resource issues to ensure the capacity and capability to perform efficiently and operate profitably;
- *Business/financial management* - the industry will only become profitable if enterprises strengthen strategic planning, business and resource management capabilities and develop the necessary human, financial and management skills;
- *Flexibility* - people in the industry must expand their skills base to provide a workforce which is able to adapt quickly to new situations and challenges;
- *Value for money* - all participants, including clients, must move from the low bid position to the adoption of a wider value set which includes whole-of-life costs, innovation and value adding components;
- *Best practice culture* - the industry must achieve continuous improvement in construction and the delivery of innovative solutions to clients' needs;
- *Working smarter* - the industry must work smarter by re-engineering business and project processes and by engaging in research and development;
- *Technology* - industry enterprises will embrace advanced technology in design, project management, business and financial management using advanced technology in process management, monitoring and information management;
- *Information networks* - the industry will integrate business practices with common information networks;
- *Critical success factors* - clients and industry participants will need to agree on critical success factors, achieve a positive mindset shift to look for new ways of doing things and adopt new approaches to risk sharing and investing in research and development;
- *Ecologically sustainable development* - the industry must achieve a lead position in environmental management.
- *Built environment* - clients and participants must increase the industry's perceived value to the community;

- *Environmental best practice* - industry participants must be a benchmark in environmental achievements such as waste management, energy efficiency, environmental auditing etc.;
- *Mainstreaming environmental management* - environmental management to be a mainstreamed business management function of all industry organisations.

Construct NSW - 1998

A second significant report to emerge in the late 1990's was entitled 'Construct NSW' (DPWS 1998). This was designed to achieve a seamless, efficient, profitable, innovative and environmentally responsible industry through a series of strategies and actions in the following areas;

- *Improving strategic information for decision-making and business development* – through development of industry KPIs and more accessible industry projections;
- *Improving business ethics and practices* – through wider adoption of codes of practice for the industry and by reducing the costs of doing business;
- *Improving security of payment* – through improved contractual requirements, awareness programs, better pre-qualification processes and greater access to remedies;
- *Improving management capabilities and workforce development* – through increased investment in training, improved access to training, improving workforce diversity, integrating training and skill formation into enterprise development, developing a long-term training strategy for the industry;
- *Encouraging continuous improvement* – through encouraging process improvement, mainstreaming industrial relations in project management, encouraging workplace reform, creating a safe working environment;
- *Improving sustainable practices within the industry* – through mainstreaming ESD in project management, establishing environmental best practice on government projects, supporting the effective use of scarce resources;
- *Improving recognition of outstanding performance* – through encouraging and rewarding outstanding performance, particularly in Small and Medium Enterprises (SMEs);
- *Improving IT* – though support for industry take-up of advanced technologies.

NatBACC

The National Building and Construction Committee (NatBACC) was established in September 1997 to provide advice to the Government on all sectors of the Building and Construction Industry. NatBACC superseded the Australian Construction Industry Council (ACIC) which itself replaced the Construction Industry Development Council (CIDC). CIDC was established in

1992 to act as a national forum for the construction industry and to advise governments on matters relating to the industry. ACIC was established in 1995 to provide leadership for the industry and develop priority areas for reform (IC 1998).

The role of NatBACC was to foster partnership between government and industry and to advise on the development of an action agenda for reform of the Building and Construction Industry. The committee included representatives from the residential and non-residential building sectors, building materials manufacturers, design professionals, specialist contractors, construction companies, property owners and developers and public works authorities.

In December 1997, the Prime Minister announced **'Investing for Growth'**, the new Government strategy for the development of Australian industry, to be implemented by NatBACC in the building and construction sector. In announcing this strategy the Prime Minister advised that the Government would be working with business to promote industry growth and to develop action agendas to address impediments to growth in specific sectors, including construction.

In 1999, the Department of Industry Science and Resources released its report **'Building for Growth'** report (DISR 1999), for NatBACC, which reaffirmed that the building and construction industry needed to adapt rapidly and embrace change more willingly to fulfil its potential and take advantage of emerging opportunities. The Building for Growth strategy emphasised the following:

- The diffusion of IT throughout the building and construction industry as a means of reengineering building process in a cost effective manner;
- Factoring environmentally sustainable design, planning, construction and maintenance into whole of life procurement design;
- The effectiveness of links between industry, universities and public sector research organisations;
- Scope for increased innovation offered by a performance-based building code;
- The links between the manufacturing sector and innovation in the building and construction industry;
- Alliances and partnering as a tool for project delivery.

The main issues and objectives identified in the Building for Growth, DISR 1999, are listed in Table 9.

Table 9 Issues and objectives identified in the Building for Growth

Issue	Objective
Innovation	That the industry has recognised and adopted innovation in all aspects of its activities as a means to increase its performance and competitiveness, with; • Wide diffusion of new processes and products throughout all levels of the industry, particularly SMEs; and • A regulatory framework that actively facilitates and encourages the development of innovative practices.
Information Technology	That the industry is efficiently using information technology as a tool to re-engineer processes within the industry, with; • Wide uptake of information technology throughout all levels of the industry as an enabler of greater efficiency and competitiveness.
Regulatory Reform	That Australia has an international best practice regulatory system with low costs on industry, that is widely adopted through the region, with; • Australia's performance-based building code the subject of continuing close consultation between the industry and government; • The minimal use of prescriptive standards; and • Planning regulations and approval processes harmonised to the maximum possible extent throughout Australia.
Exports	That the Australian Building Industry is recognised as an innovative and competitive provider of design and building services and related products tailored to the needs of individual clients and markets. Capturing opportunities associated with major projects and infrastructure developments, particularly those that will continue to emerge in the Asia-Pacific region; • With companies leading access into overseas markets working cooperatively with other competitive Australian suppliers of services and materials to provide construction solutions for clients which maximise Australian industry involvement; • With specialist service providers enjoying a high profile in overseas markets; and • A reputation for being capable of delivering environmentally responsible and energy efficient building developments.
Procurement and Project Delivery	That commercially focused procurement practices are in place which encourage long term, strategically focused supply relationships, leading to: • Greater integration and financial strength and stability in the industry, allowing it to respond to emerging opportunities both in Australia and overseas; Development of 'seamless' and 'virtual' organisations; • More innovative high quality, cost-efficient building outcomes that recognise whole-of-life costs; and • Consistency, where possible, across the public and private sectors.
Workplace Issues	That industry operate in a flexible and professional environment, with a learning oriented workforce and effective supplies of well-trained and multiskilled people at management, technical and operational levels That all parties are committed to ongoing development and training under a nationally consistent training framework, which streamlines training and skills recognition arrangements; and underpins a national, quality assured system of vocational education and training. That a workplace culture which encourages more direct and cooperative relationships between employers and employees is in place.
Environment	That the industry is recognised as having the capacity to design, construct and operate buildings in a manner which reduces the impact on the environment and with a wide understanding of the potential savings in lifecycle costs of energy efficient design and processes

Source: DISR (1999)

Later in 1999, NatBACC commissioned a series of more detailed studies concerning implementation of DISR (1999) which recommended that the industry and government commit to a 3-year partnership, based on a mix of short-term and medium-term initiatives to assist the industry to change. In NatBACC's view, the structure of the building and construction industry made market-based reform unlikely and the government had a legitimate catalytic role to play in bring about change. NatBACC made 34 recommendations for the effective implementation of 'Building for Growth' which call for greater intervention on the part of government in industry reform (NatBACC 1999). In essence, NatBACC recommended that productivity and efficiency could be increased by:

- The establishment of a permanent advisory mechanism where industry had an annual opportunity to discuss industry reform directly with Ministers;
- A construction industry survey every 3 years to understand changes occurring and performance levels in key areas;
- The government taking a more proactive role in integrating disparate bodies in the industry;
- Government working with industry to develop a better understanding of R&D and innovation processes within the industry and putting mechanisms in place to measure, publicise and reward innovative companies;
- Government agencies driving procurement reform in areas like IT and putting incentives in place for companies to adopt innovative ideas. For example, agencies may require all companies to tender electronically for public sector projects;
- Government and industry collaborating in the development of quality management programs and building a culture of self-regulation;
- Government simplifying its building control and planning procedures and regulations;
- Government developing mutual recognition arrangements with target countries to enhance exports;
- Government working, at all levels, to develop a nationally consistent set of licensing competency standards for contractors;
- Government funding research projects into issues such as impediments to improving productivity and performance, international benchmarking, procurement processes such as partnering and strategic alliancing, supply chain management etc.;
- Design professions making greater use of Australian products on local construction projects;
- Government undertaking a program of consumer awareness to change negative perceptions of the industry;
- Government developing further initiatives to simplify industrial awards, lessen industrial disputation and provide more effective remedies for employers in the event of such.

Productivity Commission Report - 1999

In August 1999 the Productivity Commission produced a report on **"Work Arrangements on Large Capital City Building Projects**" (PC 1999). The Productivity Commission is an independent Commonwealth agency and is the government's principal review and advisory body on microeconomic policy and regulation. The report investigated how work arrangements on large capital city building projects affected workplace performance in terms of labour productivity, unit labour costs, timeliness and product quality. It was based on information obtained from detailed discussions with industry stakeholders from the private sector, public sector and unions.

The report found that while there had been some improvements in working practices since the late 1980s, they had not been consistently applied. It also argued that the industry's working practices provided unions with substantial market power, which had been used during the late 1980s to entrench many inefficient work practices. Furthermore, existing industry practices gave subcontractors, which employ 90% of the workforce, limited control over work arrangements. It was argued that subcontractors are best placed to determine remuneration and associated incentives to improve industry productivity. The report also found that while completion times for projects had fallen due to better management practices and work arrangements, disputes had risen again from 1995 to the high levels of the late 1980s. Pattern agreements dominated the industry although there had been some movement towards enterprise agreements that showed consistent remuneration rates within a particular trade. Work arrangements varied considerably across Australia's major cities, the content of pattern agreements being more uniform in Victoria than NSW. The report concluded that planned changes to legislation to improve the timeliness of penalties against unprotected industrial action and to address de facto compulsory unionism, would facilitate further change in the industry's work practices.

Common themes of the 1990s

The common theme in the early 1990s was client-led, industrial relations reform. The primary aim of reform during this era was to change the industry's confrontational relationships and adversarial culture with the objective of improving productivity, time, cost and quality performance. The main mechanisms used to achieve this were award restructuring, codes of practice and public standards and policies to establish industry-wide expectations of behaviour. Although industrial relations issues have continued to punctuate the reform agenda to the current day, the late 1990s saw a shift in priorities to more contemporary and process management issues. This was driven by increasing concern over a number of problems such as the relatively slow uptake of information technology and the unacceptably high accident rates. These were seen to be contributing significantly to both the financial and social costs of production. Furthermore, in an increasingly environmentally sensitive world, a traditionally wasteful industry was being encouraged to be more environmentally conscious in its practices and the need to establish

measures of industry best practice was being been emphasised in light of opportunities in the Global Market.

The focus of the IT solution offered by the Federal Government in 'Building for Growth' (DISR 1999) was on demonstration projects in key areas which would promote the advantages of the integration of IT solutions with traditional industry practices. The proposed initiatives offered by the NSW State Government in the 'Construct NSW' (DPWS 1998) document were similar in nature and included a Construction Policy Steering Committee to monitor information management initiatives. The impediment to developments in this area lay with the fact that although governments may encourage and promote the use of integrated IT solutions, they are ultimately unable to control the purchasing and business decisions made in industry. Those companies that are unable or unwilling to practice along policy lines simply extricated themselves from dealings with the government.

In the area of Occupational Health Safety and Rehabilitation, the State Governments have a greater degree of control and influence than does the Federal Government. Both the NSW 'Green Paper' and 'Construct NSW' placed a heavy emphasis on the importance of increased measures towards substantial improvement in this aspect of industry performance. While the 'Green Paper' highlighted the importance of the issue, the 'Construct NSW' document outlined strategies, which utilised Workcover's control as a statutory body concerned with the regulation of OHS&R and with the power to monitor this area of workplace practice. In 2001 WorkCover NSW introduced a major new regulation entitled the Occupational Health and Safety regulation 2001 under the new Occupational Health and Safety Act 2000, which replaced all 36 existing regulations in this area. The new regulation considerably simplifies the law in this area and places obligations on employers to adopt a systematic and consultative risk management based approach to managing OHS. This new regulation is reviewed in detail in other Royal Commission Discussion papers. The State Government was also committed to extending the scope and application of OHS&R management systems on its own projects. As with the IT solutions offered, this strategy could only be effective in dealing with those members of industry who chose to deal directly in Government projects and submit to the standards imposed.

In terms of ecologically sustainable development, the government's response has so far been tentative. The proposed action by the Federal Government to date has been that both industry and Government need to consider issues such as environmentally responsible planning, building processes and materials and how they can be factored into commercial decision-making by clients. As yet no concrete strategy has been proposed and no plan has been produced by which such initiatives could be implemented. The State Governments have been more proactive in their approach. For example, the NSW 'Green Paper' discussed the development of an environmental management system, which would provide a basis for accrediting and monitoring contractors at both organisation and project levels. Similarly, much of 'Construct NSW' bases its strategy on a similar principle of extensive monitoring and accreditation of contractors working on Government projects.

As with most of the other government initiatives, its effectiveness will be limited to the few companies which have to capacity to comply with the standards and the even fewer which have effective environmental risk management systems in place. As such the State initiatives are progressive but are by no means a comprehensive solution to the problem.

Finally the issue of industry best practice is one, which touches on all areas of the construction industry and is crucial to many of the government initiatives. Of itself, the issue of industry best practice is critical in developing an internationally competitive construction industry. Specifically, Australian standards of best practice must be comparable to those of other competing countries if Australia is to gain credibility and recognition in the international market place. The 'Construct NSW' document does not deal directly with industry best practice as an issue, however, the promotion of the NSW 'Code of Practice' within the industry is a strategy which is given great attention along with the need for set industry standards in OHS&R and ecologically sustainable development. The Federal paper 'Building for Growth' is more explicit in that it outlines the need for regulatory reform, which will promote an international best practice regulatory system with low time and resource impacts. Regulatory reform is one of the areas in which the Government will have a direct and positive influence on the industry.

3. Case Study – Building and Construction Industry Reform in the United Kingdom

Background

The UK construction industry is a significant contributor to the national economy, accounting for 8% of gross domestic product and employing 1.9 million people (NAO 2001). The economic significance of the UK construction industry is such that the industry is inexorably dependent upon wider economic stability. The Government directly affects construction workload through the financing of public projects and stimulating and dampening of client purchasing power. UK industry activity is highly cyclical. For example, from 1989 to 1994 almost half a million jobs were lost in the industry, training fell by over 50% and over 35,000 small businesses and companies became insolvent. The recession of the early 90's hit the construction industry hard and affected the construction industry more deeply than other industries. In 1993, construction output was 39% below its 1990 peak, whereas for manufacturing the dip was 3% (Latham 1994). Since the recession of the early 90's the industry has rebounded to a turnover of approximately 55 billion pounds stg. in 2001. The recent increase in construction output has increased the need for new recruits into the industry. Indeed, the Construction Industry Training Board reported that the construction sector needs to recruit 64,000 people each year just to replace those leaving the industry (CITB 2000). The increasing difficulty in being able to recruit talented people due to the industry's poor image has resulted in the industry becoming increasingly reliant on a less skilled workforce. (NAO 2001).

