A PROSPECTIVE STUDY ON BUILDING QUALITY:
ENFORCEMENT OF CONTROL IN THE AUSTRALIAN
HOUSING INDUSTRY

Mohd Azian Zaidi¹ and Hilary Davies²

School of Architecture and Building,
Deakin University, Victoria
Australia
Email: mazai@deakin.edu.au

Abstract:
The Australian housing industry is beset with quality issues with repeated building
defects causing problems with customer satisfaction and housing performance. These
defects are caused by a combination of initial poor workmanship and poor quality
materials and subsequently by poorly executed or inadequate maintenance. These poor
work practices increase the cost and maintenance of housing. The waste and
rectification work generated by such practices means that the housing industry generally
is not engaged with sustainability. Building Control is part of achieving quality of
building output. Whilst the Australian Building Code has regulations for initial-build
material quality and workmanship, there is no continuing control and effective
enforcement over a house over its life span. Sustainability is not dealt with as a topic at
all in the Building Code with only energy efficiency concerns regulated. Inadequate
knowledge transfer, to the mainly small builders who produce the majority of
Australia’s housing, is seen to be a key issue. Mechanisms to make the transfer of
knowledge to those who need to use it need to be improved. Building regulations, for
example, could be more visual and accessible in their content and small builders should
be encouraged to update their knowledge and skills. This comparative research will
guide industry service providers in improving their performance and suggest how
overall housing quality can be improved (thereby reducing wasteful practices), by
considering more appropriate mechanisms for knowledge transfer among industry
service providers in the Australian housing industry.

Keywords:
Building quality; housing; defects and maintenance; building regulation, knowledge
transfer

¹ Mohd Azian Zaidi, PhD Researcher, School of Architecture and Building, Deakin University, Australia.
² Dr. Hilary Davies, Senior Lecturer, School of Architecture and Building, Deakin University, Australia.
1.0 INTRODUCTION

Research over the last few decades has looked into the quality of building output. The need for improved performance and housing quality within the total building process has led to the evolution and subsequent adoption of quality assurance in building works. The current trend in the construction industry is now moving towards higher quality which can be classified as the degree to which the design and specification meets the requirements for that building (Clift, 1996) and it’s ability to fulfil the functions of it’s intended use (Williams, 1993).

Building quality has become a significant issue worldwide. A series of studies by various researchers in different countries has shown that the construction industry generally performs poorly and not up to standard (Loh, 2007; Peng and Hong, 2005). There needs to be an improvement in achieving quality in housing.

Ensuring that housing has a long lifespan, (and therefore offering effective and efficient sustainable resource use) depends on an initial flexible design that can be adapted to suit changing tastes, and good quality construction and subsequent maintenance.

Initial build quality depends on the selection of appropriate good quality materials and good workmanship. Unfortunately, initial build quality does not meet desirable standards - the costs of rectification and rework are a significant element of building costs – estimated at between 3.4 per cent to 6.2 per cent, (Thomas et al. 2002), or even as much as 12 per cent (Burati et al. 1992) for Australian housing. These unsatisfactory figures result despite building enforcement in Australia regulating material selection, combined with inspections during the construction phase. Once constructed, there is no continuing control for the rest of the building’s life, unless it undergoes major renovation requiring Building Code approval. Over the life of a building, continuing quality depends on adequate maintenance – whether carried out by the owner or contractors. Considering that a considerable amount of maintenance is carried out by householders (largely untrained), (Davidson and Leather, 2000) there is potential scope for some kind of education of the DIY maintenance ‘workforce’ together with building practitioners.

This paper identifies the determinants considered to promote best practice in the construction industry aiming to produce better quality building outputs and longer term good maintenance practices. To achieve this, there is a need for organisations to improve their business skills by implementing, adopting and developing a knowledge transfer process strategy.

Four features considered to be of importance in the knowledge transfer process affecting quality are Control, Innovations, Best Practice Guidance and Audit/Appraisal. These influence the performance of building quality output and are examined in greater detail in the text. The main purpose of this paper is to achieve the following objectives:

i. To identify the key elements and contributors to quality of housing in the Australian construction industry.

ii. To identify the key issues in current practice in relation to the enforcement of control in the Australian housing industry.
iii. To identify any areas for improvement in knowledge transfer that could improve quality of building, by reducing rework and wasteful practices and thus contribute to sustainability.

