

TRENDS IN THE UTILISATION OF AUTOMATED QUANTITIES BY THE AUSTRALIAN QUANTITY SURVEYING PROFESSION: 1995 - 2005

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Abstract

This paper examines trends in the utilisation of Automated Quantities by the Australian Quantity Surveying profession since 1995. The paper is based on research by a team from the University of Technology Sydney involving a series of six national surveys of the profession spanning 1995 to 2005. The surveys have examined trends in general practice and the utilization of information technology. This is complemented by interviews conducted in 2005/06 by the author with a range of Quantity Surveying practices. The survey results since 1995 show that the uptake of automated quantities systems by firms has been surprisingly slow but that this has accelerated in the past two years. The paper will examine the current systems being used by firms and will highlight case examples of two firms who have developed their automated quantities systems over many years to the point where they are achieving significant competitive advantage and have achieved dramatic improvements in productivity, efficiency and providing value to their clients. These case examples will demonstrate the benefits that can be achieved from the effective utilisation of automated quantities technology and the strategies that have been used for effective implementation.

Keywords: automated quantities, quantity surveying, cost management

1. Introduction

As project information flow in the construction industry increasingly becomes electronic Quantity Surveying computing facilities, software and databases and general business practices will need to develop in a compatible manner. Compatibility with and the utilization of Computer Aided Design (CAD) systems is just the beginning. It is inevitable that documentation and data will be increasingly automated to the point where measurement and other technical processes will require minimal human intervention. Firms in all sectors of the industry will need to work smarter to gain competitive advantage and the use of Automated Quantities provides arguably the greatest scope for this to be achieved by professional quantity surveying firms.

This paper examines the manner in which the Quantity Surveying profession in Australia has evolved with technological and general industry changes over the past decade. It examines how business practices and quantity surveying services have changed over this period and then focuses on the use of Information Technology and, in particular, automated quantities tools, by firms.

2. The Australian Quantity Surveying Profession

Australia is a massive continent comprising 7.7 million square kilometres and measuring approximately 4000km east to west and 3200km north to south. It is the sixth largest country in the world and is approximately the same size as the mainland of the United States of America (excluding Alaska) or the size of the European continent. Despite this size, the Australian population is a little over 20 million and is one of the most urbanized countries in the world with about 70 per cent of the population living in the 10 largest cities in the country. Most of the interior of the country is flat and barren with few inhabitants. (de Valence 2003, Lonely Planet 2005). The country is divided into eight main states or territories and most of the population is found along the eastern coastline. Sydney is the largest city followed by Melbourne and Brisbane. It is in this east coast region where the majority of construction activity occurs. The total income generated by the construction industry in 2002-03 was approximately A\$140 billion accounting for 6.3% of the nation's Gross Domestic Product (GDP). It is the fourth largest industry in Australia. The industry employed over 750,000 workers which represented approximately 8% of all employed persons. (ABS 2005).

Quantity Surveyors in Australia provide financial management services for projects predominantly in the construction/property industry. Traditional services include the preparation of Bills of Quantities, Builders' Quantities, Cost Planning/Budgeting, Estimating and Contract Administration. The past decade has seen a marked rise in the diversification of services into non-traditional areas such as Feasibility Studies, Life Cost Analyses, Programming, Taxation Advice, Arbitration/Mediation, Expert Witness/Appraisal, Insurance Valuations, Risk Management, Quality Management, Value Management, Project/Construction Management and Facility Management. In the past five years, the profession has also made significant inroads in providing cost management services to other industries such as the Petro-Chemical, Manufacturing, Mining, Aeronautical, Shipping, Transport and Civil sectors. This diversification is a result of the profession adapting to meet changes in industry requirements.

The Australian Institute of Quantity Surveyors (AIQS) is the main professional association for quantity surveyors in Australia. They currently have just over 3000 members but only approximately 1200 corporate members (the rest made up of student/probationer members). Approximately one-third of these members reside overseas, predominantly in the Asia-Pacific region, which demonstrates the international recognition of this body. In recent times the Royal Institution of Chartered Surveyors (RICS) have opened a branch in Australia to further serve the needs of the profession. Whilst indicative of a small profession, an estimate of the real size of the profession is difficult. The main reason is that there are generally no requirements to be a member of the AIQS (or other professional body) or to be registered to operate as a quantity surveyor. The only exception is in the state of Victoria. Therefore, there are many quantity surveyors in the country who are not members of the AIQS but may be members of other professional associations or may not even be a member of any association. There is also now significant overlap in the roles of construction professionals with traditional boundaries becoming increasingly blurred.