Although the public sector is becoming less dominant as a client body (Latham 1994), it still accounts for some 37% of the industry's turnover (NAO 2001). The public sector client base consists of central government (expenditure in 1999-2000 was 7.5 billion pounds stg.) and local government (expenditure in 1999-2000 was 11 billion pounds stg.). As is typical in most countries, the UK Building and Construction Industry is dominated by a large number of small firms with a limited number of large firms undertaking a substantial proportion of the work (Egan 1998).

Reform in the Building and Construction Industry

The UK Government has commissioned a large number of investigations into the construction industry and has published a regular stream of reports and policy documents from the post second world war construction boom onwards. For many years the UK construction industry has been criticised by the UK government for its inability to innovate and its slow adoption of new technologies and modern management methods. The industry has long been exhorted to change its ways in a large number of reports and investigations. These range from the early Simon, Emmerson, Banwell and Lofthouse Reports (1944, 1962, 1964, 1965) to the more recent 'Constructing the team' report by Sir Michael Latham (1994) and 'Rethinking Construction' report by Sir John Egan (1998). The most recent reports 'Rethinking Construction – Accelerating Change' (2001) and 'Constructing the Future' (2001) add to the continuous barrage of inquiries and reviews which has typified the UK

construction industry during the last ten years in particular. Latham, who has been at the forefront of the modern reform agenda in the UK has commented, somewhat wryly, that '*there had been widespread agreement on the Simon Report, the Emmerson Report and the Banwell Report but rather less action*'.

It is certainly the case that since the publication of 'Constructing the Team' in 1994 and 'Rethinking Construction' in 1998, there has been a significant number of Government attempts both at central and local level to implement a radical and fundamental construction industry reform agenda. Examples of very recent UK reform initiatives include; disseminating best practice through the Construction Best Practice Program (NAO 2001), encouraging innovation through the Movement for Innovation (M^4I 2000), the establishment of Key Performance Indicators (KPIWG 2000) and benchmarking construction performance (NAO 2001). The approval of the continuation of funding to 2004 of Rethinking Construction Ltd (headed by Sir Michael Egan) is further testament to the UK's commitment to the effective implementation of construction industry reform.

A Brief History of Building and Construction Industry reform in the United Kingdom

The post war period

The main reports during this period were Simon (1944), Emmerson (1962), Banwell (1964) and Lofthouse (1965). These reports concluded that the industry as a whole had not progressed sufficiently due to various sections of the industry acting independently. All found extreme variability in the industry's performance and were largely repetitive in making the following recommendations:

- Enhancing great industry unity – to get the industry thinking and behaving as a whole to change attitudes and procedures within the professions.
- Improved communication within the industry.
- Simplification of payment procedures - particularly to subcontractors to reduce under-capitalisation of the industry.
- Fixed price contracts underpinned by longer-term wage settlements.
- Prompt payment - particularly to subcontractors.
- Better training - a force of well-qualified site agents and foremen should be built up.
- Better project management skills - in terms of more efficient use of labour, better use of machinery and more economic use of materials.
- Common education and training across professions.
- Recognised standards of behaviour and workmanship across the industry.
- Better working conditions - to improve image of industry and attract more young talented recruits.
- Increased penalties to avoid price collusion - amongst an ever smaller number of large contractors.

- More stringent pre-qualification criteria and approved lists of tenderers – instead of open tendering.
- Greater use of direct labour - rather than subcontracting.
- A central body for the exchange and provision of information - to allow contractors to benchmark their performance.
- Greater integration of design and construction teams.
- Greater integration of subcontractors - earlier in the design and building process.
- Two-stage tendering - where firms first competitively selected on management capability and then develop contract price as designs develop.
- A comprehensive review of UK building standards.
- Adequate time be given for pre-planning projects to reduce unnecessary variations.
- A common form of standard contract be developed.
- Reduced retention funds - particularly for subcontractors.
- Better preplanning in the public sector - in terms of financing building for rolling programs.
- Shorter project planning periods in the public sector.
- Provisions of incentives for good work.
- Greater willingness to be innovative with procurement methods - particularly by public sector clients.

1983 A major government report into Productivity in the Construction Industry was published entitled 'Faster Building for Industry' (NEDC 1983). This report was commissioned by the Department of Environment (DOE) and focused on the economic performance of the industry, particularly in relation to costs and productivity. It was published by the National Economic Development Council (NEDC) which brought together representatives of government, management, trade unions and other interests to assess the performance of the Building industry and opportunities for improving it. The National Economic Development Office (NEDO) provided the secretariat for the NEDC and played a key role in promoting change and overcoming obstacles to growth.

Faster Building for Industry was a study of 8000 projects across the UK. It was published in response to the Construction Industry's continual inability to respond to changes which had been recommended by over 40 major reports, published from 1945 onwards. Faster Building for Industry found that only 1 in 5 buildings were completed in what was considered an efficient time. The industry was also found to be highly confrontational in its practices and culture which was leading to a relatively high level of costly and delaying disputes on projects. Faster Building for Industry cast light on the inefficient work practices of the UK construction industry which had cemented into place, restrictive procedures and practices which protected the inefficient and held back external investment in the industry.

According to Faster Building for Industry, fast projects were characterised by:

- High client expectations.

- Good documentation.
- Clear flows of information.
- Certainty of scope.
- Quick decision-making and responses to queries.
- Good project management.
- Involved clients.
- Risks fairly distributed.
- Increased use of technology in areas of low efficiency such as wet trades.

The report's recommendations were that the Building and Construction Industry could build quickly and efficiently if:

- Customers played an increased role in the procurement process by pushing for faster times, stating their objectives clearly and closely monitoring work standards.
- Alternative procurement systems with a single point of management responsibility were used more.
- There was a more proactive approach to continuously managing the whole building process from inception to completion.
- There was better design management to ensure that designs meet client's requirements and that production information was delivered on time and was consistent.
- Subcontracting was reduced.
- More production technologies were adopted.

1984 Major industry clients were becoming increasingly frustrated that building was a confrontational experience, cost too much, took too long and did not always produce credible results. Consequently, the British Property Federation produced a major report entitled 'Manual of the BPF system – The British Property Federation System for building design and construction' (BPF 1984). The BPF were a relatively small but influential group which highlighted some important issues and created some lively debate which quietly died off. However, this group was evidence, of the first time a client voice was heard in taking the initiative to drive industry reform. The aim of the BPF was to devise a more efficient and cooperative method of organising the whole building process which eliminated practices that absorbed unnecessary effort and time and obstructed progress towards completion. It was an unashamedly client-orientated system, underpinned by many ideas from the US where costs and production times were far lower than in the UK.

The unique features of the BPF system were:

- Consultants worked for a fixed fee to give greater incentives to efficiently produce effective labour-efficient designs with minimum variations.
- Client could pay supplementary fees if tender price was within stated % of target cost and if designed were completed by predetermined dates.

- One consultant, the 'design leader' should be responsible for all pre-tender design.
- One project manager should act as the client's representative, to replace the Architect who may have a conflict of interests.
- Elimination of Bills of Quantities to be replaced with Schedule of Activities which is priced to provide stage payments linked to the program progress.
- Elimination of nominated subcontractors.

1985 The Building Employers Confederation launched its report entitled 'A Fresh Look at the UK and US Building Industries' (BEC 1985). The objectives of the study were to address increasing concerns about the relatively low productivity, cost effectiveness, speed and quality of the UK building industry. The methodology for the study involved direct comparisons between nine comparable building projects in the UK and US. The study concluded that:

- US projects are on average, 1.70 times faster than comparable UK building projects.
- UK buildings are more complex in design, less standardised and more difficult to build than US buildings.
- The UK uses significantly less prefabricated, mass produced and standard off-the-shelf components than US buildings.
- UK contractors face more design changes than US contractors. In the US, designs are normally 100% complete before site work starts.
- US specialist contractors are better organised in management skills than their UK counterparts.
- There are fewer working days on site in the UK than in the US.
- The US operative is more multi-skilled than the UK operative but there is no difference in individual productivity.
- The UK operative takes more holidays than his US counterpart.
- The US operative is not more productive than the UK operative but works longer hours.
- The ratio of labour cost to capital cost is significantly higher in the US than in the UK. The US substitutes capital-intensive technologies for labour.
- There are no significant differences in building prices between the US and UK.
- Because of the labour/capital balance in the UK, it is sensible for the UK to employ more labour intensive rather than capital intensive techniques.
- There have been significant improvements in productivity in the UK industry over the last 5 years, brought about by;
    - Higher interest rates in the UK, forcing clients to be more involved in their projects and increasingly demanding in cost and time targets. They are still far less demanding than US clients.
    - Wage demands by UK unions becoming more realistic.
    - New contracts which reduced the adversarial role of the contractor.

- Reduced volume of work, which has increased competition in the industry.

1988 A major government report into Productivity in the Construction Industry was published entitled 'Faster Building for Commerce' (NEDC 1988). This was a follow-up to Faster Building for Industry report produced by NEDC in 1983 but focussed on commercial building performance in the UK. It drew its conclusions from a range of commercial projects which covered one eighth of the UK's annual commercial building output and was designed to build on NEDC (1983) and identify the factors leading to successful projects. It was a highly influential report which added significantly to the growing evidence of sub-optimal performance.

The report concluded that there was wide variability in the industry in time performance: comparable projects took very different times to complete. Furthermore, one third of the projects studied were completed on time or early, one third overran by up to one month and the rest overran by more than one month. The main research findings are listed below:

- Fast times were linked to;
  - The participation of the customer – pressure for speed led to faster production times.
  - Effective management across ALL phases of the project.
  - Quality of design and design information.
  - Early integration of subcontractors.
  - Explicit time objectives.
- The majority of customers are ignorant of the industry's practices and of performance standards to expect.
- Many customers are ill-informed about what can be achieved.
- Industry's service to regular and major customers is better than to irregular and smaller customers.
- Systems in the industry seem unable to accommodate client changes without a disproportionate impact upon performance.
- Management skills are often poor in the building industry.
- The large number of separate specialists involved in the design and construction process is an impediment to high performance.
- There are often ambiguities over risk distribution in contracts and leadership responsibilities in contract and law.
- Customers often have difficulty assessing in tenders, the quality and calibre of management they are buying for their projects.
- Customers should be wary of 'lean' resourcing in site management costs.
- Failure to specify clear performance standards reduces competition between subcontractors and suppliers.
- The quality and supply of raw materials is often a problem as is the poor integration of suppliers and manufacturers in projects.
- The fewer subcontractors the higher the performance.
- Supervision and quality control of subcontractors is often inadequate.

- When wages are dependent on overtime and bonuses, there is dissatisfaction among the workforce, which is in turn, detrimental to performance.
- The standard of working conditions and welfare facilities on sites was generally poor.

1990 The Centre for Strategic Studies and the National Contractors Group published 'Investing in Building 2001' (CSS 1990). This report focussed on the structure and image of the building industry, education and R&D as drivers for productivity and efficiency improvements. The industry's consistently patchy performance in relation to other UK industries was put down to unstructured changes over previous years, its short-term focus, poor public image, process orientation, fragmented organisation and educational system, adversarial culture and low technology based. The report concluded that leadership in reform of the industry should move to the 'prime movers' who have a moral responsibility to mentor and nurture the industry towards improved efficiency. The recurring theme in the report was 'responsibility' and self-regulation. That is, firms and individuals accepting responsibility for their own competence and the quality of work. This required a major change in attitude in an industry that had become overly obsessed with limiting or avoiding liability by adopting short-term, defensive attitudes. Firstly, holistic thinking about buildings should replace the mechanistic outlook that had predominated. Total performance of buildings should be the key feature of the future, interdisciplinary working, flexibility and adaptability were major themes of the report. The report argued that the user's role in the process needed more emphasis and that the process of design, management, manufacturing, construction, commissioning and maintenance needed to merge and extend to include post-occupancy evaluation. There was also a need for a common culture across all disciplines, where different professions could learn together, respect each other and understand their different roles. Technology also had the ability to relive the dangerous, arduous and tedious nature of many building tasks and let more energy be devoted to creative thinking and innovation. This could only be achieved by a positive culture and a well motivated workforce which was driven by leaders who gave a meaning to work and who rewarded the hard work and dedication needed to produce consistently high quality work. Finally, it was important that industry leaders communicate the positive aspects of the industry to enhance the image of the industry and encourage the external investment which is needed to help it grow and mature.

Specific recommendations were made for individuals, customers, contractors, consultants, researchers, universities, professional bodies and trade associations, media and government. These revolved around:

- More attention to training, mentoring, R&D and learning in the industry.
- More information to drive innovations.
- More collaboration to drive innovations.
- More resources targeted to R&D.
- More long-term relationships with business partners, universities and customers.
- Supporting well-trained, professional organisations.

- Encouraging experimentation and innovation in the workplace.
- Joint accreditation procedures in education and multi-disciplinary courses.

1993 The Joint Review of Procurement and Contractual Arrangements in the United Kingdom Construction Industry was announced to the House of Commons on the 5th July 1993. The funding parties to the Review were the Department of the Environment (DOE), the Construction Industry Council (CIC), the Construction Industry Employers Council (CIEC), the National Specialist Contractors Council (NSCC) and the Specialist Engineering Contractors Group (SECG). Clients were represented on the review by the British Property Federation (BPF) and the Chartered Institute of Purchasing and Supply (CIPS). The Review which was chaired by Sir Michael Latham and is generally considered to have been of pivotal importance in terms of its strategic impact on the UK construction industry. Its terms of reference were to make recommendations regarding reform to reduce conflict and litigation in the construction industry, thereby improving its productivity and competitiveness. More specifically, the review would consider:

- current procurement and contractual arrangements: and
- current roles, responsibilities and performance of the participants, including the client.

with particular regard to:

- the processes by which client's requirements are established and presented;
- methods of procurement
- responsibility for the production, management and development of design;
- organisation and management of the construction processes;
- contractual issues and methods of dispute resolution; and

in doing so, to take into account:

- the structure of the industry
- the importance of fair and transparent competition;
- the desirability of a fair balance between the interests of, and the risks borne by, the client and the various parties involved in a project;
- the requirements of public accountability, value for money and European Community (EC) legislation as regards public sector contracts
- the importance of encouraging enterprise, the development of a skilled labour force and investment in improving quality and efficiency;
- current developments in law;
- relevant comparisons with the structure and performance of the construction industry in other countries;

An interim report 'Trust and Money' was published in December 1993 with the better known final report 'Constructing the Team' published in the following year (Latham 1994).

1994 The Latham Report entitled 'Constructing the Team' was launched in July 1994. As with many of his predecessors, Latham questioned whether any action would be taken to implement the proposals contained in the final report. In Latham's view if the UK construction industry did not seize the opportunities presented by this review the opportunity was unlikely to present itself again for several decades. Given the number of initiatives which have subsequently emerged as a consequence of 'Constructing the Team', it would appear that the government has, at least in part, heeded Latham's admonition.

The final report 'Constructing the Team' concluded that the industry's traditional methods of procurement and contract management created an adversarial culture which caused inefficiencies and ineffectiveness. Latham claimed that addressing these issues had the potential for saving 30% in construction costs over 5 years.

The key recommendations made in 'Constructing the Team' are as follows (NAO 2001):

- The Department of the Environment, Transport and the Regions to take lead responsibility for the sponsorship and regulation of the construction industry.
- Legislative changes to simplify dispute resolution.
- The establishment of a single organisation to bring together all sections of the industry and clients (this recommendation resulted in the establishment of the Construction Industry Board which was set up to implement, monitor and review the report and in the establishment of the Construction Clients Forum).
- The publication of a wide variety of guidance, checklists and best practice in various aspects of the procurement, design and construction processes (later implemented by the Construction Industry Board).
- The establishment of a single central public sector register of consultants and contractors (this recommendation resulted in the establishment of Constructionline – a central qualification database of contractors and consultants run as a public/private partnership).
- The need for more standardisation of and effective forms of contract, which addresses issues of clarity, fairness, roles and responsibilities, allocation of risks, dispute resolution and payment.

