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Builder Registration in Victoria, Australia - A Sign of Things to Come?

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Abstract

Builders have a long history of a public perception of poor image and low quality products. Political and administrative demands for builder registration and tighter control of entry into the industry have been seen to be the solution to these problems. However, progress towards registration and control has proved elusive. Recently, the state of Victoria in Australia introduced mandatory builder registration under its Building Control Act 1993. Further reform for the housing industry was introduced in 1996 through the Domestic Building Contracts and Tribunal Act 1995. As the first legislation of its kind in Australia, the Victorian experience provides a case study for similar developments elsewhere. This paper reviews the history of builder registration in Victoria and identifies the major provisions of the 1995 Act, including the organisations established to regulate and supervise the implementation of the legislation. The perceived drawbacks and benefits of the new system are also analysed in the short period since the introduction of the legislation.

Keywords: Construction industry, builder registration, building control legislation.

INTRODUCTION

The lack of attention to quality by house builders in the Victorian Housing Industry has been a contentious issue for more than two decades. In an attempt to improve the quality of housing, various mechanisms have been adopted and discarded by industry-based organisations and government legislation. While builders are admonished to improve construction quality, little is known and published about the quality of housing produced by owner builders. This paper provides a critical review of the history of builder registration in Victoria and identifies the major provisions of the 1993 Act, including the organizations established to regulate and supervise the implementation of the legislation. The perceived drawbacks and benefits of the new Victorian system are also analysed in the short period since the introduction of the legislation. It is suggested that builder registration may form part of the construction industry's strategies for reform in the next century for both developed and developing countries.

BACKGROUND

Builder registration in Victoria has evolved over a number of decades. First attempts proved to be inadequate, but from the experience more robust and practical schemes have emerged. This paper reviews the history of attempts at consumer protection and builder registration to the present day. The current system enjoys the benefits of a number of attempts to ensure the customers of domestic building get the same protection and quality of product as the consumer of any commodity in our community. Historically, builder registration has been perceived as the preferred method of ensuring that the industry provides the required levels of quality control and service the community and customers expect. Whilst developments in this area over the last twenty years have been more substantive, the first attempts at registration and regulation of builders date back as early as this century.

The oldest established building company representative organisation in Victoria, the Master Builders Association (MBA) has been the primary champion of builder registration. In fact, as early as 1911 and 1914 it is recorded that the MBA advocated the registration of builders through representations to government (Victorian Government, Hansard, 1973). The issue then appears to have been relegated in importance for many years, probably due to the First World War and the severe economic circumstances during the 1920's and early 1930's. However, during the 1930's, Keast, (1994) stated that, '*... registration of builders was an ongoing saga with more information from all over being gathered together from New South Wales, Ohio, New Zealand and Western Australia*'. Nonetheless, little progress towards its legislative introduction seems to be evident. Another failed attempt was made in 1941, when Second World War activities may have removed it from legislative view. However, with the end of the War the issue emerged again with the MBA approaching government in 1945. Subsequently in 1946 the state minister provided support and in 1947 it gained national prominence when, '*... the Prime Minister was reported as wishing to discuss at the Premiers' conference, the subject of registration of builders*' (Keast, 1994). Needless to say, registration of builders never eventuated.

Through the 1950's registration as an issue never quite disappeared and in 1958 the Building and Allied Trades Association (BATA) joined the chorus for the introduction of a builder registration scheme. Unfortunately, due to competition between BATA and the MBA, a scheme for comprehensive registration was lost. However, the two employer bodies continued their dialogue and by 1960 a joint proposal to government narrowly failed. A gap between the two employer bodies developed once again because BATA preferred voluntary registration whilst the MBA maintained its preference for legislated registration.

Meanwhile, the government and the community were concerned about the state of the building industry. The Statute Law Revision Committee prepared a report on the bonding of contractors and in handing down their report considered that registration was not a solution to the problems facing the industry (The Australian Builder, 1962).

The Committee believes that most of the building industry's difficulties arise more from financial instability and managerial incompetence rather than technical inability, and is accordingly of the opinion that the implementation of a registration scheme would do little to remedy these defects.

Thus, the *status quo* in this early part of the 1960's prevailed. It appears with hindsight that the major impediment to change was political ideology. The free enterprise system was considered to be of prime importance and any government intrusion was viewed as socialistic interference with free market philosophies of the time.

Certified Homes Scheme

Nevertheless, the MBA continued to pursue legislative registration as they considered it was the best way to improve the image of builders through the better quality control that registration would bring. Its plan was to introduce the 'Certified Homes Scheme' which offered a two years structural warranty. Modeled on a UK program (National House Building Council) based with an insurance company that would take responsibility for 'making good' only when a building company becomes insolvent. It was not a registration of builders, but a registration of houses constructed by builders to a standard that the MBA and the insurance company were prepared to accept. The scheme was introduced in 1961 with a great deal of enthusiasm and confidence. Within its first five years the scheme was in trouble and 1967 discontinued it. Approximately 1,110 houses were registered with this scheme over its six-year life. Coincidentally, the rival body, BATA, commenced its 'Certified Homes Scheme' in 1961, one-month after its competitor's scheme. Strangely, BATA (known as the Housing Industry Association from 1972) also had insurance problems, probably due to the fact that it used the same insurance company as the MBA. This scheme is also believed to have foundered in 1967.

The Certified Homes Scheme was the first concerted effort by the industry associations to address community concerns about the quality of house construction. The major reason for its failure is believed to be its voluntary nature. While there was a growing community perception of lower quality standards in

house construction, it did not translate into greater demand for higher quality obtainable through the schemes on offer. In the absence of demand by consumers, builders did not see the need to continue the schemes, as they did not add to their business. Failure of both schemes focused attention on *builder* registration as distinct from *house* registration that these schemes incorporated.

The MBA favoured registration by government legislation with minimum educational and competency standards. The HIA championed registration administered by industry. Both industry bodies went their separate ways and lobbied government individually. Each body believed its voluntary registration approach would enhance the standing of its members.