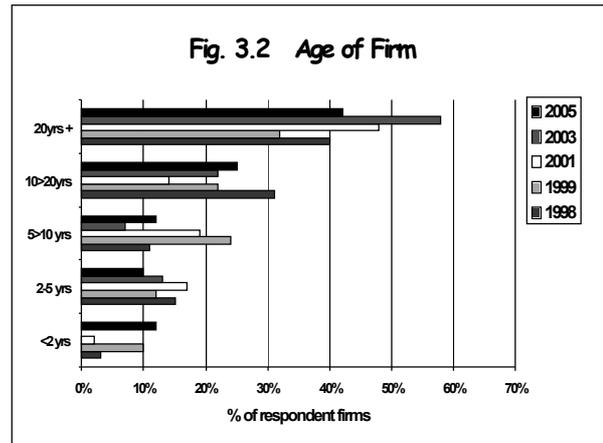
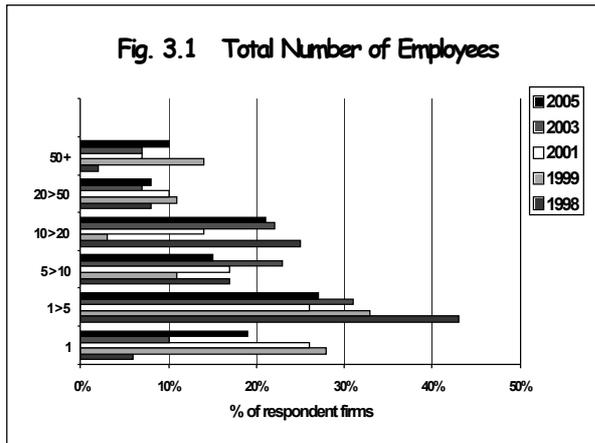
3. Australian Quantity Surveying Practice Survey Results

This section examines the general business practices of Australian Quantity Surveying firms over the past 11 years. It is based on six nationwide surveys of the profession carried out from 1995 to 2005 by a research team at the University of Technology Sydney in collaboration with the Australian Institute of Quantity Surveyors (AIQS). These survey results enable evaluation of how the profession has reacted over the past decade to the challenges and opportunities that industry change and technological development have presented.

3.1 Survey Sample

The surveys comprise a series of nationwide surveys of Quantity Surveying firms carried out approximately every two years in 1995, 1998, 1999, 2001, 2003 and 2005. The response rates generally ranged from 40% to 60% of firms with the actual responses for each year as follows: 1995 - 77 firms, 1998 - 65 firms, 1999 - 38 firms, 2001 - 42 firms, 2003 - 60 firms and 2005 - 52 firms. The surveys comprised a number of questions concerning general practice details, information technology use and future directions of the profession.

The respondent profiles are shown in Figures 3.1 and 3.2. The respondents predominantly comprise small to medium sized organizations which is typical of the profession's (and industry's) structure. Approximately half had less than 5 employees and a large proportion of respondents were sole operators. Close to half have been in business for over 20 years which suggests that longevity is a feature of the profession

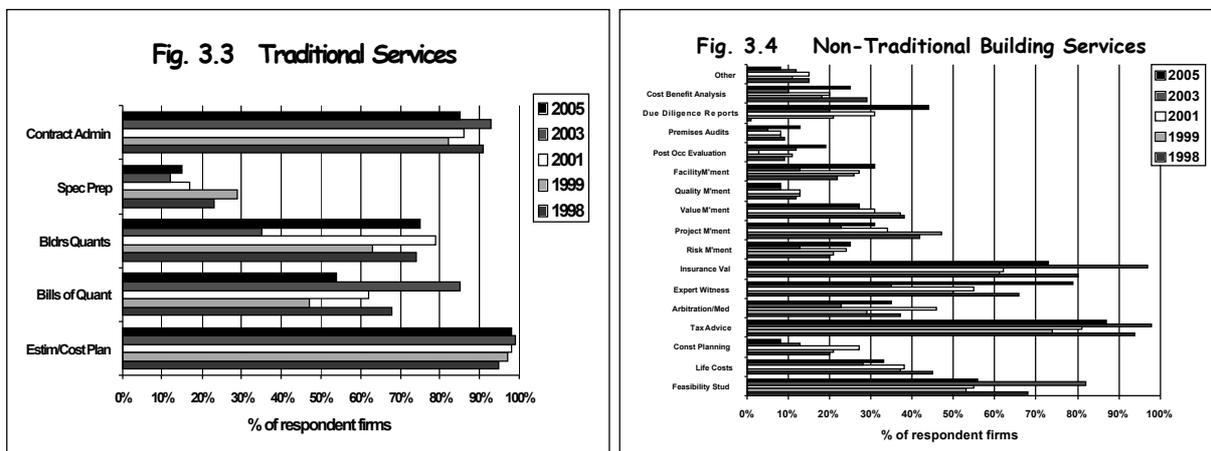


3.2 Services Provided

The past decade has seen Quantity Surveying firms expand and adapt their scope of services to meet changing industry demands. The use of the traditional "bread and butter" of the profession, Bills of Quantities, has declined markedly in the Australian construction industry over this time although there are some signs of a return to them by clients in certain market sectors. Despite this, the volume of work carried out by firms has increased over the corresponding period. Builders Quantities, whereby tendering contractors themselves (rather than the client) engage and pay Quantity Surveyors to prepare quantities are now far more common than the traditional Bill of Quantities provided and guaranteed by the client. Builders Quantities are usually prepared in a concise form with firms using their own concise