Latham made recommendations for possible delivery mechanisms to effect the main recommendations contained in his report. He also drew attention to the 'Australian Experience' in describing the functions of the Construction Industry Development Association (CIDA). He observed that 'It (CIDA) has put forward a number of Codes of Practice – including pre-qualification criteria- and has established Model Projects to trial and monitor new approaches. It regards itself as having largely completed the task of identifying and developing the management tools and cases necessary to make significant changes. The priority now is implementation, and the intention in the Mission Statement is that the change process will become self-sustaining and extend beyond the life of the Association.' (Latham 1994:109)

In terms of the implementation of 'Constructing the Team' Latham advocated a step-by–step approach as follows:

- A **Standing Strategic Group of the Construction Industry** should meet twice a year, chaired by the Secretary of State or another DOE minister. The membership should be drawn from the chairpersons of the Construction Industry Council (CIC); the Construction Industry Employers Council (CICE); and the Constructors Liaison Group (CLG). This group, in addition to addressing the Report, should be the principal Forum for bringing clients and industry together with Ministers to discuss matters of interest and importance relating to construction.
- An **Implementation Forum** should be set up, consisting of 1 or 2 Assessor representatives from each of the organisations on the Standing Strategic Group and the DOE, under a neutral chairperson. The Implementation Forum to advise the Standing Strategic Group on:
    - which of the Report's recommendations it believes can be implemented by existing agencies without any additional structures;
    - the timescale for drafting and introducing the Construction Strategy Code of Practice, the Construction Contracts Bill, the new arrangements for selection of consultants and the restructuring of contract conditions;
    - whether it favours the formal setting up of an Agency similar to that in Australia and, if so, under what format;
    - whether or not it favours the appointment of an Ombudsman, to examine allegations of poor practice and issue public comments upon them.

The central thrust of Latham's directives was similar to that of the Gyles Royal Commission (RCBI 1992) that the clients must use 'the power of the cheque book' to bring about industry reform, with the central responsibility for change resting with government clients. As a consequence of this approach the Construction Client's Forum was established as a powerful group claimed to be responsible for 80% of UK construction expenditure with the ability to lobby government departments.

It was only with the initiation of the Latham Report that the industry started to listen. It had a major impact in the sense that it was inclusive and slightly shocking (5 billion pounds being owed by contractors to suppliers and subcontractors at the time). For the first time, the whole industry began to realise that it need to reform. This was assisted by the report being produced when the climate for change was right for discussion about change. The construction economy had swung from high to low demand and where price competition was the only type of competition within the industry. Never the less, despite much discussion in the UK construction Industry press, it took a considerable amount of time for real reform to actually begin with surveys by the Construction Client's Forum (Survey of Client Satisfaction 1998/1999 and 1999/2000) showing no significant improvements in project performance since 1994.

1995 The Construction Industry Board was formed as a consequence of the Latham review to drive performance improvement through partnership between industry, Government and clients and to be a strategic forum for industry. The Board was established as a single organisation to represent all sectors of the construction industry, to monitor the implementation of the Latham report's recommendations.

1996 The Levene Efficiency Scrutiny into Construction Procurement by Government concluded that Government bodies were partly to blame for the poor performance of the industry and made recommendations to improve the structure and management of construction projects and the skill level of Government clients. The scrutiny made a number of recommendations including:

- Better communication within the construction industry to reduce conflict
- Adoption of a more commercial approach
- Negotiation of deals justified on value for money grounds
- Increased training of civil servants on procurement and risk management (NAO 2001)

1997 The Construction (Design and Management) Regulations (1994) came into force setting out a framework for addressing health and safety issues in the construction process. The regulations apply to every one in the construction supply chain – clients, architects, engineers, surveyors, designers and contractors.

The **Government Construction Client Panel** was established in 1997 by Treasury to improve Government client performance and to provide a single collective voice for Government construction clients on cross-departmental aspects of procurement. The Panel had a membership of 50 and an active core of 20 departments and was intended to ensure that all departments and agencies apply management approaches to become and remain best practice construction clients. The panel sought to do this by meeting regularly to exchange views on experience and good practice.

1998 On 1st May the most significant piece of legislation to hit the building industry became law. This was the Housing Grants, Construction and Regeneration Act 1996, better known as the Construction Act – a consequence of the industry's long-standing inability to regulate its own adversarial and unfair activities and improve its performance above all industry levels. The act was the legislative result of the Latham Report (1994). While most of the Latham report recommendations did not require legislation and were 'fleshed out' in the various working groups of the Construction Industry Board, legislation was considered necessary to redress the issue of conflict in the industry. To this end, the act introduced industry-wide adjudication – intended to be faster and cheaper than litigation and arbitration for resolving the large number of acrimonious and disruptive disputes which was damaging the industry's performance. In 1994, the building industry was still spending considerably more on litigation than on R&D. The act required all construction contracts to include provisions for adjudication and also

contained new rules to make payment fairer, including a ban of the use of iniquitous pay-when-paid clauses, except in exceptional circumstances. The act covered construction contracts between clients and contractors, contractors and subcontractors and extended to contracts between clients and their professional advisors. If contracts did not explicitly incorporate the act's provisions, then the Scheme for Construction contracts is invoked and the act's provisions implied.

In 1998 the Construction Client's Forum published a document entitled 'Constructing Improvement' which developed a 'pact' which lay down client expectations of the industry and what the industry was offering to do for its clients. Since 1998, the Construction Client's Forum has changed its name to the Confederation of Construction Clients and is emerging as a key driver of change in the industry. It has also developed the Client's Charter (described later in this discussion paper) and is at the core of the development of the Independent Client Advisor which was recommended by the Latham Report.

1998 was momentous not only for the introduction of the Construction Act but also for the establishment of the **Construction Task Force** headed by Sir John Egan to advise, from the client's perspective, on the opportunities to improve the efficiency and quality of delivery of construction, to reinforce the impetus for change and to make industry more responsive to customer needs. The specific terms of reference of the Construction Task Force were as follows:

- quantify the scope for improving construction efficiency and derive relevant quality and efficiency targets and performance measures which might be adopted by UK construction;
- examine current practice and the scope for improving it by innovation in products and processes;
- identify specific actions and good practice which would help achieve more efficient construction in terms of quality and customer satisfaction, timeliness in delivery and value for money;
- identify projects to help demonstrate the improvements that can be achieved through the application of best practice.

The Task Force produced the report 'Rethinking Construction' which emphasised the need for a change of 'style, culture and process'. Five drivers of change were identified:

- Committed leadership.
- Focus on the customer.
- Integration of process and team around the project.
- A quality driven agenda.
- Commitment to people.

Four key processes needed to be improved:

- Partnering the supply chain viz. developing long term relationships based on continuous improvement with a supply chain
- Components and parts viz. developing a sustained program of improvement for the production and delivery of components
- Focus on end products viz. integrating and focusing on the construction process on meeting the needs of the end user
- Construction Process viz. the elimination of waste

The report set seven annual (achievable) targets in construction project performance:

- Reduce capital costs by 10%
- Reduce construction time by 10%
- Reduce defects by 20%
- Reduce accidents by 20%
- Increase predictability of projected cost and time estimates by 10%
- Increase productivity by 10%
- Increase turnover and profits by 10%

There are a number of streams of activity within the Rethinking Construction initiative. These are:

- The **Movement for Innovation (M^4I)** which focuses on the general construction industry,
- The **Housing Forum** – which concentrates on the public and private housing sector,
- The **Local Government Task Force** – which is promoting the Rethinking Construction agenda within local authorities as major clients,
- The **Respect for People Steering Group** – which is currently trialling a series of toolkits to help improve recruitment, retention and health and safety.
- The **Construction Best Practice Programme (CBPP)** – which is the main dissemination arm for Rethinking Construction.

The two streams which are of primary interest to this report are M^4I and CBPP.

The intention of the Movement for Innovation was to bring together and facilitate the exchange of knowledge between those in industry and its clients who are committed to the principles of 'Rethinking Construction'. Contractors and clients were encouraged to put forward examples of good construction practice known as Demonstration Projects focusing in particular on ways of improving Egan targets. (NAO 2001). Currently the Movement for Innovation takes the lead in promoting Rethinking Construction among the non-housing sectors of the UK Construction Industry and related trade and professional organisations. The Board of Management is responsible for the performance

and learning outputs and Demonstration Projects, which in turn has led the development of the Key Performance Indicators for the industry. The M^4I is partly financed by Supporters and Members as well as the Department of Trade and Industry (DTI). It is developing the regional network for Rethinking Construction, through its **Demonstration Projects Cluster Programme** and is promoting Rethinking Construction events such as jointly supporting a series of seminars on Lean Construction (RCL 2002).

The **Construction Best Practice Program** is funded by the Department of the Environment, Transport and the Regions. The purpose is to raise awareness of best practice and to equip construction companies and clients with the knowledge and skills to implement change. The program is intended to reinforce the need for change. Its services include a help desk which companies can contact, a Web site. (www.itcbp.org.uk) to disseminate good practice, and a company visit scheme. As it currently operates the Construction Best Practice Programme (CBPP) is an integral part of the Rethinking Construction initiative. A recent survey showed that more than 90% of users acknowledged that the programme has brought financial benefits to their company. The main drive has been to improve the business management of construction through the delivery of services to the sector and the dissemination of best practice information. The CBPP plays a specific role in continuous business improvement, providing opportunities for individuals, business teams, entire companies and supply teams to engage in best practice. More than this, the CBPP is about raising awareness, gaining commitment and facilitating the sharing of knowledge. Its 1500 publications include case studies, profiles, guides, and more than 150 director's briefings and information on the learning by doing workshops. The CBPP has the recently established a team of 40 best practice advisers. More than 250,000 user sessions recorded on the CBPP Website show that the industry has adopted the Programme as a key method for learning. CBPP also aims to support companies in the construction sector make better use of information technology. IT Construction Best Practice brings together expertise and guidance on the effective use of IT throughout the construction industry. Companies that register with ITCBP receive guidance material, much of it free of charge, including case studies, guides, reports and other material, as well as updates on events and industry news (RCL 2002).

The **Building Down Barriers** project was launched in 1998 by Defence Estates to assess and demonstrate the benefits of supply chain integration. In Building Down Barriers, Defence Estates and their Prime Contractors (Laing and AMEC) adopted a different approach to the design of two physical and recreational centres by organising their project on the basis of 'supply clusters' centred around aspects of the work such as mechanical and electrical services. This approach required that all those involved in a supply cluster participate in design development and engage in extensive consultation with end users. This would appear to be the first attempt in the UK construction industry to emulating the successes that industries such as car manufacturing had achieved in the conscious adoption of supply chain management.

A public/private partnership **'Constructionline'** was also launched in 1998 to provide a qualification service where contractors and consultants were assessed against financial, technical and managerial criteria set by the Department of the Environment, Transport and the Regions (who provided project funding). Organisations which satisfy the criteria are placed on a recommended list which public sector clients can access. The underlying principle is to reduce the process costs of selecting suppliers for both clients and industry. It is recognised that tensions still have to be resolved between the demands of clients who tend to ask for an increasing variety of detailed information, and more rigorous independent assessment, and suppliers who are concerned that the detail required should not become too burdensome.

In addition to the above initiatives the Government Construction Clients Panel commissioned a report on **'Constructing the Best Government Client'** which compared Government performance with best practice in the UK and abroad.

1999 The Government Construction Clients Panel commissioned the **Achieving Excellence Program** which set goals and an action plan for implementing 'Rethinking Construction' targets in Government. The main function of the program is to improve the performance of Government departments, agencies and non-departmental bodies as purchasers of construction service to create a market force, which will require the industry to improve its performance. Key elements of the program include an Action Plan which makes clear the processes that Government clients should implement, including the use of risk management, output/performance based specifications, life costing, performance indicators, post project implementation reviews, team working and partnering principles. (NAO 2001)

1999 The Commission for Architecture and the Built Environment set up by the Department of Culture, Media and Sport to promote high-quality design and architecture and to raise the standard of the built environment generally.

A major government funded research report entitled 'The performance of the UK Construction Industry: An international Perspective' was published by Edkins and Winch (1999). This was funded by the Engineer and Physical Sciences Research Council's 'Construction as a Manufacturing Process' research programme, out of continuing concern for the relative performance of the construction industry compared to the manufacturing sector and other countries. The research concluded that there was no evidence that UK buildings were relatively expensive compared to other countries. It was found that relative prices were linked strongly to economic conditions. For example, when the Latham Report was initiated, costs were relatively high due to a building boom and a strong pound. However, when the Latham Report was published, costs were relatively low due to a recession and weak pound.

The report also concluded that the UK was home to many world-class firms but these were largely focussed on design and construction management rather than the effective management of on-site processes. Furthermore, there did seem to be a tendency towards higher quality specification in the

UK, compared to other countries, although it was not clear if this was due to over-engineering or demanding clients. It was also found that labour productivity was relatively low in the UK, due to a design culture that favoured bespoke solutions and a reluctance to standardise specifications. Finally, the effectiveness of site organisation in the UK was found to be low due to a reliance on a craft organisation of work, low levels of training and a lack of investment in modern technology. In the UK, the emphasis had been more on flexibility rather than productivity.

2000 A major initiative, the **Local Government Task Force (LGTF)** was launched to promote the principles of 'Rethinking Construction' in local authorities. Councils, as one of the biggest construction clients in the country, were seen as vital links in achieving the improvement targets required by Rethinking Construction. By focusing on the whole-life costs of a project, rather than cheapest initial tender costs, local authorities were exhorted to meet their 'best value' obligations, and to deliver high quality services to the people they served. The LGTF currently publishes advice and guidance to local authority practitioners, designed to maximise their efficiency and effectiveness. By avoiding waste, duplication and dispute, the community's interests should be served better. Working closely with the Movement for Innovation and the Housing Forum, the LGTF focuses attention on Demonstration Projects, and the improvements that these bring to the construction process. The LGTF has close links with other organisations that represent local authorities, such as the Local Government Association, Improvement and Development Agency (IDEA), Chartered Institute of Public Finance Accountants (CIPFA), and the Department of Transport, Local Government and the Regions (DTLR) (LGTF 2001).

Also in 2000 the Construction Industry Board (CIB) reviewed its role and responsibilities resulting in a change of remit to develop policies that would lead to improvements in the performance of construction firms, notably in the quality and skills of the construction work force, the efficiency and profitability of firms, the quality of their construction and in the value for money which client receive. From 2000 onwards the Board worked with and through the following organisations:

- Construction Research and Innovation Strategy Panel (identifying best practice -a joint industry and Government panel which seeks to improve the industry's competitiveness through research and development by identifying priorities and informing those who fund research.)
- Movement for innovation (demonstrating and testing new practice)
- Construction Best Practice Program (disseminating proven best practice) (NAO 2001)

The Confederation of Construction Clients was formally launched in December 2000, comprising the entire membership of the Construction Clients Forum with the support of the Construction Round Table with the following mission statement:

The Confederation of Construction Clients represents the interests of construction clients collectively by:

- encouraging clients to achieve value for money through best practice
- securing major measurable and consistent improvement in performance across the industry
- promoting policies aimed at achieving a safe, stable and skilled industry which is competitive and competent.