In 1972, the HIA instituted its own voluntary registration scheme establishing the House Builders Registry Board (HBRB). This Board enabled its members to offer a six-year structural warranty. In contrast, the MBA remained committed to compulsory registration despite the introduction of the HIA's voluntary registration scheme. However, to avoid leakage of members to the HIA, the MBA also introduced its own voluntary scheme, The House Guarantee Scheme. The MBA did not promote the widespread use of the scheme, and recommended that it be used only if requested by clients. This guarantee was effective for a period of one year after the certificate of occupancy was issued. Other pressures were building up over the years. In retrospect, probably the greatest impetus to legislated protection for consumers came in 1964 with the introduction of the *Consumer Protection Act*. Inevitably, the building industry came in for its fair share of criticism. The governing body under the Act, the Consumer Protection Council, brought the industry into its targets in a number of its Annual Reports from 1967 onwards. This culminated in a firm recommendation in its Annual report of 1973.

The Council strongly recommends to the Government that it passes legislation requiring the licensing of all builders and companies engaged in building. It should also cover the establishment of an independent tribunal to deal with complaints by consumers against builders as to unsatisfactory workmanship and delays in completion under the terms of the agreement entered into by the consumer with the builder.

House Builders Liability Act

The Government was obviously influenced by community pressure, the industry bodies and the Consumer Council and responded by introducing an industry administered builder registration scheme known as The Local Government (House Builders Liability) Act, 1973. Despite the introduction of this mild form of builder registration, complaints to Consumer Affairs continued unabated. The main features of the new Act were:

- Suitability for registration was determined by the two funds (generally to be a member of the HIA or MBA).
- Only new homes were covered.
- Owner builders were exempt from registration if the house was not sold for one year.
- Period of guarantee was from date of certificate of occupancy.
- Protection for owners in case of bankruptcy by builder.
- Guarantee covered work to a maximum of \$40,000.
- Provided for arbitration in case of disputes between parties.
- Notification of defects had to be in writing and made within three months of the complainant becoming aware of defects.

The Act may have been well intentioned, but it was doomed to failure. Both industry associations saw the Act as an opportunity to enhance the status of builders, but more importantly as a vehicle to increase membership. Unfortunately, the interests of the consumers seemed to be a minor consideration. In addition, the two bodies marketed their schemes differently. The HIA presented its scheme as straightforward insurance, which created the perception that once a house was completed it became the insurance company's responsibility. In contrast, the MBA maintained that the builder was always responsible for the quality of the house constructed. The fund would only meet its guarantee obligations in the event of default by the builder. From its introduction, the system of registration did not reduce the complaints. Many were

due to poor practices in technical content and dubious contractual applications. A number of Ministry of Consumer Affairs annual reports cited several problem areas:

- Differing standards of workmanship;
- Dispute resolution mechanism was perceived as favouring builders; and
- Notification procedures for complaints were inadequate.

By 1983 it was evident that changes would need to be made. The government asked a committee consisting of representatives from the Ministry of Consumer Affairs, industry bodies, community and consumer bodies to review the Act. In 1984, the Act was amended and the two industry funds were merged to form the Housing Guarantee Fund administered by the Ministry of Consumer Affairs (see Figure 1).

Housing Guarantee Fund

Despite amalgamating the funds an undercurrent of consumer dissatisfaction remained. This culminated in more legislation, requiring tighter control of the industry, to be enacted with the introduction of the House Contracts Guarantee Act 1987 (operational in 1988). The main features of the Act were:

- A seven-year guarantee from the date of contract or building approval (whichever was earlier).
- Applies to new houses and for the first time to renovations, alterations, additions and repairs with a value in excess of \$3,000.
- Contracts required to state financial arrangements such as deposits and progress payment schedules.
- Deposit set at 3% for work in excess of \$20,000.
- Compulsory for all builders to be a member of the HIA or MBA (but this requirement was deleted in 1992).
- Variations had to be in writing, signed and dated by both parties.
- Guaranteed maximum coverage remained at \$40,000.

Provisions of the new Act would be administered by the Housing Guarantee Fund Limited (HGFL), which was a private non-profit company. It derived its income from annual registration fees from builders and a registration fee for every house constructed. Needless to say, both industry bodies believed that a substantial bias in favour of consumers had taken place with this legislation. Consumers were not satisfied with the new arrangements either. Annual reports of the Ministry of Consumer Affairs continued to report similar difficulties with the new Act as existed previously. Whilst some of these could be attributed to the flow-on effect from the old Act, the trends were worrying. Consumers became more vocal and lobbied government and made submissions at a number of forums. Eventually, an investigation and review of the House Contracts Guarantee Act 1987 was conducted, which climaxed in the finding that the Act was inadequate. Specifically, the major problems (Kliger, 1991) of the housing industry were:

- *poor quality of finish* - differing opinions and expectations of builders and consumers.
- *delays and variations* - additional costs caused by delays in construction by items that could be reasonably foreseen.
- *poor workmanship and defects* - disputes about poor quality workmanship and defects resulting in delays and costs.
- *major and minor defects* - differing opinions of builders and consumers on the severity of the problem.
- *poor supervision* - insufficient supervision of sub-contractors.
- *practical completion* - disagreement about what constituted practical completion and completion of stages in construction. This had ramifications for progress payments.
- *ignorance by consumers* - consumers were unaware of their rights and obligations during the procurement and construction process.

The Housing Guarantee Fund attempted to address these issues, with mixed success. This period also coincided with considerations for uniform national regulations resulting in the National Model Building Act. The reform process in turn led to the Victorian Building Act 1993 based upon a national model. The initiatives in this Act ranged from privatisation and deregulation of the building approval process through to

restricting some aspects of legal liability. But most importantly, it required all building practitioners to register with the Building Practitioners Board in the newly formed Building Control Commission.

BUILDING ACT 1993

The Building Practitioners Board was established under the Building Act 1993 to oversee the quality and standard of the professional services provided by building practitioners in terms of public health and safety.