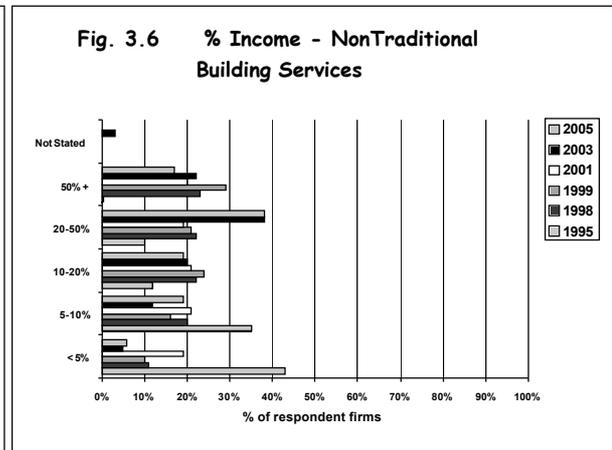
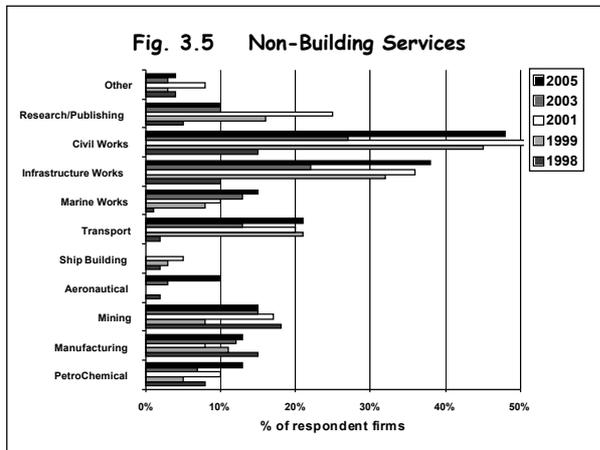
standards; no standard concise method of measurement has yet been developed. Another major change has been that Quantity Surveyors are now used much more in the "front-end" stages of projects where their expertise is of most value. Cost planning and budgeting is becoming the new "bread & butter" of the profession.

Figure 3.3 shows the percentage of firms providing traditional services (the question was not asked in 1995). Estimating/Cost Planning and Contract Administration are the main services provided. Even though the use of Bills of Quantities has declined most firms still provide this service albeit to a limited extent. More firms prepare Builders Quantities than Bills of Quantities. Figures 3.4 and 3.5 show the extent of non-traditional and non-building services provided by firms (the question was not asked in 1995). They provide a good indication of the great diversification in the scope of services provided by the profession. This scope is now clearly very broad with taxation advice (comprising mainly building Tax Depreciation Schedules) and valuations for insurance purposes the most common non-traditional service.



The growth of the profession's role in the provision of feasibility studies indicates the increasing awareness of introducing quantity surveyors at the outset of a project where they can be of most value. The involvement in Facility Management and post occupancy services generally has grown and provides perhaps one of the greatest areas for long term growth. The role of Quantity Surveyors in resolving disputes as Expert Witnesses in Arbitration/Litigation actions has escalated markedly. Australia is one of the most litigious countries in the world and a high level of dispute dominates its construction industry. Most disputes evolve around money so the cost expertise of the quantity surveyor is commonly sought.

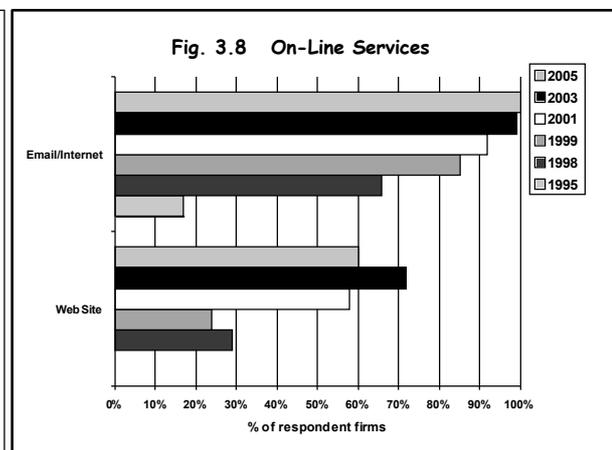
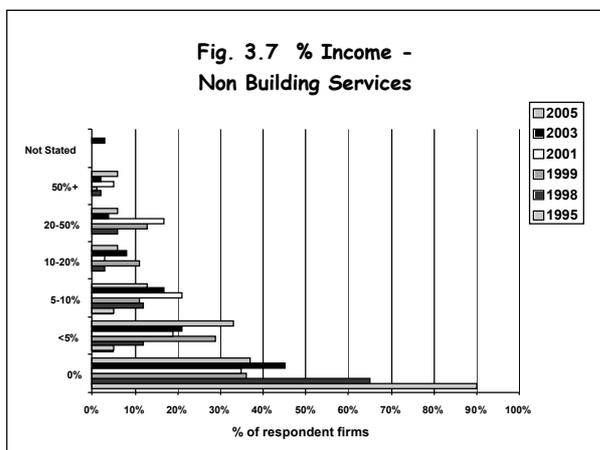
Figure 3.5 shows that Quantity Surveying firms are increasingly venturing into non-building areas demonstrating that the cost management skills of the Quantity Surveyor can be applied in other industries just as is the case with Project Management. Although the 2003 results showed a partial decline, the general trend since 1998 has been upwards with a notable increase in the 2005 results. The civil, infrastructure, transport and mining sectors are the main sources of non-building work with significant recent increases in the number of firms involved in petro-chemical and marine works.