A further example of the increased pressure being applied by Government clients to achieve best practice can be seen in the January 2000 report by the KPI Working Group (KPIWG 2000) to the Minister of Construction identifying seven main key performance groups viz:

- Time
- Cost
- Quality
- Client satisfaction
- Client changes
- Business performance
- Health and safety

The purpose of the KPIs is to enable measurement of project and organisational performance throughout the construction industry. This information can then be used for benchmarking purposes, and will be a key component of any organisation's move towards achieving best practice. For example, clients can assess the suitability of potential suppliers for a project, by asking them to provide information about how they perform against a range of indicators. Some information will also be available through the industry's benchmarking initiatives, so clients can see how potential suppliers compare with the rest of the industry in a number of different areas. Construction supply chain companies will also be able to benchmark their performance to enable them to identify strengths and weaknesses, and assess their ability to improve over time. While individual organisations have been measuring their performance for many years, there had been little consistency in the data, and in the way it had been published. This report claimed to be another step in rectifying this deficiency, which builds on the foundation of the Construction Industry KPIs by detailing a comprehensive framework for measurement.

The Department of the Environment, Transport and the Regions, the Construction Industry Board, and the Movement for Innovation will, through the Construction Best Practice Programme, continue to publish annual wall charts for the headline KPIs. Where available, operational and diagnostic data will also be published. However, the primary application of this information is for individual firms or benchmarking clubs to adopt a common framework as the basis for understanding, in more depth, their relative performance against

the headline KPIs, confident that others will be using the same common definitions.

In 2000, the Government Construction Client Panel published **'Achieving Sustainability in Construction Procurement'** setting out an action plan to promote sustainable construction. This aims to reduce waste in construction, reduce pollution and bring about better environmental management and improved health and safety (SAG 2000).

2001 The **Strategic Forum for Construction**, chaired by Sir John Egan was established and tasked to accelerate change and maintain the momentum of the original Egan task force.

2002 The **Strategic Forum for Construction** published 'Rethinking Construction – Accelerating Change' (SFC 2002). This is an important document which is intended to encourage the UK construction industry to continue to aspire to the targets set in 'Constructing the Team'. The ever-present theme of the need for client leadership is reinforced. The key measures to accelerate change are as follows:

1) Vision: The vision is for the UK construction industry to be consistently world class in delivering products and services that maximise value for clients and end users, and exceed expectations.

2) Strategic Directions: To accelerate change, the Strategic Forum has identified three main drivers to secure a culture of continuous improvement:

- The need for client leadership
- The need for integrated teams
- The need to address 'people issues', especially health and safety.

3) Supporting Client Leadership: Clients should take the lead when procuring construction services through an integrated team on the basis of value and quality, not lowest initial cost. To support this, the following should be tackled:

- The need for independent, expert advice for clients has been identified as being vital to providing wider solutions to clients' needs.
- Clients should lead and actively participate in the creation of integrated teams.
- Clients should create an environment throughout all stages of the project which delivers excellence in Health and Safety performance.
- Representing 40% of construction orders, the public sector can make a substantial difference to the widespread adoption of Rethinking Construction principles.
- Clients, specifically small and occasional clients, should have access to relevant, simple, guidance on practical steps to take when considering commissioning a construction project.
- Process maps and an 'awareness raising' pamphlet should be developed for use by clients even before they get to the point of

deciding that they need to undertake a construction project to meet their needs.

- A code of practice, model form of appointment and code of conduct should be developed to help clarify the level of service to be expected from independent client advisors.
- Clients must work to help deliver an integrated team, including clients and suppliers, to maximise value for money. Actions need to be backed up by leadership if integrated teams are to become the 'norm' rather than the exception. To support this, the following should be acted on:

    - The creation of value should be a focussed objective of integrated teams, which include the client.
    - A 'Toolkit' should be developed to help clients assemble integrated teams and mobilise their value streams.
    - The Construction (Design and Management) Regulations 1994 (CDM 1994), and accompanying Approved Code of Practice, are powerful tools to encourage the early appointment of the 'delivery team'.
    - All firms and their workforce within integrated teams should be qualified and competent.
    - Project insurance products should be made available to underwrite the whole team.
    - There should be greater focus on logistics to facilitate integrated working and the elimination of waste.
    - Payment practices should be reformed to facilitate and enhance collaborative working.

4) Supporting Culture Change in 'People Issues':

Leadership in 'people issues' must drive the cultural change that can allow integrated teams to deliver their best. To support this, the following should be acted on:

- There are simply too many competing initiatives seeking to make construction an attractive industry in which to work. These should be focussed down to those which produce the greatest impact in the shortest possible time.
- The Forum supports existing work to develop an occupational health scheme for construction and action should be taken as soon as possible to implement such a scheme.
- The industry needs to offer pay and conditions that make it an attractive industry to work in.
- The industry needs to spend more time with young people and schools drawing attention to the very best that construction can offer as a career. It should encourage recent graduates to undertake 'ambassadorial' work for the industry as 'Young Presenters'.
- A more concerted initiative should be developed to encourage 'Investors in People' (IiP) in construction.
- The industry wants to be confident that the people who work for it have health and safety knowledge and are qualified and competent.

- A simple sign posting guidance booklet on 'people issues' initiatives, aimed specifically at SMEs should be published to help focus on achieving change.
- A Code of Good Working Practices should be produced, which could be adopted by contractors, trade unions and clients.
- Further work should be undertaken to explore options for aligning Constructionline and Quality Mark more closely.
- The Forum welcomes the various initiatives - and especially the Quality Mark scheme (www.qualitymark.org.uk) - to try and stamp out the construction informal economy, which has no part to play in today's construction industry.

5) Cross-Cutting Issues:
Underpinning the leadership actions that need to be taken if the construction industry is to be transformed are a number of cross-cutting issues that can support and encourage change. To support this, the following should be acted on:

- Design Quality – the use of design quality indicators can help improve design and add value to the process.
- IT and the Internet – has the potential to transform many construction operations.
- R&D and Innovation – in line with the recommendations made by Sir John Fairclough in his recent report, Rethinking Construction Innovation and Research (Fairclough 2002), to drive continuous improvement within a strategic context.
- Sustainability – improving environmental and whole life performance can also help drive out waste, and improve construction processes.
- Planning – the planning system can add considerable cost and time to construction projects if the decision-making process is not transparent, timely and consistent.
- Mechanisms and systems such as Design Quality Indicators (DQIs), Key Performance Indicators (KPIs) and Environmental Performance Indicators (EPIs) already exist to monitor and measure progress in accelerating change. In addition, a database of the recommendations and targets contained in this report should be developed and regularly reviewed.

2001 Built Environment and Transport Panel Construction Association Programme published **'Constructing the Future'** (FCAPP 2001) a report mapping out future directions for the UK construction industry in the 21st century. The report mapped out nine key areas as follows:

1) Promote 'smart' buildings and infrastructure
Accelerate the introduction of new technologies, 'intelligent' products, standardised, pre-assembled components and advanced materials into every level of the built environment. This will create new business opportunities, improve living / working environments and enable information feedback to improve construction quality.

The following issues were identified:

- There is no shortage of technology, but the industry needs a greater will, more performance data, increased investment and a receptive environment to apply it.
- A concerted effort is required to effect rapid technology transfer from research into practical application.
- There is no shortage of good examples of technology in use. Many applications already exist in other industries, and these can be looked to for ideas.
- Use of appropriate technology has to demonstrate that it can improve profitability.
- Key applications will be the use of sensors and 'smart' robotics in construction and in adding 'intelligence' to components and materials so they can all communicate.
- Greater mechanisation, automation and off-site assembly with machine tools will significantly reduce construction costs.
- New opportunities in construction innovation lie in converging technologies.
- Third generation (3G) wireless technology will lead to less hard wiring and greater demand for in-built fibre optic connectivity.
- Biomimetics and nanotechnology concepts will enable us to challenge our conventional understanding of construction materials.
- Integration of computing into the built environment instead of it being restricted to the desktop or laptop computer will provide opportunities for greater information gathering as part of the construction life-cycle process.

2) Improve health and safety

Enhance safety awareness and thinking throughout the construction process - design, manufacturing, build, operations and maintenance. Ensure better safety training, health monitoring and near-miss reporting, and introduce safety-driven construction automation. This will save lives, minimise health problems and improve productivity.

The following issues were identified:

- Sixty percent of fatal construction site accidents can be attributed to decisions made before site work begins.
- Increasing client awareness of the risks means that company safety records could become a factor in awarding contracts.
- Products and process are changing, meaning safety is also a changing issue.
- Increased multi-skilling of people and new construction techniques will require ongoing safety training.
- Safety issues can be integrated into technology-enabled design to minimize accidents on site.
- Growing use of site simulation could help assess safety risks.

- Health monitoring technology is becoming more transportable and easier to use.
- Off-site manufacturing implies stringent factory safety practices, whilst pre-fabricated assembly may significantly reduce on-site activity.
- Criminal liability is becoming an increasing issue.

3) Enable supply chain integration

Advance technology-driven thinking and practice across design, production, build, operations and maintenance. Integrating web-enabled supply chain processes and communication standards will cut construction costs and promote seamless customer solutions throughout the construction lifecycle. The following issues were identified:

- E-business is here to stay and the 'open' availability of essential information and data is important to facilitate on-line customer decision-making.
- Technology can bridge the traditional gap between design and production.
- Joined-up manufacturers, suppliers and off-site production can lead to greater resources for research and development into new products and processes.
- Industry standard models may enable automated information sharing across the entire value chain -from products to projects.
- It is essential for the UK construction industry to play an active part in setting the world standards that everyone will eventually need to use.
- Specialist contractors, suppliers, contractors and the design team will use web-based project portals to manage the project and its associated information.
- For an industry susceptible to adversarial approaches, the issue of trust in the supply chain will be critical.
- Greater operating effectiveness and supply-chain efficiency needs new skills and talent that must be attracted through better prospects and changed perceptions.

4) Invest in people

Improve the learning and welfare of people in the industry. Define future people skills and integrate education, knowledge and learning throughout the construction process - design, production, building, operations and maintenance. Investing in lifelong learning, knowledge management and the welfare of people, will enhance industry standards, improve profitability and attract better people to the industry. The following issues were identified:

- People availability. With a reduction in population growth there is a danger of a shortage in people availability for the future.
- With an ageing population re-skilling is become an issue.
- Lifelong learning requires investment and commitment by employees and companies, as well as the industry and Government.
- An accreditation scheme for workers could acknowledge health and safety awareness and skills and knowledge capability.

- Web-based platforms are already facilitating knowledge management.
- Establishing vertical and horizontal skills alliances within and across different disciplines in construction industry education and training could foster increased collaboration and innovation for the future.
- A consequence of the industry having many small individual businesses is insufficient critical mass and motivation leading to a lack of investment in training and research and development.
- There is an imbalance of ethnic and female representation in the industry, which may be due to the perceived image of the industry.
- A company's people are its most valuable asset, yet the assets of human knowledge are not valued on the balance sheet. These may be included in take-over valuations and reflected in share prices, but are mostly undervalued.
- Improve the image of the industry and thereby invest in the quality of the people entering it.

5) Improve existing built facilities

Improve renovation and repair methods and practices. Ensure Research and Development (R&D) looks specifically at technologies and components for repair and refurbishment. Better refurbishment 'processes' and improved standards for their supply will enhance living conditions and add value to existing built facilities. The following issues were identified:

- Sensors and remote monitoring technology could facilitate widespread data collection and management.
- Changing business practices will impact upon the built environment as demand flexibility and the latest technology increases.
- The rapid pace of change in Information and Communication Technologies (ICT) will impact upon existing stock, with huge increases in communication infrastructure being required.
- Much repair and maintenance work is carried out by small to medium-sized companies, which leads to fragmentation and slower take-up of new ideas.
- The criteria for and standards of quality need to be improved and maintained.
- There is a need for public and private sector champions to set the R&D agenda so that repair and refurbishment is not seen as a poor relation to new-build.

6) Exploit global competitiveness

Recognise the impact of globalisation and exploit flexible, collaborative, business frameworks and information sharing. Helping all construction businesses, from research and design to manufacturing and supply, to cope with globalisation and to harness the technology required to manage it, will improve business co-operation and create competitive advantage. The following issues were identified:

- Globalisation is impacting on everything to the extent that Europe must now be considered a domestic market

- Design on its own can be undertaken by anyone from anywhere in the world Using the Internet, project platforms can be managed from and via any location
- ICT can already provide the tools for data management and knowledge sharing
- Web based systems can provide a platform to enable vertical and horizontal integration of construction processes within the value chain
- Intellectual property may become an issue due to the accessibility of information on the world wide web
- Increasing familiarity with SPVs (Special Purpose Vehicles) will allow the legal issues of collaboration to be safeguarded
- Wider information availability and data standardisation communicated electronically will diminish misunderstanding
- ICT-driven systems and knowledge sharing will need new skills and increase the intellect needed for competitive advantage

7) Embrace sustainability

Sustainable construction and whole-life principles will increasingly be client-driven. By shifting its culture to embrace sustainable thinking at every level, the industry can save energy, reduce waste and pollution and cut the lifetime costs of property ownership. The following issues were identified:

- Learn about the technologies that other industries are using for sustainability.
- There is mounting evidence from other sectors to support the view that it is possible to look at projects holistically and throughout their lifecycle.
- People's awareness of the importance of sustainability and thinking across the whole life of facilities will grow at an increasing pace.
- National and international governments are likely to increase their emphasis on 'the polluter pays' policies. They may legislate sustainability to save the planet.
- The rising cost of energy will be the catalyst for the discovery of new forms of renewable energy.
- As more and more clients embrace sustainability so might the financial institutions respond with new forms of construction funding that match whole-life thinking.

8) Increase Investments Returns

Seek innovative methods of demonstrating the value of built assets and lessening project risk. By better understanding 'risk and reward' principles, the industry will increase profitability, improve the way it is perceived and valued, and encourage new types of funding and investment. The following issues were identified:

- The move from public to private is happening all over the world and requires a change in investment culture.
- Changing the perception of the industry has to embrace all of society, from primary school to the elderly.

- New ways need to be found to express the 'value' of construction technology in financial and intellectual terms.
- Institutional funders are risk averse and are not always conducive to innovation and invention.
- Greater transparency is required by investors.
- Standardisation of construction processes and components would increase margins and reduce the risk of re-work being required.
- Improving industry communication is needed not only within the sector but in promoting its attributes to wider audiences as well.

9) Plan ahead
Anticipate and plan for change. Greater awareness of the cyclical nature of construction economics, better long-term strategic thinking, future forecasting and co-ordinated planning will enable the industry to better meet future customer needs, remain competitive and improve its contribution to the UK economy. The following issues were identified:

- Overseas firms will acquire and collaborate on projects in the UK. They will influence the UK system, introducing changes to design and construction processes and new ways of working, with different management and site skills.
- The small amounts of working capital required and low (academic and statutory) barriers to entry currently result in many smaller firms being unprepared for and unable to cope with shifting economic cycles.
- Industry standard forecasting would enable co-operative planning of product and service demand across the entire supply chain.
- Integrating construction processes and applying new technology will result in better information feedback and enable faster reactions.
- Specific UK foresight programmes targeted at individual construction industry sub-sectors could help many firms to forecast, prepare for and better manage economic crisis.
- Forecasting involving the client base could result in better supply-side product and service alignment, longer-term alliances and more framework agreements.
- Multinational companies, trading across international boundaries, are increasingly undertaking the role of supplying components and materials.