This research offers a model of the knowledge transfer process that could assist construction industry players and ultimately offer the best product to the end-user in achieving quality of building.

2.0 HOUSING QUALITY OVERVIEW

The housing industry is an important contributor to the Australian economy - with a yearly expenditure of $30.9 billion in 2006-2007 on new dwellings representing 3.8% of gross domestic product (GDP) in 2006 (Mills et al. 2009). However the lack of attention to ‘quality control’ in the residential sector remains a contentious issue when the industry output is typified by defective work and poor quality workmanship (Georgiou et al. 1999; Ilozor et al., 2004; Mills et al., 2009) and more than 20% of householders report building defects (AHS, 1999).

Quality can be defined as ‘fitness for purpose’ (Juran and Godfrey 1999; Ho, 1995). It is described by Crosby (1984) as ‘conformance to the requirement’. According to Clift (1996) the quality of the building is defined as the degree to which the design and specification meets the requirements for that building. Therefore, a building that does not achieve a minimum standard or meet the requirements can be categorised as a low quality output.

2.1 Issues affecting initial building quality

The monitoring of quality standards in building works is an effective means of reducing the building defects and material failure within the building. According to Georgiou et al. (1999), various mechanisms have been adopted in an attempt to improve the quality of housing. However with the increase of the total number of defects in the Australian housing sector, the desired level of quality is still not being achieved (Georgiou et al. 1999; Mills et al. 2009), and failure to meet display home standards or architect’s specification requirements can influence a customer’s satisfaction level (Georgiou et al. 1999).

Research by Ilozor et al. (2004) found that inadequate design information and poor site practice caused housing defects. This study pointed out the most frequent categories of house faults needing attention in Australia were timber framing and roofing faults and suggested that a greater focus on both elements during construction would make economic sense. Similarly, Mills et al. (2009) found that defects in footings and water ingress were the major sources of rework in the housing sector in Victoria, Australia.

One of the problems is the housing supply chain and it’s management. In Australia, for example, 94 per cent of construction trades employ fewer than five people, and less than 1 per cent employs more than 20 people (Commonwealth of Australia, 1999). As a consequence, most of these firms simply do not have the resources to adopt modern principles of quality management (Karim, et al. 2006). The majority of work is carried
out by subcontractors who do not see following trades as their “customer” and do not bear any of the consequences of the rework that they may create (Karim et al. 2006).

Whilst studies identify common defects that may influence housing quality in the Australian residential sector, it would appear that the current system of enforcement control is not as effective it could be. Wong (1996) points out that the current processes in project delivery across the construction industry in Australia do not adequately improve quality. Lack of interaction between the key players in industries and non effective communication are the key contributors to this problem.

There needs to be an improvement in current mechanisms or changes in monitoring practices geared towards ongoing control. Lack of expert knowledge and unfamiliarity with the building regulations are reasons why enforcement is not always effective (van der Heijen et al. 2007). According to the Facilities Management Association of Australia (FMAA, 2006), inadequate knowledge transfer will hinder the quality of building in the Australian housing sector. Wong (1996) suggests that construction firms do not have the necessary knowledge, interest or understanding of the industry that could address the issue of project quality in the Australian construction industry.

3.0 ENFORCEMENT OF AUSTRALIAN HOUSING CONTROL

In the last few decades, the Australian government’s view of building and regulation policy was reshaped by setting in place a reform system in a mission to increase housing quality. The building regulation system in Victoria has been developed during the 1990’s into a leading model for other Australian States and Territories as well as for other countries (Building Regulation Reform, 2004).

Regulation can be defined as the deployment of legal instruments by public players for the benefit of public and private interest (den Hertog, 2003). According to Baiche et al. (2006) it is a central part of government approaches to maintaining and improving quality and performance of new construction.

In Australia, the enforcement of control is governed by a series of regulations. The regulations are administered through various governments and agencies such as Building Codes Australia (BCA), Australian Standards (AS), the Building Act 1993, Building Regulations 1994 and Housing Regulation Policy. Whilst the regulations themselves may be a model of best practice, they need to be effectively communicated and enforcement requires inspection, checking and evaluation in order to be effective.