However, the provision of these services does not necessarily mean that they account for a large proportion of a firm's volume of work. Figures 3.6 and 3.7 indicate the percentage of income that these non-traditional/non-building services provide for firms. The results indicate a significant increase over the 11 year period. These results provide evidence that Quantity Surveying firms have really taken on the challenge of diversification to better meet and serve industry demands. This indicates, in part at least, a proactive approach to change by many firms. They also demonstrate the very broad range of employment and business opportunities available for the modern day quantity surveyor.

In 1995, non-traditional services accounted for less than 10% of total income for over 80% of firms and no firm had a percentage higher than 50%. Non-building services were very limited; only 10% of firms carried out these services and, even then, they only accounted for less than 10% of total income. From 1998-2001 this picture changed significantly and the 2003 and 2005 results have shown an even greater increase in non-traditional building services. By 2005 non-traditional services accounted for more than 10% of total income for over 80% of firms and over 20% of total income for over half of firms. For approximately 20-25% of firms these services actually account for over 50% of total income.

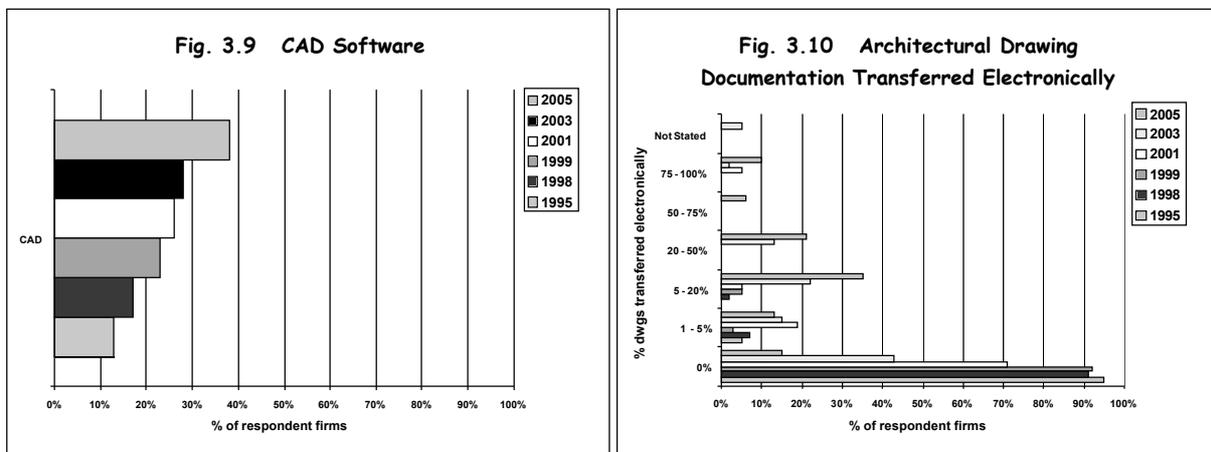
Income from non-building services also showed substantial rises although this tapered back a little bit with the 2003 and 2005 results. In 1995 90% of firms did not generate any income from non-building services but by 2005 this figure had reduced to approximately 37%.



3.3 Information Technology Utilisation

This section of the survey examined the use of electronic technology by quantity surveying firms. In terms of electronic communication, access to on-line services has gradually improved as shown in Figure 3.8 (previous page). In 1995 only 13% of firms had e-mail/internet facilities but by 2005 this figure has increased to 100%. In 1995 none of the respondent firms had web sites but by 2003 72% of firms had one although this dropped back to 60% with the 2005 respondents. This may well be an anomaly with the survey responses. Nevertheless, the fact that many firms still do not have websites to market their services and provide information for clients is surprising.

Figures 3.9 and 3.10 show that the level of firms with some form of CAD software and the proportion of architectural drawings received electronically. The purpose of these questions was to gauge the evolution of the profession with CAD technology. The statistics in relation to CAD software are alarming. In 1995 only 13% of respondents had CAD facilities. Over the ensuing 11 years this percentage has slowly increased to 38% which at least indicates that some firms are venturing into the CAD area. Nevertheless, this proportion is still low particularly if the profession is intent on remaining a key player in the project procurement cycle.



Improvements in the electronic transfer of drawings are occurring. The 1995-1999 surveys showed that less than 10% of firms transferred or received architectural drawings electronically but by 2005 this figure had risen to 85%. Improvements were also evident with engineers' and other consultants' drawings. Figure 3.10 shows that the percentage of firms that do not transfer or receive any architectural drawing documentation in an electronic form has reduced from over 90% in the 1995-1999 period to 15% by 2005.