2002 As a clear indication of the UK's commitment to continuous industry reform, Rethinking Construction 2002 Ltd was given a further 2 years funding to continue its four key strategic objectives listed below. This is to be underpinned by the programme of dissemination, support and advice provided by the Construction Best Practice Programme.

1. **Proving and selling the business case for change** – through effective monitoring and evaluation of demonstration projects and organisations, and the collection of KPIs. This will deliver clear evidence to the industry that continuous business improvement is achieved by following the principles and targets of Rethinking

Construction. Particular emphasis will be placed on clients, integrated supply teams and respect for people issues.

2. **Engage clients in driving change** – To encourage clients to promote Rethinking Construction though involvement in demonstration projects and commitment to the Clients' Charter.
3. **Involve all aspects of the industry** – To ensure that every sector of the industry is represented by active demonstration of the Rethinking Construction principles.
4. **Create a self-sustaining framework for change** – To ensure that the industry takes responsibility for developing and maintaining improvement, nationally and regionally.

4. Case Study – Building and Construction Industry Reform in Singapore

Background

The output of the building construction industry in Singapore has grown 30 fold since 1965, when Singapore gained independence. During this time, the Singaporean Government has taken a highly interventionist approach to economic development, using investment incentives, technology transfer requirements and labour market regulation to move the economy up the technology ladder. The encouragement of technologies, which reduce dependence on labour intensive processes and strategies, has been essential for Singapore due to its relatively small human resource base (Ofori 1994). Employers within and outside the construction industry have been encouraged to continuously upgrade their technological capabilities and to automate their operations in the realisation that they will not be able to compete with firms from developing countries such as China, which have cheap and abundant labour.

The Singaporean Building and Construction Industry

The Singaporean construction industry has had an average annual output of S$17 billion over the last five years and has contributed about 7% to Singapore's GDP, although this has gradually reduced, year on year, from 9.1% in 1998 (BCA/REDAS 2002). Since the mid 1980s, the growth rate of the industry has averaged about 7% per year, although in recent years, the Asian Economic Crisis has had a major impact upon output and investment. For example, construction demand has fallen from a high of S$24.4 billion in 1997 to S$12.3 billion in 2001 and output has shrunk from S$19.2 billion to S$15.2 billion over the same period (BCA/REDAS 2002). Exports of construction services have also fallen dramatically, from a high of S$1,595 million in 1992 to S$326 million in 2000.

The Singaporean building and construction industry is relatively small in international terms and employs about 200,000 skilled and unskilled site workers and about 35,000 professionals and technical personnel (Debrah and Ofori 2001). The largest firm in the industry has an annual turnover of about S$450 million. The procedures and practices adopted by the industry are based heavily on those prevailing in the UK and, like Australia, the most widely used system of procurement is the traditional system, which is characterised by a separation of design and construction teams. However, the Singaporean construction industry has been adept at adopting different procurement processes and advanced technologies to drive up productivity, especially from countries such as Japan, USA, Finland, Germany and France (Ofori 1994). This has led to the growing use of alternative procurement systems such as design and build and project management. A key distinguishing feature of the Singapore Construction Industry is its heavy reliance on an entrenched labour-only subcontracting system, which has a heavy dependence on foreign construction workers (Debrah and Ofori 2001). A 1999 survey of the construction industry found that 85% of enterprises in

the industry had paid up capital of less than S$250,000 (CIDB 1999). This structure has, for some time, been widely linked to the industry's labour shortage problems, low productivity and quality problems (Debrah and Ofori 2001). Currently, the main problems facing the Singaporean building and construction industry are related to falling productivity, excessive reliance on foreign construction workers and foreign competition, particularly from Japan, Korea and more recently, China. It also continues to face the perennial problem of acute labour shortages owing to the poor image and relatively low pay associated with the industry. These issues will be discussed in more detail below.

Reform in the Singaporean Building and Construction Industry

To drive reform in the building and construction industry, the government established a Statutory Board called the Construction Industry Development Board (CIDB) in March 1984. The role of the CIDB, which became the Building and Construction Authority (BCA) in 1998, was to oversee the upgrading of the construction industry in Singapore by creating a framework to increase its efficiency, productivity and professionalism. It has done this by seeking to attract high calibre people to the industry, training initiatives, grading construction firms, raising and measuring quality standards and improving the business environment to reduce risk and to attract greater external investment.

Essentially, the history of the CIDB is the history of building and construction industry reform in Singapore, although occasional studies by the International Labour Organisation (ILO) and prominent researchers have occasionally had some impact. Compared to Australia, which has a much larger, politically fragmented and geographically dispersed building and construction industry, the governance structure in Singapore is far more centralised, simple and clear. This has avoided the problems of demarcation and conflicting agendas which appear to have impeded reform in the Australian Building and Construction Industry. It has also ensured a peaceful industrial relations environment and a far greater sense of momentum towards reform than has existed in Australia. Since its formation, the CIDB and BCA have introduced a number of key initiatives to improve productivity and efficiency in the industry and the remainder of this paper discusses these chronologically, including some key statistics about the health of the sector.

A Brief History of Building and Construction Industry Reform in Singapore

1984 *The volume of construction activity declined from S$10.3 billion in 1983 to S$7.7 billion in 1984, the public sector accounting for more than 80% of construction projects. The previous ten years had seen construction volume growing continuously. The construction industry's productivity growth rate fell from 9.8% per annum in 1983 to 9.1% per annum in 1984 (in 1981 it was 1% per annum). This was less than other sectors, which saw an increase in productivity growth from 5% per annum in 1983 to 6.5% per annum in 1984. Real productivity levels also remained relatively low in construction compared to other sectors (CIDB 1995).*

1984 was characterised by the following major events:

Formation of CIDB in March 1984 by Act of Parliament. The role of this new statutory body was to promote the development and improvement of the building and construction industry, particularly in productivity, costs competitiveness and quality of work. The emphasis of the CIDB in 1984 was on improving skill levels within the industry and providing assistance for export activities.

The launch of **Centralised Contractor Registration System** provided a uniform basis for rating and classifying construction companies. All contractors tendering for public sector work registered with CIDB and were graded G1 to G7 based on their financial capability, track record and technical expertise to undertake certain jobs. Higher-grade contractors could tender for larger and more complex projects. The registry also sought to encourage the upgrading of technical expertise and quality standards by requiring re-registration and inspection every two years. Firms could be upgraded or downgraded accordingly. The registry also became used by the private sector in developing lists of reliable contractors.

Opening of **Construction Industry Training Centre (CITC)**, a centre offering formalised training for a wide range of construction trades. The aim of the CITC was to upgrade skills levels within the building and construction industry and to instil a sense of quality and productivity consciousness amongst the workforce. It would do this by a multi-faceted approach, which included: full-time training for new entrants; establishing skill standards and certifying the skill levels of workers to enable them to get proper rewards for their skills; coaching existing skilled workers to continuously upgrade their skills; and providing contractors, site engineers and foreman with the skills to train their workers. In its first year, the CITC introduced the National Construction Trade Test Programme to certify construction tradesmen's skills. This has continued to be an important initiative and by 1999, 104,447 workers per year were being skills tested, 63,023 per year were being certified as skilled, 11,006 per year were undergoing skills training and 3,427 per year were being trained in supervisory and management skills. Skills tests are now conducted in 21 different trades.

1985 *The volume of construction activity declined further, from S$7.7 billion in 1994 to S$4.5billion in 1985, the public sector accounting for more than 80% of construction projects. The construction industry's productivity increased, rising 11.8% during the year, compared to 9.1% in 1984. This was in contrast to the other sectors, which saw a reduction in productivity growth from 6.5% in 1984 to 4.5% per annum in 1985. Real productivity levels in construction remained relatively low in comparison to other sectors (CIDB 1986).*

1985 was characterised by the following events:

CIDB Awards for Construction Excellence were introduced to recognise projects and construction firms, which demonstrated high standards of workmanship, management and technical capability.

Launch of **Investment Allowance Scheme** to provide subsidies to contractors to help improve productivity and competitiveness through mechanisation. Provides a tax allowance of 50% of investment expenditure. The volume of investment under this scheme in 1985 was S$12.6 million.

Launch of **Preferential Margin Scheme** which provided a 5% margin advantage for firms who formed joint ventures with overseas contractors to tender for public projects.

1986 *The volume of construction activity declined further with S$3.9 billion contracts being awarded compared to S$4.5 billion in 1985. The public sector accounted for more than 90% of construction projects. Labour productivity growth fell from 11.8% in 1985 to 0.7%, emphasising the link between productivity levels and market conditions. Singapore construction firms secured an 84% increase in overseas contracts compared to 1985 (CIDB 1987).*

1986 was characterised by the following events:

Attachment of Public Professionals for the Export of Construction Services scheme (APPECS) is launched. This scheme enables firms to request the secondment of specialists from the public sector to provide advice and undertake assignments relating to construction exports.

Government develops first of many mutual recognition arrangements with target countries to enhance exports.

A long-term R&D strategy was formulated for the construction industry to improve the development and uptake of innovative products and processes.

Launch of **Maintenance Cost Feedback (MCF)** service which assisted property owners to control their maintenance costs. At the same time, the CIDB registration scheme was extended to maintenance contractors.

National Skills Competition launched to encourage the pursuit of excellence in construction skills and to recognise and reward skilled workers. These awards were intended to serve as an additional incentive for contractors to upgrade their project management and organisation capabilities, standards of workmanship and technical capabilities.

A **Steering Committee on Modular Coordination** completed a major report, which called for a three-phased program to increase the use of modular coordination in design, as a means of increasing productivity and cost efficiency in the building and construction industry. Six pilot projects were conducted in the public and private sector to demonstrate the productivity and efficiency benefits of this approach to design.

1987 *The overall volume of construction work increased 3.6% to S$4.04 billion. The volume of private sector contracts soared 300% from 1986 and exceeded public sector contracts. The private sector became the principle*

force sustaining the building and construction industry. Productivity levels increased dramatically but real productivity levels remained below the all-industry average (CIDB 1988).

1987 was characterised by the following events:

CIDB began to formulate proposals to raise the standards expected of registered construction firms in the top grades. Particular emphasis is placed on more stringent capitalisation and technical resource capabilities. Registered firms now had to renew registration annually to permit performance to be reviewed more regularly. **Creation of G8 Contractors**, a new top grade of 'unlimited class' contractors. A basic entry grade was also introduced to enable small firms and new entrepreneurs to tender for small public projects without any previous track record. Firms that accumulated sufficient experience and expertise, could eventually apply for upgrading.

A major manpower policy study completed on the industry's educational profile, concluded that:

- 75% of managerial personal in construction firms were trained at university level.
- 91% of managerial personal in consulting firms were trained at university level.
- 35% of supervisors had received formal training or instruction.
- 6% of tradesman had received formal training or instruction.

To upgrade skill and educational levels in the industry, a **National Certificate in Construction Supervision (NCCS)** was introduced and stipulated as a minimum standard of competence for all Clerks of Works by 1991. This was a flexible training program. The NCCS was introduced to raise the standard of construction supervision and enable experienced site supervisors to obtain formal qualifications recognised by the Building Control Act. It was jointly delivered by Singapore Polytechnic, the CIDB and the Singapore Contractors Association. The trade certification system was also extended to a broader range of trades.

A major study of safety in the building and construction industry was initiated between the CIDB and the Singapore Contractor's Association. This resulted in a national program of site safety instruction campaigns. Since 1983, recorded construction accident severity rates had dropped approximately 40% to just under 800 man days lost per one million man hours worked, and frequency rates had dropped 25%, to just under 5 per one million man-hours worked. These recorded rates were second only to Japan.

1988 *In 1988, total construction demand fell from S$ 4.04 billion in 1987 to S$3.02 billion, the private sector continuing to be the main source of construction demand (54.6%). Construction export orders continued to rise by 53% from the previous year (CIDB 1989).*

1988 was characterised by the following events:

The **Construction Quality Assessment System (CONQUAS)** was launched which was an objective system for assessing the quality of work produced by contractors. It was a voluntary market-driven initiative, which enabled firms to ask for CONQUAS assessment and to thereby charge a higher price for projects with high CONQUAS scores. CONQUAS scoring was mandatory in the public sector and was offered to the private sector.

Launch of **Zero Defects Campaign** by Minister for National Development and supported by major government bodies, Statutory Boards, private firms and tertiary institutions. This marked the start of a new drive for better quality, undertaken as a joint effort between major government agencies, professional institutions and trade associations. This campaign involved a week of events with a construction quality focus including an exhibition on construction quality for the public, workshops for managers and professionals, round table discussions, the presentation of the CIDB Awards for Construction Excellence and a formal graduation ceremony of qualified construction supervisors.

A **Joint Industry Training Scheme (JITS)** was introduced in collaboration with trade associations, to encourage construction companies to be more active in upgrading the skills of their workers and to pool resources and train workers in a collaborative way. This was a concerted effort to cultivate a culture of training in the industry - which only accounted for 1% of training places subsided by the governments skills development fund, yet accounted for 7% of the total Singaporean workforce. The focus of this training initiative was to be on skills that allow workers to achieve high quality and productivity. Under this scheme, participating companies could develop their own training programs and on-the-job training facilities in order to minimise workplace disruption. The CIDB would offer financial assistance and professional guidance in the development of curriculum, tests standards, trainers, equipments and physical amenities. The CIDB would also certify the standards attained by trainees who had completed courses under the scheme.

The **Workers Certification Scheme** was introduced, requiring contractors tendering on public projects to have specified proportions of skilled workers among their workforce.

Centre for Advanced Construction Studies (CACS) was set up as a collaboration between the CIDB and a Polytechnic to cover education and training at higher levels, research and development and technology transfer.

The **CIDB expanded continuing training programs** and its capacity to train for the National Certificate in Construction Supervision (NCCS). Enrolment of construction tradesmen on skills based courses increased 88% from the previous year and enrolments on supervisory courses increased 51%.

A major study on manpower development found that construction companies were too labour intensive and recommended strategies to minimise their

dependence on labour. These included greater mechanisation, the adoption of more labour efficient methods of construction and the wider use of standardised components and prefabrication in design. It was hoped that this would also increase safety levels on site.

CIDB sets up the **Construction R&D Advisory Council** to chart R&D directions and to serve as a coordinating body to stimulate more R&D in the construction industry, particularly in the area of mechanisation and prefabrication. The unit administered two schemes to encourage R&D. The **Product Development Assistance Scheme (PDAS)**, a grant to defray expenditure on product development work by 50% and the **Construction Technology Assessment Scheme (CTAS)** to facilitate the acceptance of new products.

CIDB launches a new Corporate Plan for the next decade entitled 'The construction sector in a developed Singapore' (CIDB 1988a). Under the corporate plan, the CIDB developed a new mission, which was 'to make quality and value for money the hallmarks of the construction industry'. This major report established the direction of CIDB reform agendas over coming years. Direct comparisons were made with countries like Australia, which had higher labour and material costs, but unit construction costs which were proportionally lower. For example, Australia was cited as having 60% higher material costs and 300% higher labour costs but a unit construction cost of 10-15% higher than Singapore. In addressing the industry's problems, CIDB (1988a) called for a nationally orchestrated effort which was organised around three strategic objectives, namely; *cost competitiveness*, *quality* and *export abilities*.

In improving cost competitiveness and bring about a 25% cost reduction 'in the long-term', CIDB (1988a) recommended:

- A comprehensive international study on costs competitiveness which included Australia, US, Asia Pacific and Europe.
- Improved construction management capabilities including; the requirements for alternative designs in tender submissions; promoting the concept of buildability through a buildability index for designs; improved material management expertise and material wastage control.
- Development of consulting firms and their management capabilities within the procurement process through; an industry standard on service quality; better training through a Centre for Advanced Construction Studies at a local university; encouraging multi-disciplinary consulting firms and consortia.
- More R&D underpinned by a comprehensive R&D strategy for the industry; a National Construction R&D Advisory Council made up of representatives from research bodies and the public and private sectors; five year R&D plans; establishment of R&D units in government agencies; supporting planned R&D programs in private sector firms.