The Regulations describe the various categories of building practitioner and the qualifications and experience required for a person to be legible to apply to the Board for registration as a building practitioner. The Act is a milestone in builder registration as it established a significant governing body, the Building Control Commission, to oversee the operation of the registration and regulations systems.

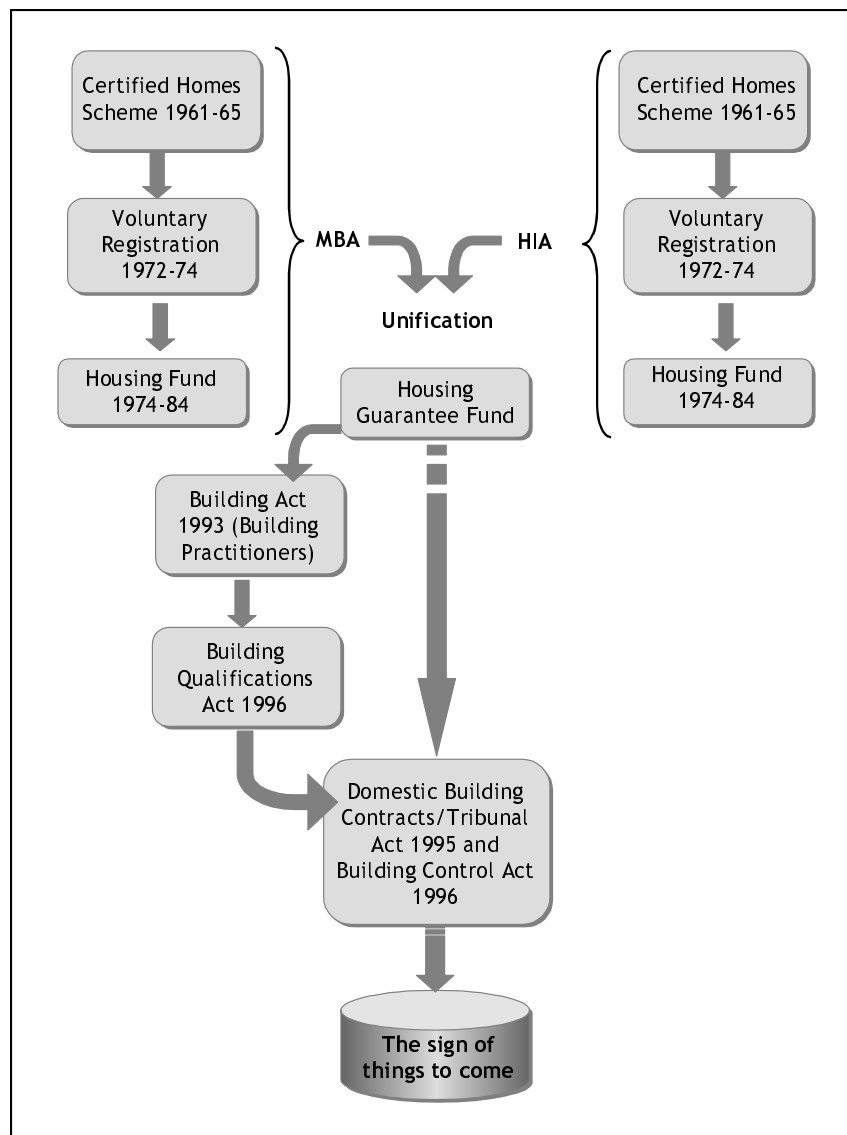


Figure 1 The Roadmap for Builder Registration Victoria

The main functions of the Building Practitioners Board are to administer the building practitioner registration system, report to the Minister on the qualifications requirements of building practitioners, monitor the conduct of building practitioners and deal with any other functions conferred by the Act or Regulations.

Building (Qualifications) Regulations 1996.

These regulations define building practitioners. Building practitioners include building surveyors, building inspectors, quantity surveyors, engineers, draftspersons who prepare plans for building work or prepare documentation relating to permits or permit applications, builders (commercial, domestic and demolition) and persons who erect or supervise the erection of temporary structures. The trades and on-site skill categories are also defined and regulated. Architects are covered separately under the provisions of the Architects Registration Act 1922 as administered by the Architects Registration Board of Victoria.

A significant departure from the past is that in these regulations it is the individual who is registered, *not a company*. This prevents the individual trading under a new company name, which was a problem encountered in previous legislation.

DOMESTIC BUILDING CONTRACTS AND TRIBUNAL ACT 1995 (DBC&T ACT)

From May 1996 the Housing Guarantee Fund Limited (HGFL) was no longer responsible for registering builders and building projects, and providing warranties. Each domestic builder was required to register with the Building Practitioners Board and, under the requirements of the DBC&T Act, to take out appropriate insurance in relation to all building work undertaken (see Figure 1).

The DBC&T Act operates under two main requirements to regulate the quality of domestic building. These are:

- Insurance of the works; and
- Registration of the builder as a building practitioner.

Insurance

In order to obtain a building permit from the planning authority or local council, a domestic builder will need to show proof to the building surveyor that they have the required insurance and they are registered as a building practitioner. The insurance must be validated by the Building Practitioners Board and be for a period of 6 years and 6 months, either with the name of the builder or the name of the building owner. During construction of the house a builder must also hold valid professional indemnity insurance. The lessons from previous experience again are evident, as the individual rather than a convenient *shelf company* must hold the insurance.

A builder carrying out domestic building work of more than \$5,000 in value must be registered and this ensures that consumers are protected by a valid insurance policy. The project cannot be broken up into a series of small separate contracts below the \$5,000 limit to avoid this protection. However, single trades such as electrical, glazing, floor covering, insulation, painting, plastering, plumbing and gasfitting are exempted from this requirement. Normally, when a domestic builder undertakes building work which involves more than one trade and the work includes structural work then they need to be registered and a building permit must be obtained for building work.

There are three classes of registration for domestic builders:

- A domestic builder (unlimited) being a person who has adequate knowledge and experience to carry out, manage or arrange to carry out all components of domestic building work;
- A domestic builder (limited), and
- A domestic builder (manager) being a person who has adequate knowledge and experience (including financial management) to manage or arrange the carrying out by a registered builder of the components of building work.