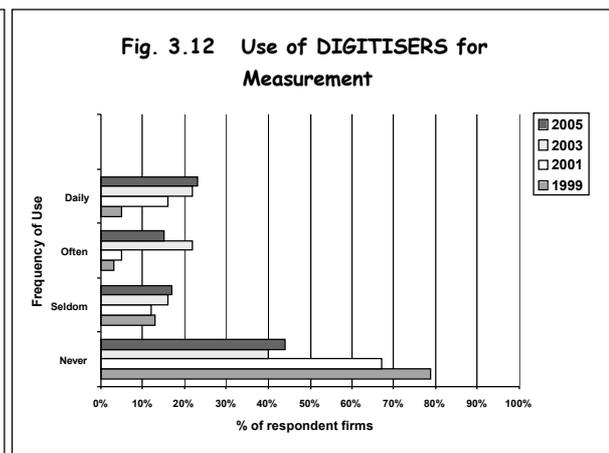
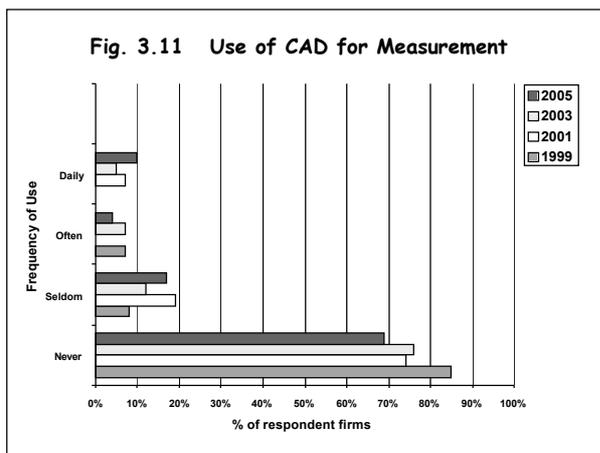
The 2005 results generally show a marked increase from previous years. Some firms are clearly developing their capabilities in this area - the latest results show that approximately 37% receive/transfer over 20% of their drawing documentation electronically compared to 0% in the 1995-99 period. Five of the respondent firms in the 2005 survey receive close to 100% of their architectural drawings in electronic form. These firms really stand out from the pack.

However, the level of electronic transfer of project documentation still remains very limited when looking at all firms collectively. Clearly there are mainstream technological capabilities that many firms are simply not keeping pace with. Whilst this may be suffice for their operations at this point in time, this neglect of technological development may have serious consequences in the not too distant future.

3.4 Measurement Tools

The 1999 survey introduced a question relating to the use of electronic tools to aid the measurement process and these results provide a base foundation for this paper. The results in Figures 3.11 and 3.12 show that the majority of firms still cling to traditional paper-based measurement with the use of electronic measurement tools still quite uncommon.

Whilst discussions by the author in 2006 with many quantity surveying firms suggests that a number of firms have been taking steps to implement automatic quantities technology into their business practices since the 2005 survey, it appears that many of these firms are trialling products but are having difficulty in successfully implementing them. It appears that some of the greatest inhibitors are the necessary cultural changes with staff and the re-engineering of work practices to optimise the use of this technology. It is evident that these processes take time and the immediate “fix” is simply not possible. Additionally, the technology is advancing rapidly and it can be difficult for firms to identify the system that will best suit their purposes long term.



The majority of respondent firms remain averse to using CAD automated quantities – in 1999 85% were not using CAD for this purpose and by 2005 this had only improved slightly to approximately 69%. In other words this indicates that approximately 30% of the profession still do not use CAD at all for measurement. Given the low proportion of firms with CAD facilities in the first place, these results are probably not surprising. Nevertheless some firms have seen the potential with the 2005 results showing that approximately 14% of respondents use CAD often or daily for measurement. However, it is not known whether this applies to all staff within these firms or just “selected” staff. Nevertheless, these firms and others like them who did not respond to the survey, stand out as pioneers in this area.

The major reasons cited for not using CAD are the cost involved in investing in the necessary hardware/software and training of staff, the incompatibility of different CAD systems and problems with the automated capabilities of these systems. Many firms stated that there was no need or requirement for them to measure with CAD. There are still many problems associated with using CAD for measurement and the time when CAD systems can automatically produce a detailed Bill of Quantities for projects generally (rather than being set up for specific projects) is still probably a way off.

Irrespective, the reality is that most CAD systems have the capabilities to, at the very least, automatically generate basic quantities in terms of areas, volumes and numbers of items and specialist automatic quantities system are now extremely sophisticated and are generally easy to use.

4. Automated Quantities Systems Used By Australian Firms

This section examines the actual Automated Quantities Software systems that quantity surveying firms are using based on the survey responses and discussions/interviews by the author with firms. Whilst there is a limited number of firms actually using these technological tools in any meaningful form, it is of assistance to see the actual programs that are being used. It must be pointed out that some respondents did not identify the actual automated measurement software that they used so the following programs should not be viewed as the only ones being used by the profession.

Some firms indicated that they used the measurement tools in standard mainstream CAD programs such as AutoCAD, Microstation, ArchiCAD and the like. This paper will not describe these programs but will focus on specialist automated quantities software. The main programs of this ilk were found to be the CostX, Eclipse, and the Buildsoft Take Off System (BTOS).¹ Whilst these programs were identified as the three most commonly used by respondents to the survey, the author would like to stress that there are many other automated quantities products on the market that may or may not be better than the above three systems.