3.1.1 Building Codes and building quality

Building quality results from initial build quality and from ongoing maintenance and repair. Initial build quality relies on the selection of appropriate materials and good workmanship. Whilst the Building Code provides guidance on initial build quality and a series of key stages are inspected, research provided by Baiche et al. (2006) suggests that the evidence of non-compliance with building regulations in Australia results from inadequate checks and balances to ensure that any new house is safe, properly certified
and built to satisfactory standards. The authors explain that a key concern was the decline in knowledge of the Building Codes amongst builders.

The increasing number of defects in the housing sector suggests that the current system of enforcement of control is insufficient. According to Georgiou et al. (1999) most house buyers assume that the level of quality is uniform amongst all builders due to the requirement for local authority inspections during the construction period. Unfortunately housing quality does not always meet house buyer’s expectations.

3.1.2 Maintenance Practices

The Building Codes do not require any continuing care or compliance with regulations once the construction has been completed, nor do they require any maintenance to be performed. The Australian government allows owners a large element of discretion with regard to their own property and its condition – unless there are imminent hazards to the general public or occupants – for instance from potential collapse. A building owner does have an onus under regulations for ensuring that any safety equipment, safety fittings or safety measures are maintained in a state which enables them to fulfil their purpose.

However, a significant question is how the owners could know what the required standard should be? There are rarely any ‘user manuals’ or ‘maintenance handbooks’ provided for owners describing when maintenance tasks should be carried out. Given that Do-it-yourself (DIY) is a staple element of the spare time activities of many households, little is known about the extent to which basic repair work is carried out nor about the quality of this work (Davidson and Leather 2000). The provision of continuing control together with more advice, information and education by government, local authorities and the private sector could ensure that more DIY work is of better quality and that home owners give priority to essential repairs whether or not they tackle these themselves (Davidson and Leather 2000).

In the public sector, the Australian government has established ongoing control for housing. Under the Housing Standard Policy (Office of Housing (OoH), construction and maintenance standards have been established to ensure all builders meet the policy standards. Under this policy, all public rental housing is required to comply with the minimum standard for maintenance which requires tenants to maintain their properties in a state of good repair during the life of the tenancy. However these maintenance standards are only applicable to those publicly owned properties under the management of the Office of Housing and are not applicable to private dwellings. Obviously these maintenance standards are also important for private housing and providing information about effective maintenance practices to private dwelling owners could improve the long term quality of all housing in Australia.

3.1.3 Housing Asset Management

In the past two decades, Australia has made various reforms in public housing asset management, but there is still a long way to go in terms of the adoption of good asset management practices (Kenley et al. 2009). The challenge is not just ageing stock, but also a lack of basic information on public housing asset condition making it extremely
difficult for asset managers to determine how to allocate funds for individual housing projects. Upgrades and renovation projects are part of the overall management of the housing.

However, maintenance and renovation of large housing stocks is only practical if the quality of the existing dwellings warrants upgrading (Itard and Klunder 2007). Large-scale demolition and construction of new dwellings is not a resource efficient or very sustainable choice. Using Life Cycle Assessment with calculation of environmental effects, the transformation of the existing housing stock is a much more environmentally efficient way to achieve the same result than are demolition and rebuilding (Itard and Klunder 2007).

A combination of initial flexible design capable of future adaptation and construction methods that consider life-cycle costing (understanding the contribution of embodied energy and operational energy use) together with systematic planning for maintenance work would facilitate a significant improvement in sustainability.

Kenley et al. (2009) also point out that many of the most basic good management models used in the private sector are not being used because of the lack of managerial skill within the public sector. Staff engaged in property and asset management in both the public and private sector need to share knowledge and skills and undergo ongoing training. An effective knowledge transfer process will facilitate better management systems to be employed.

4.0 KNOWLEDGE TRANSFER PROCESS IN PRODUCING QUALITY HOUSING

The current trend in the construction industry is now moving towards higher quality. Business re-engineering and performance measurement processes are commonly employed by organisations wishing to improve their performance. However many construction firms do not believe that quality management methods and techniques applied by the manufacturing industry are suitable for their businesses because of the specific nature of the construction process (Kazaz & Birgonul, 2005).