Qualifications for registration

These were originally defined in the Building Regulations 1993 and amended in the Building (Qualifications) Regulations 1996. In the 'unlimited' class the builder needs to possess an accredited degree, diploma or associate diploma and have three years of practical experience; or have completed a 'Course in Builder Registration (BPB)' together with three years practical experience. In the 'limited' and 'manager', a may certificate issued by the Building Practitioners Board, after examination of the applicant, which defines the components of domestic building work which that registrant may undertake. However, an existing builder could be exempt from these requirements if they had been registered in the previous scheme with the Housing Guarantee Fund before 1 May 1996.

ROLE OF BUILDING CONTROL COMMISSION

The Building Control Commission was established under the Building Act 1993 and it oversees the administration of building control in Victoria. The Commission is a self-funding corporate body subject to the direction and control of the Minister for Planning and Local Government. The role of the Commission is to develop and apply building law to provide for the design, construction and maintenance of healthy, safe, habitable and energy-efficient buildings. Another of the Commission's tasks is the role of promoting national regulation reform. It aims to increase the efficiency and cost-effectiveness of building regulations and improve their responsiveness to the needs of the construction industry and the community. The income of the Commission is provided by a statutory levy of 0.064 cents for every \$100 of the cost of the project when it is more than \$10,000 in value. The levy is paid to the relevant building surveyor before a building permit is issued.

Building Advisory Council

A Building Advisory Council was established under the Building Control Act (1993). The Commission provides administrative support to the Council. The Council advises the Minister on the administration and impact of the legislation and regulations on the building industry and the community. Its members consist of representatives of the industry and professions:

- Royal Australian Institute of Architects (Victorian Chapter)
- Master Builders Association of Victoria (MBAV)
- Housing Industry Association (HIA)
- Australian Property Council
- Australian Institute of Building Surveyors (Victorian Chapter).

Building Practitioners Board

This Board comprises building practitioners drawn from major professional organisations who are appointed upon the recommendation of the Minister. It administers the registration system of building practitioners and monitors their performance. It may also make recommendations to the Minister regarding qualification and on insurance matters.

Building Appeals Board

The Board's role is to hear applications for modifications to the building regulations, decide on any disputes or appeals arising from the Building Act and listen to appeals from the Building Practitioners Board.

Disputes and Complaints

If disputes cannot be resolved between the parties, they can be referred to the Domestic Builders Tribunal which is administered under the Domestic Building Contracts and Tribunal Act 1995. The Tribunal has unlimited monetary jurisdiction to hear and determine domestic building disputes, owners' insurance claims

and insurers' decisions on such claims and requests to stop building work that does not comply with the contract. The Tribunal may advise mediation, order payment of money, vary a term of the contract, order rectification of defective work, and enforce any right of indemnity against a builder by an insurer.

Complaints about the conduct of Building Practitioners must be written and signed and lodged with the Commission. The Commission will investigate the complaint and may refer the matter under investigation to the Building Practitioners Board for its consideration and subsequent action.

Building Regulations Advisory Committee

This Committee advises the Minister on changes to the Building regulations. The Committee's membership comprises the Commissioner together with architects, builders, building surveyors, engineers and building owners as well as a representative from the fire authorities, state government and local government and the Melbourne City Council.

SUMMARY

The perceived drawbacks and benefits of the new system in the short period since the introduction of the legislation may be analysed. The perceived benefits of the builder registration are:

- The building practitioner must be insured to carry out the works and this protects the consumer.
- The commencement date for the liability period for insurance and disputes is fixed.
- Refusal of insurance for a building practitioner results in de-registration or non-registration by the Building Practitioners' Board. This has led to more individual responsibility being borne by practitioners.
- The registration requirements, taken with privatisation of building permits and approvals, has improved the speed of the system leading to cost and time savings.
- Consumers have greater protection.
- The building permit levy has generated funds that are being channelled back into the industry for research and education.

The possible drawbacks of the new system are:

- Consumers are paying more for building work and professional services because of the requirement for compulsory insurance for all practitioners and professionals.
- The building permit levy (0.064 cents per \$100 construction costs) is added to the costs of projects and passed on to the consumer in higher building costs.
- Despite the insurance and qualifications requirements for building practitioners, there are still some disreputable individuals and firms whose quality of work and service is not up to standard. In these cases consumers will still not be satisfied with their work.
- When all builders registered with the HGF were automatically transferred across to the Building Practitioners' Board in 1996, the transfer included bad builders; for example, six bankrupt firms were registered.
- Some unregistered builders are still practising in the industry, illegally.

The system of builder registration in Victoria has evolved over a period of thirty years. Each step in the process has built upon the experience gained with the previous scheme, eliminating the obvious drawbacks with each stage. Registration has developed from voluntary arrangements, to registration of companies with insurance providing the means to protect consumers. The latest stage can be described as a scheme based on registration on the basis of the insurance of individual building practitioners with the necessary qualifications and experience to be insurable (see Figure 1).

It is too early to state categorically whether the most recent scheme described in this paper is a success. The authors' research on defects in houses constructed under the HGFL scheme indicated generally low levels of

defects at an average of two defects per house (Georgiou, et al, 1998). Similar studies have not been carried out on houses under the present scheme. However, the early positive indications are that consumers appreciate the insurance protection it affords on an expenditure that is larger than most they commit themselves to during their lives. Statistics are not available to determine whether the level of disputes and defects have dropped as a result of the *policing* role conducted by the Building Control Commission and its various boards and tribunals. The registration arrangements in Victoria, Australia, (together with the organisations and bodies established in this important area) deserve close study by other administrations that grapple with similar problems in the construction industry. This form of consumer protection may be the most practical way forward in the new millennium.