4.1 Cost X

CostX is a new automated quantities system produced by “Exactal Precision Software”, a company based in Brisbane, Australia. The firms in the two case examples presented later in this paper use this system. The following information has largely been obtained from the Exactal website (Exactal 2006).

The CostX program has been developed in close collaboration with industry practitioners and professional firms to provide a package specifically designed for quantity surveying and estimating professionals. It has full automatic measurement capabilities and supports all standard drawing formats (AutoCAD DWG, DXF and DWF) with capabilities extending to PDF and even hand-sketched drawings. Quantity surveying practitioners regard the program as easy to learn and use effectively. A major advantage is its revision system for changes to the project design. CostX provides automatic reports on changes between drawings - what is

¹ The author has no financial interest in any of the firms associated with these software products

the same, what has changed and what is no longer on the drawing. This extends to automatic changes to the quantities in the Bill of Quantities, cost plan or estimate. This enables powerful scope management capabilities during the design development stage and avoids the frustration of have to re-measure quantities when drawings change. A drawing comparison mode graphically shows the changes between the drawing revisions.

The program can be tied to cost libraries to provide automatic project cost plans/budgets and automatic adjustments as changes to the design are made. Measurements are also easily transferable in both directions to other estimating and spreadsheet applications. The program also enables trade to elemental workbook sorting (and vice versa) including rate and quantity breakdown analysis.

4.2 Eclipse

Eclipse is a system designed by the CSSP Pty. Ltd. software company who are based in Adelaide, Australia but have many branches in Australia and overseas. CSSP specialise in construction industry software and is also well known for producing estimating software (RIPAC and EVEREST), contract administration software (CHEOPS) and information management software (CLIENT). The following information has been largely drawn from their website (CSSP 2006).

Eclipse is a program designed for engineering and construction estimating, tendering, contract administration and management. It is a document centric application with a Microsoft Windows and Word/Excel “look” and presents costing information in a WYSIWYG format ready for printing or exporting. The program has very powerful analysis tools that are particularly beneficial for large projects. Firms that have used the RIPAC and EVEREST systems are particularly attracted to the Eclipse system.

CSSP also produce two other measurement related programs called ICEPAC and ICEMATE. ICEPAC was first developed in 1987 and is a leading system for civil engineering bill preparation and contract administration. It was developed to a specification devised by the UK Institution of Civil Engineers to computerise the administration of engineering contracts using CESMM, MMHW or other methods of measurement. ICEMATE is a software package which has been designed specifically to computerise the estimating and elemental cost planning functions of civil engineering contracts for use by engineers, quantity surveyors, cost planners, contractors, clients and project managers. It has been developed as a joint venture between Thomas Telford Services, the commercial arm of the Institution of Civil Engineers and CSSP.

4.3 Buildsoft Take-Off System (BTOS)

The BTOS system is an automated quantities on-screen take-off system that can be used as a “stand-alone” product or as an “add-on” module to the Buildsoft estimating system. The survey results have shown that the Buildsoft program is the most widely used estimating program by quantity surveying firms and this is also reflected in the industry as a whole with Buildsoft being most commonly used by contractors. The wide use of this program suggests

that the BTOS system has the most potential for use by firms, particularly by those firms taking their first steps into the automated quantities world. Whilst the program does not have the sophisticated capabilities available with programs like CostX and Eclipse, it does provide an easy to use system that can be picked up very quickly. It is one of the easiest to use take-off systems on the market.

The program allows the main range of digital image formats like BMP, DXF and DWG to be imported into the project. Using a digitiser-based approach, the measurement process involves tracing over drawing plans to produce measurements. The results can be automatically transferred to the Buildsoft program or most other estimating programs.

4.4 Case Examples of Firms Successfully Utilising Automated Quantities Systems

The survey results have shown that the use of automated quantities systems by quantity surveying firms is limited and, in many cases, non-existent. However, there are a growing number of firms who have successfully embraced this technology and the profession has much to learn from their experiences. The following two sections examine the case example history of two quantity surveying firms who have successfully implemented Automated Quantities tools into their business practices. The lessons learned by these firms, the approaches/strategies taken and the benefits obtained will prove of great assistance to firms interested in going down this path as well as the profession generally. The examples comprise a medium sized firm, Mitchell Brandtman, and a large firm, Turner Townsend Rawlinsons.²

5. Case Example 1 – Mitchell Brandtman, Brisbane, Queensland

5.1 Background to Firm

Mitchell Brandtman is a medium sized Quantity Surveying firm that was established in 1970. The main office is in Brisbane, Queensland with branches in Cairns, Sydney and Perth. This case example will be based on the Brisbane office which comprises approximately 35 staff with 27 quantity surveyors. The firm is well known for its innovative approaches particularly with respect to the use of IT. The information in this section has been provided by the firm's Managing Director, Mr. David Mitchell.

5.2 IT/CAD Development

The firm began its journey in IT development in 1981 with the objective of making their business practices more efficient and productive. This involved a range of initiatives including the electronic development of systems and databases and the gradual re-engineering of their works practices to suit.