According to Wong (1996) the implementation of quality service systems has been inhibited by the absence of an industry-wide common interpretation of the roles, responsibilities and practices among industry players. It is argued that the current process do not adequately deal with improving the performance in project delivery across the industry and experience has shown that these organisations do not always have the necessary knowledge, interest or understanding of the industry.

It is important to acknowledge that knowledge transfer is essential to all organisations and industry players in construction. Enhancing information sharing amongst the designers, facility managers, researchers, clients, educators, code officials, industry partners and all stakeholders could have a significant impact and effect better quality in the Australian housing industry.

4.1.1 Knowledge Transfer Explained
Knowledge transfer is one of the most important stages of the knowledge management process. It is one of the activities that constitute knowledge work in knowledge management assessment and it is a fundamental component in a knowledge management approach (Fong and Lee, 2009). According to Meagher et al. (2008), knowledge transfer is a one-way flow of knowledge, and also known as ‘knowledge exchange’. It is becoming increasingly important in organisations today and there is evidence of an increased use of knowledge transfer in various companies (Eliufoo 2005).

Knowledge can occur both implicitly and explicitly (Eliufoo, 2005). Explicit knowledge is the knowledge that can be easily captured artificially through say manuals, standard operations and then shared with others either through taught courses or through books for self-study. Tacit knowledge is the knowledge that is stored in people’s heads and is acquired through experience (Nonaka & Takeuchi, 1995) and better shared using communication channels such as face-to-face contact (Carrillo et al. 2006).

In order to achieve effective knowledge transfer, it is important to consider both implicit and explicit knowledge, supported by the elements of effective communication and interaction, creating shared awareness in developing knowledge sharing and continuing the development of human resources through a training and education strategy (Brackertz and Kenley, 2001; Robinson et al. 2005). Moreover the knowledge transfer approach could also be effectively achieved by exploiting the information and technology systems within organisations (Mohamed and Anumba, 2006; Anumba et al. 2008).

4.1.2 Quality Output in Housing Construction Process

Housing construction processes involve various systems in an organisation. The current system in the Australian construction industry must establish effective enforcement control in producing quality housing at all organization levels. Wong (1996) noted that, ‘successful interfacing’ between organisations is one of the factors in achieving building quality output. Similarly to Brackertz and Kenley (2001), good internal and external communications between organisations were seen to be essential as they facilitated better planning processes, better decision making and better outcomes for all concerned.

In order to explain how knowledge transfer has a significant impact on housing quality, this paper proposes four elements to support both knowledge transfer and assist the development of effective enforcement control in the Australian housing sector ‘Control’, ‘Innovations’, ‘Best Practice Guidance’ and ‘Audit/Appraisal’ (Figure 1). Organisations involved in developing useful knowledge for the construction sector (see Figure 1) provide a wealth of excellent advice, standards and current best practice guidance. However, their means of transferring this information to the user (diy-owner-builder, sub-contractor, or builder) is very limited. There needs to be significant improvement in ensuring the information transfers reach the “Actors” ie builders, in the building process.
Figure 1 shows the significant links between these four elements in achieving quality building outputs, requiring improvements in knowledge transfer processes to facilitate better housing quality in Australia.

**Figure 1**: Knowledge transfer and factors influencing production of Quality Building Performance in Australia
4.1.3 Element of ‘Control’

The element of ‘Control’ refers to the enforcement of any building regulation and policy made by the government in order to ensure that any housing project built should comply with the standard. ‘Control’ is the responsibility of government agencies such as the local authority, Office of Housing, Department of Environment etc. in relation to the construction industry.

Communication and effective interaction amongst industry players will contribute to success in this ‘control’ element. Whilst building trades are taught at colleges, without enforcement and monitoring of practice, standards are unlikely to improve (Georgiou et al. 2003). One of the reasons why quality issues recur is due to poor decision making and communication breakdown. Brackertz and Kenley (2001) explain that there were no suitable communication channels and processes between authorities and other agencies. This justifies the proposed need for good multi-way communication. Figure 1 shows the relationship among these four elements by offering a multi-way communication platform.