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Changes in the European Large Scale Engineering Construction Industry

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Abstract

In recent years the Large Scale Engineering (LSE) construction sector in Europe has seen profound change. This is mainly due to increasing competitive pressures from the United States and the Asian Pacific countries which has led in turn to increased pressures to improve competitiveness, productivity and client satisfaction. Lack of understanding of clients' and contractors' requirements hinders achieving such goals especially with the increasing trends of executing LSE projects in a "virtual enterprise" environment. ICT (Information and Communications Technologies) vendors and developers also need to understand clients' and contractors' requirements of systems and to align their products to them. This paper reports on findings from studies undertaken within the eLSEwise (European Large Scale Engineering Wide Integration Support Effort) ESPRIT project to investigate the LSE construction industry requirements, and identifies gaps in the relationships of clients and contractors with other parties of the supply chain and in ICT provision.

Keywords: Large scale engineering, information and communication technologies, construction, eLSEwise, virtual enterprise.

INTRODUCTION

The European Large Scale Engineering (LSE) industry operates in a global market. In recent years it has seen profound change reflecting on the emerging political, social, economic and technological developments. Increasing competitive pressure globally, clients' demand for lower costs and better quality, coupled with new developments in information and communication technologies and deregulation and privatisation of utilities, have all come together to force players in the LSE sector to review their traditional ways of doing business. This is in line with the industry's commitment to improve its competitiveness, productivity and client satisfaction.

The studies presented in this paper were undertaken within the eLSEwise (European Large Scale Engineering Wide Integration Support Effort) project which is part of the European ESPRIT (European Union's information technologies research in technical developments) programme. eLSEwise is a user reference project which took a business led approach in identifying the European Large Scale Engineering (LSE) construction industry requirements for Information and Communication Technologies (ICT). eLSEwise aimed to reduce the fragmented nature of the current European LSE industry to improve competitiveness through integration of information and processes and enable it to collaborate more effectively in an increasing global market for LSE (Garas and Hunter, 1999).

Within the context of this paper, "Large Scale Engineering" refers to the complex multi-discipline engineering (both design and construction) which is encountered at the top-end of the construction industry's spectrum of activities (Watson, 1996). LSE includes complex buildings, process plant,

infrastructure, significant civil engineering work and other major construction works. A LSE project has the following attributes (Watson, 1996; Brohn *et al*, 1997; Hunter *et al*, 1999):

- “High” capital cost
- Long duration but programme urgency
- Technologically and logistically demanding
- Requires multi-disciplinary inputs from many organisations.

Different parties to the construction process need to understand and fulfil clients' business and information requirements throughout the product life cycle from inception to operation, maintenance and decommissioning. However, it is also important that clients understand requirements and views of the contractors who undertake their projects. Information and Communication Technology (ICT) vendors and developers also need to understand clients' and contractors' requirements of ICT systems and to align their products to them.

The research described in this paper aims to identify clients' and contractors' business and ICT requirements of the LSE industry and presents their views of the LSE environment. This was achieved through a focused workshop supplemented by questionnaire surveys issued to LSE clients and contractors across Europe. The main requirements and views with regard to the LSE business environment were identified during the workshop and then ranked and prioritised through the questionnaires. In the same manner, the usage of the different means of information exchange was established, the degree of importance of different information systems within the LSE clients' organisation was identified, together with the areas where sharing information between different parties of the supply chain are necessary. The paper also outlines the vision developed by eLSEwise for future execution of LSE projects in a "virtual enterprise" environment. Finally, the paper concludes with a set of recommendations for the LSE industry and for ICT developers and vendors based on the eLSEwise findings.

THE CLIENTS' ELECTRONIC WORKSHOP

The aim of the workshop was to gain clients' views on current and future business and ICT requirements of the LSE industry across the different construction sectors, including complex buildings, process plant, infrastructure, and special large scale civil engineering projects. The objectives of the workshop were to:

- investigate clients' business drivers and objectives and the application of ICT to serve clients' business needs currently and over the next 10 years; and
- investigate clients' requirements from the supply chain to achieve their business objectives (also currently and over the next 10 years).

The participants in the workshop were senior representatives from large-scale engineering client organisations. Data elicitation during the workshop was undertaken partly electronically via a local computer network and partly manually via discussions and comments on initial results. The participants were divided into two groups and each participant was allocated a computer. The questions appeared on each participant's screen and the facilitator explained each question in more detail. Discussions were generated among each group before each participant entered his or her answer. A separate window on each screen displayed the group answers. After all participants entered their answers for each question, the groups' answers were printed and distributed for further comments and discussions. The electronic workshop enabled an equal participation of all the attendees, acquiring more 'hard' information in shorter time compared to traditional workshops and better time management for the workshop (Hassan *et al*, 1997).

LSE CLIENTS QUESTIONNAIRE

The objective of the clients' questionnaire was to investigate and prioritise the different factors and issues that were identified by the clients' electronic workshop. The questionnaire was issued to some 90 European clients. Although the response rate was disappointing (only 19%), covering the different LSE sectors, it did confirm one of the findings of the workshop which is that clients organisations are downsizing (and relying on more input from contractors) and there are increased time pressures on staff which reduced their participation in research activities (Hassan, 1998a).

LSE CONTRACTORS QUESTIONNAIRE

The objective of the contractors' questionnaire was to investigate the LSE industry's response to clients' views and requirements identified from the above mentioned workshop and questionnaire. In order to ensure a satisfactory response rate and geographical spread, the questionnaire was distributed through the eLSEwise project consortium. Each partner had to issue the questionnaire to LSE contractors in their countries (eight different European countries). Responses from a total of 34 LSE contractors were analysed (Hassan, 1998b).

The following sections describe the main findings from the workshop and questionnaires.

CLIENTS VIEWS AND PERCEPTIONS FOR CHANGES IN LSE BUSINESS ENVIRONMENT

The relationship between clients and contractors is changing with clients seeing a swing of responsibilities and risk from the client's side to the contractor. This is due to Clients out-sourcing their non-core activities to contractors and relying on more technical input from them. The result is a decrease in size of clients' organisations and loss of construction expertise.