Mitchell Brandtman first began utilising CAD systems in 1998. This began with the exploration and analysis of CAD systems generally and what they had to offer the firm. This initial research and development was conducted by Mr. Mitchell and two staff members. A major first step was to develop their IT systems so that they could receive drawings and be able to plot them electronically and therefore manipulate the drawings in an electronic mode

² The author has no financial interest in either Mitchell Brandtman or Turner Townsend Rawlinson.

to suit the firm's purposes. This enabled the receipt and transfer of documents/drawings much more quickly. Being able to work from drawings that were able to be plotted was a big step forward.

In terms of electronic measurement, the firm began experimenting with standard "off-the-shelf" CAD systems such as AutoCAD. Their capabilities and constraints were explored and identified and the firm began to use these capabilities where possible for measurement. In 1999 it was decided that if the firm was to effectively move into the IT world the whole office needed to understand CAD technology, systems and software. All staff members undertook CAD training programs that were organised through outsourcing. In-house CAD training was not seen to be economical or effective for the firm.

During that period the firm embarked on an ambitious strategy to turn all information into electronic mode – the virtual office. This applied to both historical and current project data and information. It was recognised that if cultural change was to be achieved with staff it had to be backed up with the necessary technology and IT systems. In effect, re-engineering their systems to suit their mode of operation. All records in the office dating back 30 years were converted into electronic form and were made available for access by all staff. Emphasis is placed on re-using information from previous projects rather than starting from scratch and this database provides the foundation for this. Additionally, staff can search the database for information/knowledge gained from previous projects. For example, if an issue with a particular contract clause arises, staff can search the database for information on previous projects relating to that clause.

The cultural change was achieved relatively easily with the firm's staff members. This is seen by many firms as the biggest inhibitor to major change – the conservatism and inability to adapt by staff members. Mr. Mitchell attributes this to the firm's history of innovation, the employment of staff that had the necessary attributes and the young age of staff in the office. When the electronic changes began in 1999, all of the staff, except two principals, were under the age of 35 with the majority in their 20s. This factor, combined with the firm's targeting of bright students/graduates, proved extremely valuable during this transitory period.

The firm began to first develop meaningful electronic quantities using a relatively cheap program called CadLite. They then progressed to the 2000 version of AutoCAD which had better measurement tools than earlier versions. From there they used the BTOS (Buildsoft Take Off System) that had been developed within the Buildsoft estimating program. Up to this point, the firm relied on creating electronic quantities in a log file and then copying this data into their Buildsoft estimating system or a spreadsheet application. The next step was to explore systems that would enable quantities to be exported automatically into their estimating systems.

In 2003/04 the firm adopted the CostX program developed by Exactal. This program enabled them to work in a combined CAD/estimating environment. Mr. Mitchell found that this system best suited their firm's purposes and the firm is now entrenched in its use. He described some of the main benefits as follows: easy to use, short training period for new

users, has the “look” of any Microsoft program (adding to familiarity), can work totally within the CAD drawing and produce quantities and estimates, automatic links between drawings and cost planning databases, when drawings are changed the revisions are automatically accounted for in the quantities and estimate (thus eliminating the previously time consuming task of remeasuring and pricing work when changes are made), and the immediacy of these results where clients can quickly be informed of the cost consequences of proposed changes

5.3 Improved Productivity – Reduced Working Hours & Better Working Conditions

Research has shown that Australians now have second longest average working hours of countries comprising the OECD and current trends indicate that they will soon top this list.³ The Australian Council of Trade Unions (ACTU) found the following:

“ACTU research into workplace issues has found that long hours and the increasing intensification of work is the overwhelming primary concern of workers. For much of the last century Australia led the world in fair working time. But in 1980 Australia started to buck the international trend and hours began to grow. Currently, Australia has the second longest working hours in the OECD. On current trends we will soon have the longest. It is a sad irony that Australia now has one of the worst records in the world. It is time to once again civilise working time” (ACTU 2005, p.1).

Professionals in the Australian construction industry are a prime example of this trend with long hours in the realm of 50-60 hours per week or even more considered quite normal. Added to this problem is the intense pressure that these professionals work under particularly in terms of meeting deadlines. For Quantity Surveyors, the time consuming task of physical measurement (and re-measurement as drawings change) adds to these pressures. Fee competition amongst firms still remains an issue for the profession and has seen profit margins squeezed for many firms thus exacerbating the problem.

Mitchell Brandtman recognised this problem many years ago. The company places tremendous importance on staff enjoying work and having time for an “outside life”. A real aim was to use the productivity and efficiency gains through IT to enable staff to enjoy a more balanced life. Whilst deadlines still need to be met, the focus is on a 37 ½ working hour week for all staff. Emphasis is placed on productivity, efficiency and a balanced working life.

Productivity improvements are just not restricted to CAD applications. The firm continually looks at ways of making their work practices faster and more efficient. An example is the use of the Adobe Acrobat Professional program where it is possible to convert a PDF “image” of a table of figures automatically into a “live” table in a spreadsheet application. This proves useful when, for example, they receive a “hard copy” schedule of finishes and fittings – it can quickly be converted into a live spreadsheet table.