- Rationalisation through; prefabrication standardisation and greater dimensional coordination.
- The Application of improved products and processes through; an construction technology assessment scheme similar to the Agreement system in Europe; model specifications for new products and processes, an information clearing house for technology development; greater computerisation and automation.

In improving quality, CIDB (1988a) recommended:

- A review of contract practices including; extending progress payment periods; extending defects liability periods and total project insurance policies.
- Better quality management systems through; development of an assessment system for construction quality; development of a model total quality management system.
- Raw materials quality assurance.
- Greater recognition for quality attainment through; a contractors registration system; CIDB awards for construction excellence.
- Upgrading trade subcontractors through an accreditation or registration system.
- Improving the quality of the workforce and supervisory personnel through a manpower development strategy; a national certificate in construction supervision in collaboration with local universities; expansion of trade certification programs; expansion of continuing training programs including foreign workers; more full-time training; rationalisation in overlaps of training responsibility between through Construction Industry Training Centre (CITC) and Vocational and Industrial Training Board (VITB).

In improving export abilities, CIDB (1988a) recommended:

- A focus on export niches.
- Greater support for exporting companies and the creation of consortia to assist smaller companies to tender on large overseas Build Own Transfer (BOT) projects.
- Creation of Construction Exports Advisory Committee.
- Expanding market development support through; CIDB market desk officers providing more support and information on overseas markets; filed trips and missions; development of greater institutional contacts with foreign counterparts, financers and procurement agencies.
- Encouraging and fostering greater linkages with leading international firms
- Training and technical briefings on issues such as FIDIC international conditions of contract.

1989 *An upturn in the construction market with a 62% increase in contracts awarded to S$5.5 billion compared to S$3.02 billion in 1988. The rapid recovery led to dramatic price rises in basic building materials, cement*

registering a 42% increase, bricks a 21% increase and reinforcement a 14% increase. Wages also rose and tender prices rose by 24%. Construction exports continued to soar with an increase of 48% over the previous year to S$806 million. Productivity increased but remained below the all industry average (CIDB 1990).

1989 was characterised by the following events:

An extension of the CONQUAS system was launched. Called the **CONQUAS-Premium Scheme**, it provided an incentive for companies with a consistently good track quality record by giving a 5% tender advantage on public sector projects. This scheme marked an important shift in government policy – *that it was willing to pay a premium for quality work*. To help companies upgrade their operations to comply with CONQUAS, public sector agencies such as the Housing Development Board (HDB) and Public Works Department, provided interest free financing for the purchase of necessary equipment and other investments. By September 2002, more than 1,700 public sector and private sector projects with a total contract value of S$59 billion had been assessed under CONQUAS and the average CONQUAS score had improved from 67.9% to 76.5%.

A major effort was made to draw up a standard condition of Contract for public sector works with the specific objective of boosting productivity and promoting sound management through the effective and fair allocation of risks.

In terms of training initiatives to promote higher skills and productivity, the CIDB set a target of 33% of the workforce being skills certified by 1994. In 1989, there was a 45% growth in part-time trainees and a 69% increase in workers under going skills testing. Total R&D in construction rose by 30% to more than S$3 million, the private sector increasing its investment by 76% to just under S$600,000.

To encourage greater investment in automation, a **National Construction Automation Program** was started with the setting up of a National Construction Automation Task Force. The **Investment Allowance Scheme** to increase mechanisation was also liberalised to allow smaller firms to benefit from grants.

The CIDB also published ‘Cost Competitiveness of the Construction Industry in Singapore’ (CIDB 1989a). This report was commissioned by the Ministry for National Development to recommend measures to improve the cost competitiveness of the industry. It arose as a result of increasing concerns about relatively poor international cost comparisons with countries like Australia. For example, Australia was cited as having 60% higher material costs and 400-500% higher labour costs but a unit construction cost of 5-11% higher than Singapore. The recommendations made in CIDB (1989a) are listed below and the CIDB were tasked with the responsibility of coordinating and overseeing the overall implementation process. The overall goal was an improvement in cost competitiveness of between 10-15% over the short-term and 20-25% in the longer-term. The recommendations made were based

heavily on comparisons with Japanese, US and Australian practices at the time, and fell under four headings, namely; *planning and design regulations*, *design practices*, *contract practices* and *construction operations*.

Under planning and design regulations, the recommendations included:

- Staged building approvals for faster developments.
- Fee discrimination to encourage architects and engineers to submit one completed design that complies with all statutory regulations.
- Establishment of an independent panel to review building regulations and guidelines every three years.
- Consolidation of all regulations and requirements of various public sector agencies into one publication.

Under design practices, the recommendations included:

- More efficient building designs to increase net-gross floor ratios.
- Development of a central architectural details library.
- Support for modular coordination in design.
- Encouraging details, which minimise wastage on site.
- Specifying more standardised and prefabricated components.
- Rewards for labour efficient designs.
- Promote productive and efficient practices through education and training.
- Set up a technical information service to increase awareness of more efficient design practices.

Under contract practice, the recommendations included:

- Encouraging more selectivity in choice of bidders through stricter pre-qualification or registration systems.
- Standardisation of key contract provisions.
- Development of a single contract for both private and public sectors where there is clear, rational and equitable allocation of risks to all parties.
- Moves towards performance-based contracts.
- Encourage more contractor input in design through tenders with alternative designs.

Under construction operations, the recommendations included:

- Improvements to construction management and planning.
- Reduced material wastage.
- Expansion of training programs.
- Extension of mechanisation to SMEs.
- Reduce as much as possible the use of nominated sub-contractors or suppliers.
- Make contractors wholly responsible, as far as possible, for project performance.

1990 *Despite the Gulf Crisis, contracts awarded increased by 46% to S$8.03 billion. The private sector also overtook the public sector as the main contributor (54%) to construction growth. Tender prices increased by 10% and for the first time, overseas work surpassed S$1 billion (CIDB 1991).*

1990 was characterised by the following events:

The **Centre for Advanced Construction Studies (CACS)** was set up in conjunction with Nanyang Technological University, undertaking construction research and offering a post graduate course in construction management for the international construction industry.

To improve productivity by up to 25%, the CIDB set up the **Design Support Centre**, giving companies' access to a computerised database to increase detailing standardisation and to improve the efficiency of the design office. The centralised Design Support Centre provided the industry with a one-stop CADBase-service – a centralised computerised graphic database of 45 company's standardised product details.

There was a 90% increase in grants under **The Product Development Assistance Scheme (PDAS)** to foster innovation and a 300% increase under the **Investments Allowance Scheme** to increase mechanisation and computerisation of the construction process.

A two-tier levy on foreign workers was introduced to encourage firms to deploy more skilled workers. Essentially, a firm was required to pay a levy of $250 per month for a skilled worker and S$350 per month for a non-skilled worker. This provided an incentive for companies to train their foreign workers to reduce the levies paid.

1991 *Contracts awarded fells slightly from S$8.03 billion in 1990 to S$7.9 billion in 1991, although the GDP growth rate of the industry grew 21%, far exceeding the national average of 6.7%. Wages increased by 14% making the sector attractive to young professionals and technicians and overall tender prices increased by 7% (CIDB 1992).*

1991 was characterised by the following events:

Launch of **'Build-In-Time' Campaign** by Minister for National Development, a 5-year program by 5 large public sector agencies, promoting more buildable designs, the effective combination of design, technology, management and skills to deliver quality buildings with higher productivity and in shorter time.

Development of **Buildable Design Appraisal System**, an objective measurement tool to rate the labour efficiency of a design and set targets for industry. The CIDB's Buildable Design strategy was targeted at increasing Singaporean construction productivity, which was estimated to lag behind Japan by about 30%.

Launch of new **'Best Buildable Design Award'** to focus the industry on high productivity design ideas. The Best Buildable Design Award was an annual competition to give recognition to design teams for use of buildable designs and concepts, which increase construction productivity. The Best Buildable Design Awards are given for companies' labour saving methods.

Training and trade testing remained one of the CIDB's core activities to raise quality and productivity. Training and trade testing reached record levels with the CIDB expanding its testing capacity further. Training enrolments were at 6,500 (7% increase from 1990) and trade testing saw a 50% increase to 6,900 as the new two-tier foreign worker levy system took affect. A three-pronged strategy to raise worker's skill levels was launched incorporating; *coaching*, *training* and *equipping* workers to become skilled.

The CIDB introduced the **Construction Tender Price Index** to assist the industry monitor trends in tender prices and track price changes in key resources and the finished product.

CIDB ISO 9000 Certification Scheme for quality management systems which meet international standards in construction contractors and consultants. All G6 to G8 firms working on projects over S$30 million, had to be certified by July 1999. CIDB provides training on ISO 9000 quality management systems to contractors, developers and consultants. The CIDB ISO 9000 Certification Scheme provides the framework for the CIDB's long term effort to improve quality.

1992 *The industry showed strong performance with contracts awarded reaching an all time high of S$12.8 billion. The sector's GDP growth rate was 18%, almost three times the national average. S$1.6 billion of contracts were secured overseas, a 68% increase on the previous year. Material prices fell and labour costs increased by about 11%, causing a general rise in tender prices by 1%. Productivity improved slightly but did not match GDP growth rate, remaining well below the all industry average (CIDB 1993).*

1992 was characterised by the following events:

One-Stop Foreign Worker Applications were introduced as CIDB took over from the Ministry of Labour processing of work permits for foreign construction workers (the majority of site workers are foreigners on three year visas).

Launch of the **'Construction and You'** program which was designed to dispel the negative image of the building and construction industry as being dirty, dangerous and demanding. The aims was to recruit high level talent by promoting the industry as one where people could find rewarding and challenging work, improved working conditions and increased wages.

The first **Construction Industry Scholarship Scheme** was launched and 12 scholarships were awarded by The Minister for Finance and National

Development. The scheme was designed to attract bright students to take up construction-related careers through courses at local tertiary institutions.

In response to an unprecedented increase in construction activity, which was not matched by productivity increases, the CIDB created a **Productivity Task Force** which published 'Raising Singapore's Construction Productivity' (CIDB 1992a). The terms of reference were to ascertain comparative productivity levels with the building and construction industries of other developed countries, to identify the underlying reasons for low productivity and to recommend ways of improving it. The objective of productivity improvement was '*to reduce manpower usage at reasonable cost, while maintaining design variety and high quality work*' (CIDB 1992a: 1).

The background to the CIDB (1992a) report was as follows. The economic indicator used to measure construction productivity in Singapore is value added per worker. Using this indicator, CIDB (1992a) argued that Singapore's construction productivity had increased at an average rate of 3.1% per year over the 10 years 1982-1991, lower than the averages of 4.5% for manufacturing and 4.2% for the whole economy. Australian performance for the same period was: construction productivity 2.7% per annum; manufacturing 4,5% and the economy 3.2% per annum. The widening gap between construction and manufacturing productivity was a trend reflected in Australia, the UK, Japan, the United States and Germany, as well as other developed countries.

Before summarising the conclusions and recommendations of this important report, it is worth noting that the report found that low productivity cannot be attributed to a single factor and that the measurement of productivity and its interpretation was not a simple task. The traditional indicator of value-added per worker is distorted by economic changes and needs to be supplemented by other indicators to provide different facets of looking at productivity. Using an additional indicator of built-up area per man-day enabled better international comparisons to be made. Furthermore, the report found that productivity varies significantly across different building sectors, buoyed by relatively high productivity in the public housing sector. Finally, the report concluded that any recommendations had to be brought about by industry initiative and collaboration without regulatory measures from government.

The main findings were that:

- Japan's building and construction industry productivity (0.44 m^2/ man-day) was 30% higher than Singapore's (0.31 m^2/man-day).
- Finland's building and construction industry productivity (0.55m^2/man-day) was 60% higher than Singapore's. Between 1965 and 1980, the construction workforce remained constant while construction output increased by an average of 4% per year).
- High productivity in Japan and Finland is linked to high levels of prefabrication (20% of buildings in Japan are fully prefabricated and 40% in Finland).

- Higher prefabrication and standardisation has to be balanced with Singaporean's clients' demands for more variety in design.
- Low productivity was attributed to design and construction factors and is caused by:
    - A low skilled workforce resulting from low training investments, an unattractive construction environment, insecure employment conditions, lack of recognition and relatively low wages;
    - Low integration between design and construction;
    - A large, transient and unskilled pool of foreign workers (80% of workforce);
    - An underdeveloped subcontracting sector;
    - Inadequate site management;
    - Relatively low levels of automation, standardisation and dry trades;
    - Architectural details which are difficult to construct;
    - Poor site management and planning;
- Buildable designs are central to productivity growth.
- Analysis of labour wastage showed that 65-70% of construction labour are engaged in structural work and finishing work such as external and internal brickwork, plastering and tiling. There was considerable capacity to raise productivity in these areas by prefabrication.

A series of recommendations were made to achieve a productivity improvement of 30% within 10 years. This would place the Singaporean building and construction industry on a par with Japanese productivity levels.

In the long-term (10 years):

- Design and build projects should be encouraged since they tend to promote more buildable designs.
- The public sector should take the initiative to drive change within the building and construction industry.
- Buildability technologies should be developed and promoted particularly in the prefabrication of structural systems (to reduce formwork carpentry, numbers of beams and variety of beam sizes) and internal and external walls (to reduce wet trades). The process of education should begin at tertiary level.
- To attract and retain a new generation of talented and skilled workers, apprenticeship training should be boosted by CIDB and Singaporean Contractor's Association (SCAL) and key subcontractors.
- Better status and employment conditions for industry workers through promotion of worker welfare by National Trades Union Congress (NTUC) and SCAL.
- Expansion of training to include assembly and foreman type skills.
- Foreign workers policy to encourage higher productivity and higher skills.
- Development and recognition of major subcontractors.
- Upgrading management and technological skills of main contractors through personnel and firm upgrading programs.

In the short-term (3 years):

- Start a major standardisation effort to apply prefabrication and buildability technology to replace labour-intensive structural and finishing works (such as pre-cast floors, curtain walls, staircases etc).
- Start a concurrent program to source, adapt and/or develop prefabrication and buildability technology for Singapore's construction needs.
- Tertiary institutions should be encouraged to teach buildability technology.
- Promote the use of procurement systems which integrate design and construction.
- Public sector to award more projects in which a greater proportion of design is done by contractors.
- Launch a construction industry apprenticeship scheme to recruit and train a younger generation of skilled workers, especially for finishing and building services trades.
- Set up a recognition system for subcontractors.
- Start a management-upgrading program for local firms, professional and technical personnel.
- Study the long-term scope and viability of automation of construction processes (tower cranes, hoists, table forms, painting, welding, bolting, drills, saws, fasteners etc).

1993 *The GDP growth of the building and construction industry was strong at 8%, the value of contracts awarded remaining at a healthy S$10.6 billion (58% from the public sector). Total value of overseas contracts was S$1.05 billion. Foreign workers numbers increased by 20% to meet high demand, but the tender price index fell due to increased market competition among contractors for construction projects. Falling and low productivity of private sector (0.31 m^2/man day) compared to 0.66 m^2/man day for public sector remained a concern (CIDB 1994).*

1993 was characterised by the following events:

The **CONQUAS Premium Scheme** was extended to civil engineering works and the number of contractors in the scheme rose from 52 to 68. Some firms in private sector begin to use CONQUAS score to determine bonus payments to contractors for achieving specified quality targets.