Clients who responded to the questionnaire were asked to rank the importance of different factors which impact the LSE industry. These factors were identified by clients who attended the workshop as:

- Partnering/alliancing
- Private Finance Initiative
- Increasing regulations particularly Health and Safety
- More technical input from contractors
- More risk allocation to contractors
- Sharing expertise between clients
- Electronic information and documentation
- Increase in volume of information exchanged
- Change in size of clients' organisations
- Reduced time scale of projects
- Clients out-sourcing non-core activities.

Reduced time scale of projects, partnering/alliancing, reliance on more technical input from contractors and more risk allocation to contractors were found to be the most significant factors to impact the LSE industry currently and during the next 10 years. Electronic information and documentation, changing in size of clients' organisation and clients out-sourcing non-core activities will gain more importance in the future.

In a similar manner, different factors and issues, which have been identified during the workshop, were prioritised and further investigated through the questionnaire. The analysis of the results showed that there will be major shift in procurement routes during the next 10 years towards strategic alliances and integrated

supply chains. Capital cost, quality, profitability and time scale of projects represent the most important factors considered by LSE clients in the business case of LSE products currently and in the future. However, in the next 10 years quality will be gaining more relative importance and the clients' cost focus is shifting from capital expenditure to total life cycle cost (Hassan *et al*, 1999).

Health and safety represents an important aspect in the clients' current and future view of the LSE industry. Clients envisaged growth in health and safety regulations and the use of information systems related to health and safety.

Although LSE clients maintained that their relationships with other parties of the supply chain are currently strong, they envisage a change in such relationships over the next 10 years as follows:

- Increased dependency on a small number of strategic alliances leading to an integrated supply chain.
- A greater role for regulatory bodies especially with regard to environmental issues. This may lead to a "tense" relationship with authorities.
- More technical dependency on contractors.
- Greater input from partners and funding bodies.
- More direct involvement with suppliers.
- Stronger relationships with consultants and funding bodies.
- Client/supply chain relationships will take the shape of a "private enterprise".
- Partnerships with other governmental bodies.

CLIENTS VIEWS AND PERCEPTIONS FOR CHANGES IN THE LSE ICT ENVIRONMENT

The analysis of the clients' questionnaire showed that the massive amount of information in paper format is being replaced by a massive amount of information in electronic format and there is a major shift in information exchange from paper, telephone and fax to e-mail and proprietary computer networks in the next 10 years as illustrated in Figures 1 and 2. However, managing such information remains a key issue. There is a growing need to train managers and executives in information management.

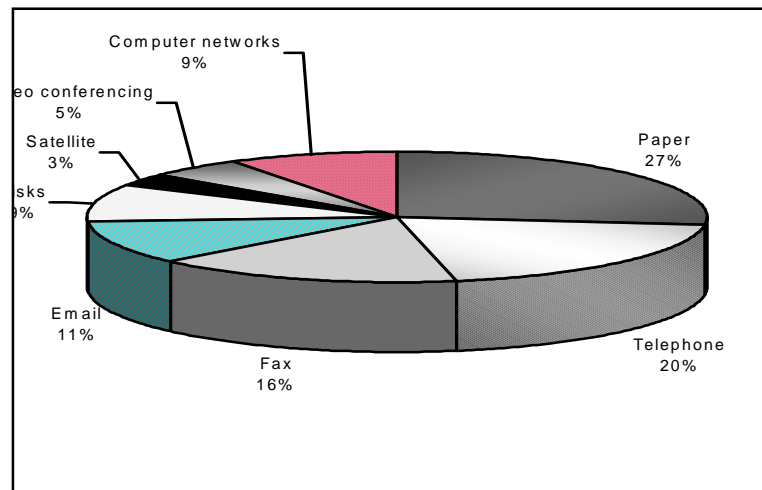


Figure 1

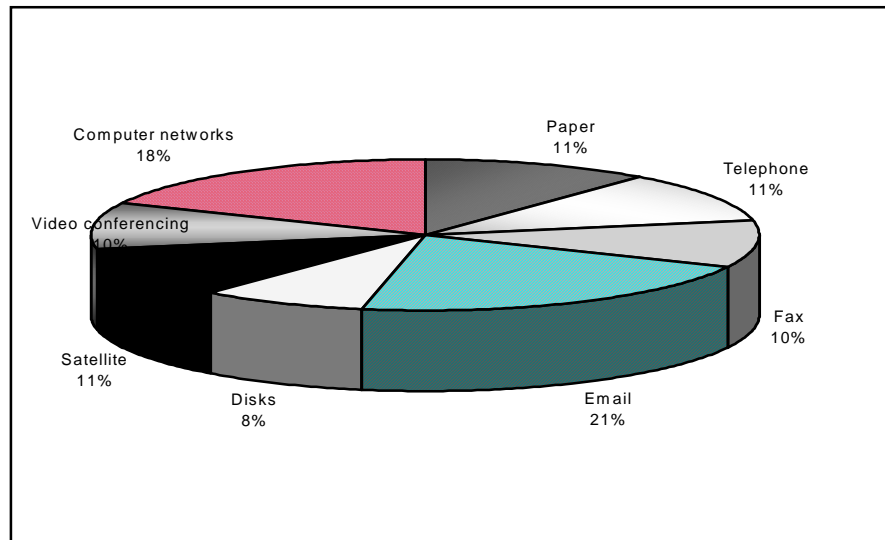


Figure 2

The most important systems for clients' organisations currently are finance and accounting, project planning and human resources. There is an increase in the importance of project planning, QA (Quality Assurance) systems and documents control; materials procurement, CAD systems and communications systems during the next 10 years.

There is a need for electronic sharing of information between clients information systems and those of:

- Contractors in the areas of CAD, project planning, materials procurement, QA systems & documents control, modelling and calculations and communications systems.
- Project Managers in the areas of project planning and QA systems and documents control.
- Funding bodies in the areas of finance and accounting.
- Consultants in the areas of modelling and calculations.
- Suppliers in the areas of materials procurement.