4.1.4 Element of ‘Innovations’

The element of ‘Innovations’ refers to any research and development (R&D) work that has been made by the various agencies to produce a new technique and technology or greater understanding of the process. The result from these research findings and innovations will be disseminated to appropriate parties in order to achieve better housing quality.

Research bodies such as the Australian Housing and Urban Research Institute (AHURI) and Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) publish and disseminate all their findings to the government and non-government agencies (professional institutions). However, this information is not transferring to those that need to be informed – the builder on site.

The reason for this problem is due to lack of participation and involvement by the ‘actor’ or builder. Research conducted by Baiche et al. (2006) noted that few builders were members of the Joint Select Committee on the Quality of Buildings (JSCQB) and therefore did not access information from these organisations. A key concern of this research was the decline in knowledge of the Building Codes among builders that could contribute to the poor quality housing in Australia.

In an attempt to improve quality, it is important to review current policy and to encourage builders’ involvement. This could facilitate more effective transference of knowledge from related research organisations.

4.1.5 Element of ‘Best Practice Guidance’

‘Best practice guidance’ is an initiative by the government to motivate key players in the industry to apply proper building practice. This could be obtained through research
programmes organised by agencies such as the Australian Building Codes Board (ABCB) and Australian Procurement and Construction Council.

Attendance at seminars and workshops could be a mandatory condition to renew builders’ licences and could be a significant way of updating skills and knowledge. The concept of Continuous Professional Development (CPD) could also be extended to builders and not be limited to professionals such as architects, surveyors and engineers. These approaches could increase awareness among builders of useful information from research organisations.

4.1.6 Element of ‘Audit and Appraisal’

‘Audit and appraisal’ is one of the approaches to set Key Performance Indicators (KPI’s). Benchmarking the performance of the housing industry can be achieved through ongoing audit and appraisal of organisations. However simply conducting audits for benchmarking does not of itself educate people within an organisation. Motivation to improve and to surpass benchmarks can be useful to organisations wishing to stay ahead of their competition.

Rewards and recognition can be a way to motivate people within organisations. Introducing reward and incentives schemes can facilitate motivational achievement in project teams and increase organisation performance (Hartmann, 2006, Grisham and Walker, 2006)).

5.0 CONCLUSIONS

Improving the effectiveness of the enforcement system in the Australian housing industry could be a means to improve quality of housing outputs. A better means of achieving improvements in quality may be through improving knowledge transfer – especially ensuring builders receive updating on building code requirements and other innovations in the industry. Whilst the initiative has been taken to produce an innovative world class set of codes, consistently producing ‘quality’ outputs from the housing sector is proving still problematic. The need to upgrade and improve knowledge transfer approaches will enhance building quality throughout its lifetime by educating the builders, home owners and all industry players.

Better quality housing requires fewer costly defects rectifications or maintenance during its lifetime and therefore reduces wasted resources and contributes to sustainable practices.

Educating those who manage housing stocks (both private and public sector) about sustainable design requirements – using life-cycle analysis for estimating embodied energy and operating energy, and procuring flexible adaptable designs capable of meeting future housing standards by renovation and upgrading, will mean that housing has a longer useful lifespan, again reducing the use of resources.

Knowledge transfer needs to be a continuing activity in educating all parties in the industry. Current issues for the Australian housing industry as suggested by this paper:
i. The current practices in enforcing housing control in Australia are still insufficient with poor transference of knowledge to the builder due to lack of interaction between parties in the construction industry.

ii. Even with current initiatives implemented by the government aimed at improving housing quality, there is still a need for a knowledge transfer approach in an attempt to increase awareness among industry player and home owners.

iii. The key elements and contribution to quality of housing in Australia could be achieved through a more effective knowledge transfer mechanism by adopting the proposed elements of ‘control’, ‘innovations’, ‘best practice guidance’ and ‘audit and appraisal’.

If knowledge transfer is improved, there would be an overall improvement in quality outputs by the Australian house-building industry resulting in less rework and less need for ongoing maintenance, both thereby reducing the use of resources and contributing to sustainable practices.

6.0 REFERENCES


Kazaz, A. and Birgonul, M.T. (2005), The evidence of poor quality in high rise and medium rise housing units: a case study of mass housing projects in Turkey, Building and Environment, 40, 1548-1556