43,000 construction personnel have now been trained by Construction Industry Training Centre (CITC). 33,000 workers have now taken trade tests through the National Construction Trade Test Program introduced in 1984. CITI aims to train another 40,000 workers and 6000 supervisors by 2003 and to certify another 20,000 skilled workers.

Career Promotion Media Campaign launched **-** the first career promotion advertising blitz for the construction industry, in conjunction with a

'Construction & You' programme which included Construction Industry Scholarships to attract young talent into the industry.

The CIDB takes over collation of construction statistics from Urban Redevelopment Authority (URA), making the CIDB the one-stop centre for construction information. Information on demand and supply, activity trends, prices of resources (especially labour) and tender price indices, and forecasts of construction volume and value are published. Supply and demand of labour and basic construction materials is sensitive to fluctuations and the CIDB closely monitors these resources. The CIDB assists the Ministry of National Development in forming policies to ensure that these resources are made available.

1994 *The GDP growth rate of the industry rose to 15.7%, the highest of all industries in Singapore and almost double that of 1993. The value of contracts awarded reached S$12 billion (S$1.17 in overseas markets), 13% higher than 1993. Construction productivity turned positive at 4.1% after negative growth in 1993. Construction manpower increased to 180,000 but the tender price index dipped 1% (CIDB 1995).*

1994 was characterised by the following events:

Launch of CITI, previously CITC. To satisfy the demands for skilled workers and better trained supervisors the CIDB opened a S$38 million new campus. Renamed the Construction Industry Training Institute (CITI), the new training centre has twice the capacity of the CITC centre.

A new requirement was introduced that all G6 to G8 companies tendering for public projects of over S$30 million would need to be **ISO certified** by 1999.

Only subcontractors registered with **Singapore List of Trade Subcontractors (SLOTS)** and employing over 10% skilled workers could be selected by main contractors for public sector projects.

Work on a new public standard conditions of contract was completed to drive procurement reform and raise productivity which included alternative dispute resolution techniques such as mediation.

On the tenth anniversary of the CIDB, a Commemorative Publication was produced which traced achievements to date and establish a vision for the coming ten years (CIDB 1994a). This covered three main themes, namely; *skills development*, *raising quality and productivity standards* and *strengthening international competitiveness of firms.*

Under skills development, the plan was directed at:

- Training and certifying a core of skilled foreign workers.
- Increasing retention of skilled foreign workers.
- Training and certifying Singaporeans for higher value-added trades.

- Expanding the range of certified trades to include dry trades.
- Strengthening the training of supervisory, technical and managerial personnel.
- Increasing opportunities for career progression of construction personnel.

Under raising quality and productivity standards, the plan was directed at:

- Refining CONQUAS and providing incentives for firms to achieve higher scores.
- Promoting certification under ISO 9000 to encourage the setting up of quality systems.
- Environmental and safety management standards to be strengthened.
- Emphasise integration of design disciplines.
- Encourage use of IT to raise efficiency.
- Promotion of buildability concept in design.
- Promotion of prefabrication.

Under strengthening international competitiveness of firms, the plan was directed at:

- Strengthening the graduation system for firms, including identifying a group of top-class contractors.
- Improving conditions to encourage more local participation in large projects and developing stronger capability in complex projects.
- Developing more design and build capability.
- Developing the subcontract industry.
- Providing assistance to firms exporting services through information and networking.

In 1994, the ILO also produced an important report entitled ‘Foreign construction workers in Singapore’ (Ofori 1994). This reflected an increasing realisation that Singapore had become dependent upon foreign workers because of its geographical proximity to countries with cheap labour, its aging workforce, growing academic standards and expectations of Singaporeans and changes in population demographics. There was also a realisation that the influx of foreign workers lay at the core of the industry’s problems and had yet to be addressed effectively. These problems related to a low skills base producing low quality work, social problems relating to the need for additional infrastructure to support such workers, political problems relating to alleged harsh treatment of citizens of other countries, adverse effects on OHS performance and a perpetuation of the industry’s low social status. There was also an adverse impact on productivity, since low labour costs provide a disincentive to invest in technological developments. In 1994, over 70% of the construction workforce was foreign and in 1998 the problem remained with foreign workers making up 81.2% of the total construction workforce in Singapore (CIDB 1998b).

Singapore's foreign workers policies are currently embodied in legislation and regulations which provide protection in terms of conditions of employment such as OHS, compensation for work related injuries, medical benefits and insurance protection. Employers are levied by the government for each foreign worker they employ to ensure that these provisions are paid for. Most foreign workers are given a two-year working permit which is renewable for another two year period. During this time, foreign workers are also given the opportunity, through the CITI, to learn a trade on a part-time basis while in Singapore and those with special skills may also qualify for permanent resident status and even citizenship. The employer of a foreign worker is directly responsible for a worker in all respects, including the provision of accommodation and eventual repatriation. Despite this, it had been found that the standards of employment provisions vary significantly between different employers, some providing excellent conditions but other providing unhygienic and dangerous conditions.

The long-term policy of the Singaporean government is to reduce dependence on foreign workers, but in the shorter-term, to increase skill levels amongst these workers, allowing those with skills to stay longer. This is particularly important in light of economic growth in labour source countries such as Malaysia which will mean that workers will have fewer reasons for travelling to Singapore to find work. Incentives were being developed to encourage employers to adopt working practices which will achieve these aims, such as assistance in purchasing new labour-saving technologies and a two-tier levy system where employers have to pay more to recruit more foreign workers (Ofori 1994).

1995 *This was another good year for the construction sector with a growth rate of 8.5% and value of contracts awarded at an all time high of S$16 billion, a 31% increase over the previous year. Total value of overseas contracts was S$1.59 billion. However, manpower shortages continued to plague the industry and the tender price index rose by 4% compared to 2.6% in previous years. Labour productivity continued to fall (CIDB 1996).*

1995 was characterised by the following events:

The **ISO 9000 and CONQUAS schemes** were widened with a 100% increase in firms being certified, 54 design and construction firms getting assistance to set up quality systems and 79 new private sector projects (S$3.34 billion) being added to the CONQUAS scoring system. The average CONQUAS score rose from 71.5 to 72.2.

CORENET (Construction and Real Estate Network) was launched, as a major initiative led by the Ministry of National Development (MND) to achieve a quantum leap in productivity by revolutionising the industry's business processes through effective and innovative use of IT. CORENET is a broadband and high-speed electronic network structure to link key players in the building and construction industry with secure electronic transactions. The aim is to speed up regulatory approvals, information exchange and

procurement processes for building and construction projects. It is essentially a centralised system for single point access to multiple sources of information that will facilitate design, construction and facilities management related activities on-line and via the Internet. It provides a series of tools to verify computer generated plans for compliance with the requirements of all relevant authorities involved in the building and construction industry. Plans can be submitted electronically to the authorities. CORENET also provides a legal framework including a set of legal guidelines and procedures that define the rights and responsibilities of business partners engaging in electronic business transactions (www.bca.gov.sg/corenet).

Three overseas testing centres were created to test foreign workers at source before being deployed to Singapore. Over 7000 new skilled overseas workers joined the workforce. CITI launched new supervisory courses and more than 1600 construction managers, professionals and supervisors underwent management training. 4500 workers underwent skills training.

The use of prefabrication increased by 27% as a result of increased use of pre-cast concrete.

1996 *The construction industry continued to prosper with total value of contracts awarded reaching an unprecedented S$19.6 billion, 22.5% higher than 1995, representing a GDP growth rate of 18.4%, way above the 7% growth rate of the national economy. Tender prices moved upwards by 2.7%, largely due to higher labour costs and clampdowns on illegal workers (CIDB 1997).*

1996 was characterised by the following events:

A **Manpower Taskforce** was formed to look into the shortage of professional and technical manpower and, the future manpower needs of the industry over the next ten years. Tertiary institutions increased their enrolment of construction students and training and testing of construction personnel were increased by CITI with over 5000 construction personnel being enrolled on trade, supervisory and management training courses. About 11,000 certified workers were added to the workforce during the year.

CIDB and industry representatives launch Singapore chapter of **International Alliance for Interoperability**, a global alliance to draw up a universal standard to enable interoperability between different computer systems used by architects, engineers and construction firms.

Ministry of National Development (MND) established a taskforce to review costs competitiveness of the building and construction industry and to improve its operating conditions and business environment. Its recommendations included pre-qualification of contractors for very large public projects, reducing dependence on foreign workers, raising the level of skills in the industry, continuing to promote buildable design and prefabrication, requiring top developers to take the lead in showing greater innovation in using technology

to replace labour, greater support for pre-cast industry and widening sources of basic materials.

CIDB conducted a survey on worker profiles and concluded that the overall skill level of workers within the Building and Construction Industry was about 12% and the industry continued to be heavily dependent on foreign workers.

Launch of **Product Development Assistance Scheme (PDAS),** in which companies receive as much as 50% grants for research work on product or technique development. Other schemes to encourage innovation include **Local Enterprise Technical Assistance Scheme (LETAS)**, **Innovation Development Scheme (IDS)** and **Initiatives in New technologies (INTECH)**. Since 1985, the CIDB has handled applications worth more than $100 million under these schemes.

1997 *In 1997 construction continued to boom in both private and public sectors with an all time high of S$22.4 billion contracts awarded. Building and Construction Industry productivity continued to fall (CIDB 1998).*

1997 was characterised by the following events:

The CIDB launched **'Training 21'** – a blueprint that sought to develop a construction workforce with world-class skills and productivity levels by addressing the industry's training needs over the next 10 years. Under this initiative, the skill level of the workforce would be raised to 30% within 10 years. It would also train 15,000 supervisors to raise the supervisor-to-worker ratio from the current 1:30 to 1:20 (still far exceeding the 1:15 ratio of Japan and the 1:7 ration of Finland). Training 21 focussed training in areas of high productivity impact, multi-skilling and the testing of foreign workers' skills at source. It was an initiative designed to revolutionise the construction workforce and underscore the aim to strengthen Singapore's supervisory and technical management capabilities while raising the skills and productivity of the workforce.

An industry census was conducted to obtain a better understanding of the performance and structure of the construction industry. The last census was 10 years earlier.

The CIDB continued to promote design and build as a procurement approach which is more productive and cost competitive, with S$2 billion being tendered on this basis. A 'Design and Build in Singapore' handbook was published and circulated to industry.

The CIDB launched its own ISO 9000 certification scheme confirming the CIDB at the leading certification body of the construction industry. A Memorandum of Understanding (MOU) was signed with the Japan Quality Assurance Organisation, to provide greater international recognition for certified firms.

To raise productivity, the CIDB expanded its **Design Support Centre** which provided training in Computer Aided Design (CAD) with particular application to the Building Plan Expert system developed by the Public Works Department.

A CIDB report (CIDB 1997a) estimated that only 14% of workers in the Building and Construction Industry were skilled, although this had grown from 6% in 1993. The CIDB set a target of 20% skill levels by 2002. During the year, there was a 54% increase in the number of workers taking skills tests at 27,761 with 16,835 being certified as skilled.

1998 *The Asian economic crisis adversely affected the construction industry with demand falling by 35%, from S$23.54 billion to S$15.24 billion. Tender prices fell due to increased competition. Productivity continued to fall (CIDB 1999).*

1998 was characterised by the following events:

On the 15th anniversary of the CIDB, it was merged with the Public Works Department to form the new **Building and Construction Authority (BCA)**. The BCA would continue to develop and transform the building and construction industry into a technologically advanced state and to improve productivity, competitiveness and cost efficiency.

CONQUAS 21 was launched. This was a revised CONQUAS system with new features to make it more comprehensive and user-friendly. It included a bonus scheme, which directly rewarded, with monetary bonuses, contractors with high CONQUAS scores and penalised, with monetary penalties, those with low scores. The number of projects assessed under CONQUAS fell by 11% as a result of the economic slowdown but average CONQUAS scores continued to rise from 74.3% to 75.8%.

The CIDB ISO 9000 certification scheme was expanded to include ISO 14000 (Environmental Management system).

CITI increased training by 61% with 79,000 workers taking skills certification tests with 46,000 workers being certified. A further 16,000 workers took supervisory and management type courses.

Man-Year Entitlements system launched to reduce dependence on low paid, unskilled, low productivity foreign workers. This was reducing investments in new technologies since contractors were becoming reliant upon very cheap labour and therefore, had no incentive to innovate. The aim was to restrict the flow of foreign workers by balancing the number of foreign workers with industry demands. Under the system, companies are given work permit entitlements/quotas depending upon the size of projects and the number of locals employed. There must be at least one local worker to every five foreigners hired. These entitlements can be retained by the main contractor or 'farmed-out' to local subcontractors involved in a project.

The contractor registration system processed a record 4,144 applications, a 63% increase over the previous year.

The CIDB continued to promote buildable designs by amending the Building Control Act to allow for the inclusion of minimum buildable scores as a mandatory requirement for building plan approval.

The **Construction 21 (C21) Committee** was established by the Ministry of Manpower (MOM) and Ministry of National Development (MND) to address the manpower and productivity problems plaguing the building and construction industry. While the Singapore construction industry had played an important role in contributing to Singapore's economic development, it faced serious problems such as:

a) Continual low productivity level compared to other industries;
b) Sustained negative productivity growth;
c) Heavy reliance on a large pool of unskilled labour;
d) Malpractice and social problems associated with the employment of a large number of foreign workers;
e) Labour intensive construction techniques and practices;
f) Poor safety performance; and
g) A poor public image which reduced the flow of talent into the industry.

The C21 Committee was tasked with a study to address the above problems across the entire construction value chain, from design to construction and to maintenance. Its four working groups comprised representatives from major industry players, i.e. developers, architects, engineers, consultants, contractors, regulatory bodies and knowledgeable individuals. The C21 Steering Committee and its Working Groups would produce the most thorough review of Singapore's building and Construction Industry ever undertaken and publish its results in 1999 in a document entitled 'Construction 21' - a strategic blueprint spelling out the vision and reform strategies to re-invent Singapore´s construction industry. This study would be undertaken through extensive research and consultations with local and overseas industry bodies. The committee also sought the views of Sir John Egan who was involved in a similar scope study entitled 'Re-thinking Construction' in the UK. The recommendations of the C21 Study were to be fine-tuned through an Industry Forum.

1999 *Total contract value fell further by 32% to S$10.4 billion. The total number of enterprises in the industry also fell, as did employment levels. The industry accounted for 3.7% of total retrenched workers. Labour productivity in terms of value-added also fell to S$27,300, which was lower than other sectors. The tender price index fell by 11% although gross profit margins remained at about 3.3% (CIDB 2000).*

1999 was characterised by the following events:

The Singapore Government set aside S$50 million to boost construction productivity and innovation. This comprised a S$10 million R&D budget that focussed on strategic areas such as buildable technologies and IT. The BCA was tasked with coordinating the R&D effort. The remaining S$40 million would be allocated to the various incentive schemes administered by the BCA and The Singapore Productivity and Standards Board.

The two-tier levy differential was widened from S$370 to S$440.

By the end of 1999, CITI had tested 286,440 workers and certified 162,015. About 18,700 professionals had undergone training programs at technical, supervisory and management levels.