LSE Clients prefer to use proprietary ICT tools than bespoke ones as they want to focus on their core business not on IT development. They identified their requirements in ICT provision as:

- Systems to be developed to match business needs.
- Systems to be proprietary not to be bespoke.
- The ability for the system to be fully used by non-IT specialist with low level of training requirements.
- The ability to use the same system reasonably independent of computer hardware.
- The ability to be able to manage (track and control) electronic information within the system.
- Ease of information archiving, retrieval and updating throughout the whole product life cycle and not the life of the computer system.
- The ability to easily exchange digital information with other applications/ information systems using appropriate data exchange standards.

There is also a need for more integration not only between different systems within the client organisation and between the client's organisation and the supply chain, but also between different software of the same information system (a typical example is CAD systems).

CONTRACTORS VIEWS AND PERCEPTIONS FOR CHANGES IN LSE BUSINESS ENVIRONMENT

The responses to the contractors' questionnaire showed that LSE contractors are reacting to clients' views and requirements positively. They have also identified that 'partnering /strategic alliancing' and 'electronic documentation and information exchange' represent the most important factors having an impact on the LSE industry over the next 10 years. Contractors preferred a 'functional specification' type of brief from the clients as it allows them to innovate in the methods and technologies they apply for construction.

To respond to clients' requirements, LSE contractors have identified the following sources of competitive advantage for their organisations:

- The ability to generate sources of project funding and provide clients with better value for money.
- The ability to build partnerships/alliances.
- Reducing project time-scales which lead to increase of certainty.
- Technical expertise, experience and reputation.
- Capability to carry risks.
- Fostering a whole life cycle view for LSE projects/products.

In order to meet clients' requirements, and to achieve the identified sources of competitive advantage, LSE contractors have to extend their roles within LSE project delivery; moving from the traditional function of design or construction service provision, through that of project management of the design and construction, to one of developing a complete business. This requires extending the range of contractors' skills and knowledge base from pure construction, to design and construct, through working with clients to improve value-engineered design, construction and operation and latterly to become the complete sponsor and developer of complete businesses from concept to operation and maintenance. This is illustrated in Figure 3. This new role of business development was instigated by the needs of private funding of public sector projects, leading to the adoption of new contract forms such as BOT (Build-Operate-Transfer) and BOO (Build-Own-Operate) which require the constructor to operate the facility as part of his recovery of initial project finance. These aspects are reported in more detail in (Mitrovic *et al*, 1997; Hassan *et al*, 1998).

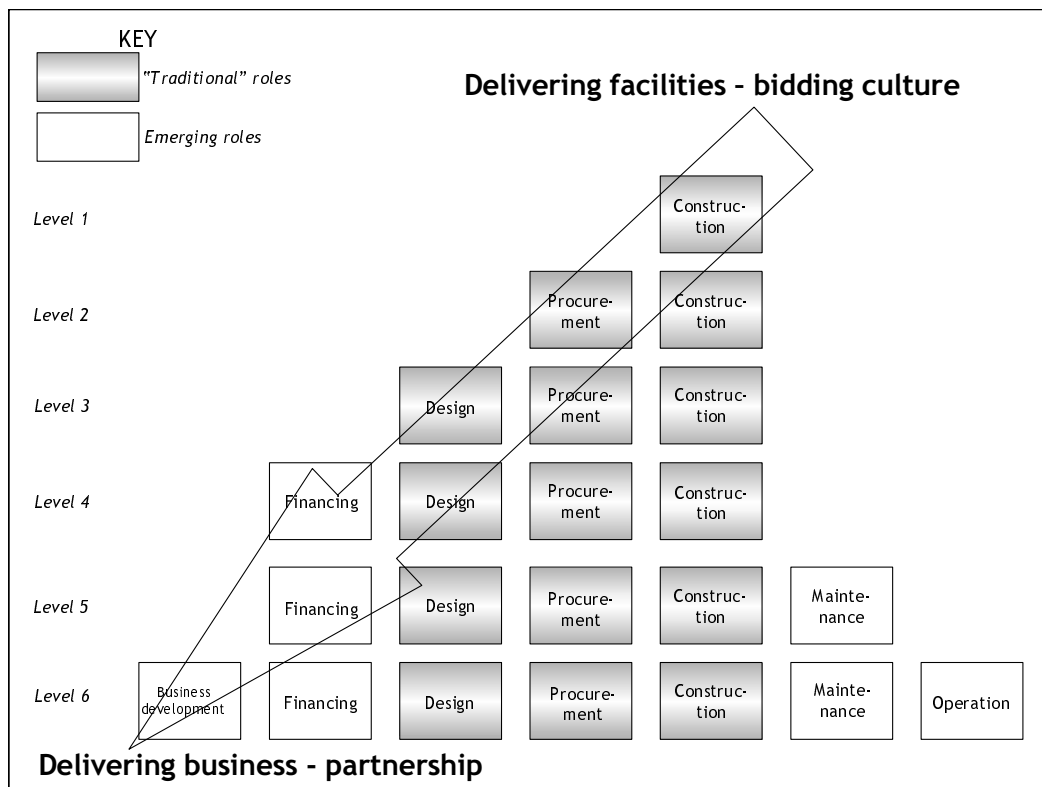


Figure 3

CONTRACTORS VIEWS AND PERCEPTIONS ON CHANGES IN LSE ICT ENVIRONMENT

LSE organisations will be increasingly turning to forms of applied ICT to assist with the understanding, planning and control of project information as well as the exploration of possible options to optimise proposed solutions.

The results of the contractors' questionnaire survey showed that the usage of e-mail for information exchange is anticipated to increase from 3% to 20% during the next 10 years and that the usage of external computer networks will increase from 2% to 16%. This shift is even more apparent in exchanging information between the contractors' offices and the site. This is undertaken currently via the traditional ways (paper, telephone and fax) 95% of the times. During the next 10 years it is anticipated that 60% of information exchange between office and site will be undertaken electronically.

It is expected to have a significant increase in the usage of the following information systems during the next 10 years:

- 3D Modelling
- Quality assurance/control systems
- Health and Safety
- Communications
- Procurement
- Logistics.

ICT tools should be able to exchange digital information with other applications/systems using appropriate data exchange standards. There is a need for more utilisation of existing data exchange standards such as

STEP and EDIFACT as currently contractors rely on exchanging information using neutral file formats and native file formats. Neutral file formats (for example, DXF, TIFF) are mainly used in exchanging information of drawings (CAD), invitations to tender, text processing and banking and accounting. Native file formats (for example, Microsoft Office products, DWG, HTML for web technology) are mainly used to exchange information of drawings (CAD), statistical calculations (spreadsheets), estimating and virtual reality (using web technology).

The lack of compatibility between different software applications / information systems results in a 'debate' at the start of each project on which information system will be used throughout the project (or sometimes the product) life cycle.

THE eLSEwise VISION

eLSEwise concluded that the required attributes for the LSE constructor to be competitive are best supported by the concept of a "Virtual Enterprise", where different companies with supportive skill sets, appropriate to meet the specific project demands, form into a cohesive team, but without the need for co-location of the team members. The Virtual Enterprise (VE) uses ICT tools to allow it to undertake such logistically complex projects whilst retaining the individual agility of the consortium members to undertake their own business operations and participate in other VE type projects simultaneously. The associated supply chains are also part of this networked enterprise (Hunter *et al*, 1999).

Various organisational models are represented diagrammatically in Figure 4. Although perhaps implied by the figure, these models are not entirely 'evolutionary' but do require greater degrees of pre-determined organisational and ICT skills moving in the direction of the arrows. The Integrated Enterprise may represent the 'departmentalised' view of a single organisation or a closely associated conglomerate group of companies. The Extended Enterprise reflects the current situation of certain manufacturing industry sectors, where a dominant partner has long-term supply relationships with associated providers of materials, components or resources such as design. The Virtual Enterprise is that model which eLSEwise believes best fits the LSE construction needs in the future. Here, a semi-transient central consortium provides the essential skills to formulate the solution to and spread the major risks of the project, but they will also involve various other supply chain members to execute the project. It is probable that one of the consortium, or a separately formed core team, will act as the "information and resources broker" to the project, involving other consortium member resources as required. However, communication and information flows between all members of the Virtual Enterprise (Hunter *et al*, 1999).

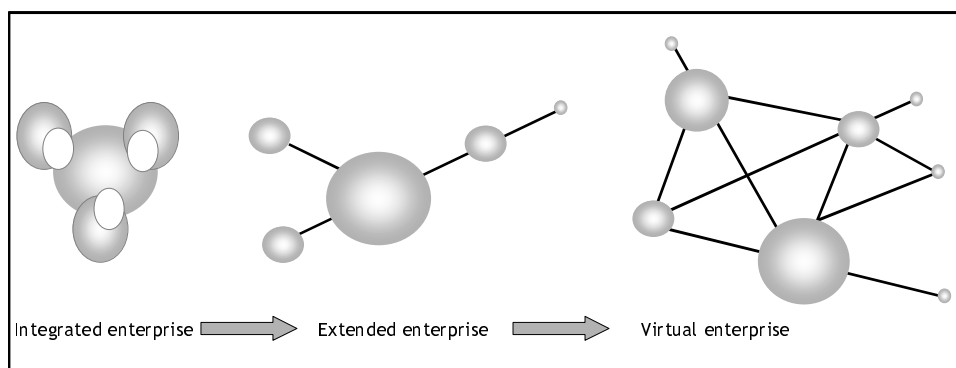


Figure 4

The LSE as an end user of the technology combines ICT with business drivers to work together to form the Virtual Enterprise that will deliver LSE projects. The ICT providers are developing the generic technologies and tools that can be used by LSE and other industries. The Research and Technical Developers are working to provide data models and data standards that can be uniformly adopted by industry and ideally are "open" in nature and hence independent of any particular ICT provider. The whole

Enterprise also has to operate within the wider conditions of regulations, standards and educational support provided by general society.

eLSEwise has devised simplified, pragmatic progression routes that are intended to assist LSE practitioners to prepare ICT and process development strategies that match to the overall future vision. The project has also suggested appropriate points of action to all parties that could influence the development of such a future vision. These development routes and points of action are reported in eLSEwise Consortium (1998) and Hunter *et al* (1999).

CONCLUSIONS AND RECOMMENDATIONS

The results of the studies presented in this paper which were undertaken within the eLSEwise ESPRIT project highlight clients' and contractors' requirements and views of the business and ICT aspects of the LSE construction industry. Understanding these requirements by all parties of the supply chain is crucial to ensure efficient and successful execution of LSE projects and operation of the final product. The studies provide also guidelines for ICT vendors who should consider the industry's requirements in their current and future provision for ICT systems and solutions.

The major ICT providers are already developing clear strategic thinking for many different businesses to enhance their working methods using current and near future ICT developments. What they lack from the LSE sector is a clear strategic development policy as at present the ICT developers do not perceive the LSE construction sector as a major user of ICT, nor do they fully understand the business requirements from this sector (Hannus *et al*, 1999).

It is this form of information and understanding that eLSEwise is trying to address, by providing some degree of business and process requirements for future LSE project delivery and also proposing some form of ICT strategy development. In this respect eLSEwise has proposed the following recommendations for the LSE industry and for ICT developers and vendors (Hunter *et al*, 1999).

Recommendations for the LSE Industry

- Foster Whole Lifecycle viewpoint
- Develop sector based Product Model Templates
- Define ICT policy that will support overall business needs
- Provide adequate network communications
- Define company wide data standards for project and company documentation
- Develop in-house company data libraries
- Define policy for company knowledge and learning.

Recommendations for ICT Developers and Vendors

- Work with LSE clients and practitioners to devise neutral format data models and use standard data representations such as STEP to allow inter-working between disciplines.
- Use neutral format based data management to hold, exchange and share data in a controlled manner.
- Link the data management needed for exchange and sharing to workflow requirements.

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