The major event of 1999 was the publishing of **'Construction 21'** (C21 Committee 1999), a blueprint for reform of the Singaporean Building and Construction Industry. C21 was designed to totally transform the industry from one that is plagued by negative productivity growth and heavy reliance on unskilled foreign workers to one that is professional, productive and progressive, and whose workforce is able to exploit knowledge for competitive advantage. The C21 Blueprint was the most significant review of the Building and Construction Industry ever undertaken in Singapore and represented the construction industry's response to Singapore's general economic vision of becoming a globally competitive knowledge-based economy. Although research indicates that the impact of C21 has so far been limited (Dulaimi et al 2001), its findings and recommendations are seen as being extremely important to the future development of Singapore's Building and Construction Industry.

To achieve the vision of a world-class Building and Construction Industry, six strategic thrusts were formulated:

Strategic Thrust 1: Enhancing the Professionalism of the Industry.
Strategic Thrust 2: Raising the Skills Level of the Construction Workforce.
Strategic Thrust 3: Improving Industry Practices and Techniques.
Strategic Thrust 4: Adopting an Integrated Approach to Construction.
Strategic Thrust 5: Developing An External Wing.
Strategic Thrust 6: A Collective Championing Effort for the Construction Industry.

Strategic Thrust 1: Enhancing the Professionalism of the Industry

C21 found that there was a wide disparity in the professional standards of industry players (i.e. developers, architects, engineers, project managers and contractors). While some may have institutes and associations that strive to maintain a level of professionalism, others are less focused. In fact, many lack the capabilities to measure up to world-class standards. Hence, it is crucial to change the image of the industry and raise the level of professionalism and competence among industry players so that every

player is able to maintain a high level of professionalism when carrying out their responsibilities.

Recommendations:

To enhance professionalism, the recommendations focus on improving education and training of professionals by enhancing tertiary curriculum for construction-related studies and promoting Continuing Professional Development Programmes; promoting the use of IT in the industry to enhance efficiency and image; and encouraging good practices and standards through codes of conduct.

Specific recommendations included:

- Contractors, project managers and developers to draw up codes of conduct and acceptable practices for their profession. An industry-wide Code of Conduct spelling out industry standards with regard to the working relationships among the various players can be established thereafter.
- Promote, recognise and reward creativity, quality work and innovation through existing and new awards.
- Raise the use of IT, in particular, the CORENET programmes. To use incentives such as capital grants in assisting the industry to expedite use of IT.
- License all contractors (include sub-contractors) to influence their standards and professionalism. MOM to grant foreign workers only to licensed contractors thereafter.
- Introduce common modules for engineering and architectural students to develop multi-disciplinary skills and build a foundation for future cooperation.
- Enhance the tertiary curriculum for construction-related fields by including soft skills (e.g. work ethics, management skills, etc) so as to make them sufficiently broad-based.
- The institutes of higher learning to collaborate with the professional bodies and BCA to design courses which meet the needs of the industry and attract more professionals to attend these courses.
- Professional and trade groups in the construction industry to make Continuing Professional Development (CPD) programmes mandatory for the renewal of professional and trade membership.

Strategic Thrust 2: Raising the Skills Level of the Construction Workforce

The Singaporean construction industry is heavily dependent on low skilled construction workers. This has led to low productivity, certain irregular practices and spawned a host of social and industrial relations problems. The large number of unskilled workers and its attendant problems also accentuate the negative perception of the industry. There must be a determined approach to upgrade the construction workforce to align it with the knowledge workforce in a knowledge-based economy.

Recommendations:

The measures to address these problems are to reduce reliance on foreign workers through the tightening of the Man Year Entitlements Scheme; raising the skills profile of the foreign workforce; and building up a core pool of skilled construction workers, both local and foreign.

Specific recommendations included:

- Tighten the Man-Year Entitlements (MYE) for projects to 70% of current levels by 2005 and 50% by 2010, or earlier if practicable.
- Set a target for 45% of construction workers to be skilled (i.e. attained at least the Skills Evaluation Certificate) by 2005, and raising the proportion to 60% by 2010. MOM to impose this as a requirement for work permit applications.
- Raise the Basic Skills Certificate (BSC) requirement to 100% with effect from 1 April 2000.
- BCA to work with industry to train construction workforce, and continue to review training curriculum regularly to respond to industry needs.
- Continue to use the Two-Tier levy system to encourage the employment of more skilled foreign workers. In particular, to widen the levy differential by increasing the levy for unskilled workers.
- Industry to work with BCA to devise appropriate incentive schemes for training workers.
- Nurture a pool of local workers in selected areas by suitable promotion and training programmes.
- Employ and train multi-skilled foreign construction workers.
- To pilot a facility for the temporary loaning of skilled foreign workers so as to give employers the flexibility to keep their skilled foreign workers when their workload levels are low.

Strategic Thrust 3: Improving Industry Practices and Techniques

A key thrust for upgrading the construction industry is to improve existing industry techniques and practices that affect construction productivity and cost efficiency. There is also a need to review management practices to enhance the image of the industry.

Recommendations:

The C21 Committee identified the following areas of focus, which will help to improve productivity and efficiency:

- Enhancing buildability;
- Enhancing construction safety;
- Enhancing maintainability;
- Enhancing quality;
- Stepping up Research and Development;
- Improving construction management;

- Improving foreign worker management;
- Improving tendering practices.

This can be achieved by:

- Setting minimum buildability for building plan approval. Minimum buildability score should be raised progressively over time.
- Using appropriate incentive schemes, such as the Industry Productivity Fund, to encourage the use of prefabrication and assist suppliers of prefabricated components.
- BCA to raise the use of standard construction components by incorporating its use in the Buildable Design Appraisal System (BDAS).
- Publishing a Practice Guide on standard building components and modular dimensions for use by the industry.
- Introducing the Construction (Design and Management) Regulations after the enactment of the Occupational Health and Safety Act (OHSA) in 2000/2001.
- Commissioning a study to research and devise a system that can be used to audit maintenance costs and produce manuals which give the design life and maintenance costs of components.
- Continuing to cultivate among professionals, contractors and end-users the awareness of quality products and good design through programmes such as CONQUAS 21 and BCA Good Practices Guide.
- Developing a set of national quality specifications.
- Establishing the National Construction Research Institute (NCRI) to coordinate construction R&D.
- Setting up a separate annual R&D budget for the construction sector starting with an initial sum of S$20 million per annum to be administered by BCA.
- Developing a generic Construction Management System for all contractors and subcontractors and use appropriate incentive schemes to assist adoption of system.
- Developing a pool of supervisors trained in proper site management and safety procedures to ensure high productivity and safety levels.
- Creating a leading agency to coordinate the policy on housing for foreign workers, in cooperation with other agencies.
- Minimising the modifications to the standard contracts for both building and civil engineering works for the private sector.

Strategic Thrust 4: Adopting an Integrated Approach to Construction

One of the main causes of low productivity in the industry is the lack of integration of activities across the construction value chain where design is segregated from construction or other downstream processes. Closer integration among the industry players in carrying out a project would facilitate the adoption of good practices in buildability, safety and maintainability, at the design stage. This will bring about higher efficiency and productivity.

Recommendations:

The C21 recommendations focus on the active promotion of Design and Build (D&B) to foster closer integration. C21 proposes a three-pronged approach to increase the use of D&B arrangements: through promotion, provision of a conducive environment by reviewing existing acts to facilitate D&B, and the nurturing of D&B firms.

- BCA should continue to encourage integration of construction activities through the promotion of design and build arrangements.
- To review the tendering system for D&B to make it more transparent and minimise wastage. This can be achieved through the provision of an open system of information sharing.
- BCA to undertake a comprehensive review of the Architects Act, the Professional Engineers Act and the Building Control Act, to facilitate D&B arrangements.
- Encourage the formation of multi-disciplinary firms in order to groom a core of internationally competitive firms with D&B expertise.

Strategic Thrust 5: Developing an External Wing

Experience in other countries (such as Japan, Australia and UK) has shown that the construction industry can export part of its services and become a global player. This is already happening in some companies with niche expertise. In Singapore, it is important to resolve the problems in the domestic industry. This will lay a solid foundation for local companies to venture abroad and contribute to Singapore's GNP. C21 has thus proposed the development of an external wing as the next step of a internationlised industry.

- BCA to assist construction companies and consultancy firms in venturing abroad through existing schemes.
- Construction Industry Joint Committee (CIJC) to encourage companies to take proactive efforts, and form consortia to venture abroad.

Strategic Thrust 6: A Collective Championing Effort for the Construction Industry

It will require a concerted and collaborative approach among all players in the construction industry to bring about the transformation and development of the construction industry. BCA will coordinate efforts in a holistic manner, through its regulatory and promotional functions, and with the C21 Report serving as the blueprint to re-invent the construction industry.

Recommendations:

- BCA to be the champion agency for the construction industry and oversee the implementation of the C21 recommendations.

- Institutionalise a partnering mechanism between BCA and the Construction Industry Joint Committee (CIJC) to implement the C21 recommendations and develop the industry.

2000 *The economic downturn continued to affect the Building and Construction Industry with contracts awarded being about S$13 billion. The building and construction industry has consistently registered negative growth ranging from –2.9% to 8.8% over the last five years. The slowdown in domestic construction demand led to short-term over-capacity problems, exerting greater pressure on the industry to seek external markets for growth and revenue. There was also a continued need to tackle the perennial problems of heavy dependence on foreign workers and low productivity and concerns over construction quality (CIDB 2001).*

2000 was characterised by the following events:

The **Construction Industry Joint Committee (CIJC)** signed an MOU which formalised a cooperative framework among the 9 construction-related bodies for improving the construction industry and implementing Construction 21 (C21).

Launch of C21 Best Practice Award for individual companies which demonstrate innovation and leadership in implementing the Construction 21 blueprint.

The BCA revamped the **Contractors Registration System (CRS)** to encourage companies to upgrade and grow. By setting minimum registration standards for companies tendering for public sector projects, the system has been instrumental in raising standards in the industry. The revamped system would place a greater emphasis on paid up capital, net worth, professional personnel, track record, technology sophistication, quality systems and environmental performance to meet the demands from better-educated clients.

To encourage the use of the Design and Build procurement system, the Architects' Act, Professional Engineers' Act and Building Control Act were reviewed and legislative changes made to remove restrictions on builders doing design work and on designers providing construction services. It was hoped that this would create a more conducive environment to the formation of multi-disciplinary firms, which can seek greater synergies.

Two new incentive schemes were launched to assist the industry in technology and management upgrading. This included **'Jumpstart Construction'** (provides a 50% subsidy to help firms upgrade their IT facilities) and **CRS Step-up** (a 70% subsidy to accelerate the upgrading of SMEs to use IT more effectively, to build up technical capability and formulate business strategies).

The Building Control Act was amended as planned to a minimum buildable score a compulsory requirement for building plan approvals. It also

introduced more stringent OHS inspection requirements. Accredited OHS checkers will now have to go through a more rigorous accreditation system and be more involved in the design of large and complex structures.

Current reforms 2001 onwards

The last year has registered a contraction of 39.2% in construction demand, mainly due to cutbacks in public housing projects, the private property market and industrial developments. Construction output also dropped by 4.3% and, with the exception of bricks, the prices of basic construction materials fell to a ten-year low. Tender prices have fallen 20% from their 1996 peak but productivity growth registered a positive 0.2% following negative growth for the last six years. The continued slowdown in domestic construction demand exerted greater pressure on the industry to seek external markets for growth and revenue. However, concerns over international competitiveness continue, with a firm downward trend in exports by local contractors (S$326 million in 2000) from the highs of 1995 (S$1586 million). Established firms from the United States, China, Japan and Europe, are considered to have a significant lead in technical expertise and financial resources needed to carry out extremely large-scale projects (BCA/REDAS 2002).

In June 2002, Dr Vivian Balakrishnan, the Minister of State for National Development announced a number of new initiatives to boost the industry.

In particular, in pursuing the government's broad plan to remodel the Singaporean economy, the **Economic Review Sub-Committee for Domestic Enterprises** has formed a Workgroup comprising developers, architects, engineers, contractors and suppliers with the aim of ensuring that the sector remains competitive and progressive. The Workgroup will examine various issues including industry restructuring, upgrading capabilities and assistance measures for local firms in their internationalisation efforts.

Meanwhile, in line with C21 efforts, three areas of change are being introduced that are hoped to have a significant impact upon the industry, namely: the BCA's revamped Contractors Registry System; incentive schemes to upgrade firms' technological capabilities; and initiatives to improve construction quality.

The revamped Contractor's Registry System was launched in July 2002 and is designed to raise standards and set benchmarks for contractors undertaking public sector projects. It requires contractors to meet more stringent turnover, financial strength, track records and professional manpower requirement criteria, to be registered at various grades. For example, firms in the G8 category will have to raise their paid up capital from the current S$5 million to S$15 million and have at least 30 professionally qualified staff instead of four. They will also need to prove they have secured at least S$75 million worth of public-sector projects, S$112.5 million in main contracts and S$37.5 million in a single project in the last 3 years. Firms will also be re-graded according to a new system of grades, namely; A1, A2, B1, B2, C1, C2 and C3. The new Grade A1 is equivalent to the old G8 and only 20% of contractors under the

old G8 are expected to attain the A1 ranking. It is expected that more than 50% of construction firms in the existing system will be downgraded at least one grade as a result of the new system.

Over the last 3 years, a total of 991 firms have benefited from more than S$26 million of grants under the various financial assistance schemes introduced to help companies upgrade. Many of these schemes have been remodelled to speed up management upgrading, the adoption of IT and Infocomm technologies and investment in advanced construction equipment.

In July 2002, Dr Balakrishnan announced the launch of the BCA Quality Mark for Construction workmanship, an initiative which gives special recognition to newly completed residential units that achieve high workmanship standards. The Quality mark system is based on CONQUAS but is applied to individual apartments.

As the Building and Construction Industry slowdown continues, unemployment is becoming a problem with 2,160 job losses in the first quarter of 2001 alone. The treatment of foreign workers is also becoming an issue with some complaints about their working and living conditions and the social problems that arise from this. There is also said to be a black market for foreign workers, which stems from the restrictions imposed by the Man-Year Entitlement System which was introduced in 1998. To exploit loopholes in the system, come companies are putting phantom local staff on their payroll to increase their foreign worker entitlements and thereby reduce their proportion of local to foreign workers and in turn, their labour costs.

To encourage the employment of skilled workers, the government is proposing to widen the levy for skilled workers compared to unskilled workers. Currently it is S$430 for a skilled worker compared to S$470 for an unskilled worker.

The Real Estate and Developers' Association of Singapore (REDAS) launched its new industry standard Design and Build Contract which is intended to save the industry time and money. The stated benefits of Design and Build projects are better design/construction coordination, more efficient use of resources, shorter construction times and lower costs. Before this contract was launched, developers and contractors have had to hire legal consultants to write and amend their own contracts.

Current assistance schemes to encourage productivity increases include:

Industry Productivity Fund – To encourage companies to collaborate on projects to implement radical changes in strategies, operations and practices leading to significant gains in productivity and competitiveness. Only registered companies are eligible.

Innovation Development Scheme – Encourages and assists construction companies to engage in innovation of products, processes and applications

which can increase quality, efficiency and productivity. Only registered companies are eligible.

Jumpstart Construction Programme – Aims to accelerate online transaction capability in the construction industry in e-submission, e-collaboration and e-procurement. Only registered companies are eligible.

Local Enterprise Technical Assistance Scheme – Helps companies defray costs in engaging external consultants to develop and upgrade management systems. All construction-related SMEs are eligible.

Investment Allowance Scheme – Encourages capital investment in automation and prefabrication. All construction-related SMEs are eligible.

Initiatives in New Technologies Scheme – To equip construction professions with IT skills.

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