The firm also does a lot of work with informing/educating staff about the high level use of spreadsheet applications. Examples include the use of pivot tables within a spreadsheet

³ OECD research reveals that Korea has the longest working hours in the OECD group

application to quickly re-arrange tables/figures to suit. This information and knowledge sharing amongst staff members has now become an integral part of their business practice.

Mitchell Brandtman's services are predominantly estimating and cost planning. Whilst they have not done any detailed research into specific time saving benefits, Mr. Mitchell estimates that they can now prepare a cost plan in one-tenth of the time it would normally take using traditional methods. The major benefit is that they can spend far more time concentrating on the pricing and the development of cost data bases rather than spending most of their time on measurement. Mr. Mitchell explains that in a traditional QS office, a lot of the time pressures and stress come from the time consuming nature of physical measurement and the frustration of having to make changes to those measurements as drawings are revised and deadlines get squeezed tighter and tighter. The use of CostX has had a major effect on reducing these time pressures. The program's ability to automatically change quantities and the cost plan if drawings are revised has been particularly beneficial.

5.4 Involvement in the Profession

Rather than adopt a "closed shop" attitude to the firm's IT developments and innovative approaches, the firm is very open in discussing and raising awareness of their IT practices to the wider QS community. Mr. Mitchell and his staff conduct a range of industry seminars and other forums for the profession and the industry generally.

Another valuable contribution is made through their involvement in the education of quantity surveying students at university level. Mr. Mitchell and staff members have been involved in Quantity Surveying IT and CAD education at the Queensland University of Technology (QUT) for the past five years. Most of this time is donated to the university free of charge. The courses are extremely popular with the students and enables the QS course to be at the leading edge of QS related industry technology.

David Mitchell sees this as a key contribution to the future of the profession as it is these young quantity surveyors who will have an important role in picking up and evolving with this technology. The firm itself gets a lot of direct benefits from the classes. As everyone in their office has obtained expertise in the use of the technology and CAD applications, training from scratch is only required for new staff. Being able to conduct classes with a whole group of students with little or no training in the area enables the firm to trial things with the students, see how they react and adapt to these different approaches. Mr. Mitchell has found that he learns a lot from educating students with no background knowledge – it provides an element of randomness that can't be found in their office. Many developments in their IT systems have come from what they have learnt from these students.

5.5 Attracting Quality Staff

Mitchell Brandtman have a young average age of staff in the office and the firm is widely recognised for its innovative and "staff-friendly" practices. This has resulted in tremendous interest from student/graduate quantity surveyors and has enabled the firm to employ some of the brightest young Quantity Surveyors on the market. Underpinning any professional

services business is the quality of staff and this ability to attract bright young staff is seen as a major competitive advantage for the firm. This is particularly important in Australia as there is currently a chronic shortage of good quantity surveyors in the market. The firm places great emphasis on staff training and see this as very important for the long term development of the organisation.

Anecdotal evidence suggests that the capacity for QS firms in Australia to provide on the job training has been greatly diminished over the past decade due to squeezes on profit margins and other industry pressures. The productivity benefits obtained by their IT systems have enabled Mitchell Brandtman to devote the necessary time for staff development and training. Staff are encouraged to ask questions, help each other, share ideas and essentially work together closely as a team.

Whilst these IT developments are the hallmark of the organisation, Mr. Mitchell contends that all of this is useless, and in many cases very dangerous, if staff do not have sufficient expertise in the core competencies of the QS profession. Areas such as developing construction knowledge, site experience, documentation understanding, measurement knowledge and other key competencies are seen as extremely important.

6. Case Example 2 – Turner Townsend Rawlinsons

6.1 Background to Firm

Turner & Townsend Rawlinsons are one of the largest Quantity Surveying firms in Australia. In 2005 Turner & Townsend, an international construction and management consultancy firm, merged with Rawlinsons, one of the oldest QS firms in Australia. Rawlinsons are also well known for publishing the Australian Construction Cost Handbook . The firm employs more than 120 people across eight Australian offices (Sydney, Brisbane, Melbourne, Canberra, Cairns, the Gold Coast, Adelaide and Perth). The information in this section has been provided by the firm's Managing Director, Mr. Harry Carrick.

6.2 IT/CAD Development

Turner & Townsend Rawlinsons (TTR) is widely recognised as an industry leader in IT and CAD development and innovative and progressive business practices. In terms of electronic measurement, the firm has been instrumental in the development of the CostX system. Mr. Carrick has been a driving force in this development since the 1990s. The catalyst for Mr. Carrick's endeavours was his frustration at the QS profession's generally apathetic attitudes to the utilisation of CAD capabilities for electronic measurement. He saw this as an opportunity to explore not only for his firm but also for the profession generally and the wider industry.

After examining and trialling a range of applications, Mr. Carrick set about developing a system that suited his firm's business practices and engaged CAD programmers and other IT experts to assist with this process. This eventually led to the development of the CostX program and a separate company called Exactal was formed to continue this development. TTR does not have a financial interest in this company but continues to work with them in ongoing development work.

6.3 The Benefits

The firm now utilises CostX for the preparation of cost plans, estimates and Bills of Quantities. When utilising CostX all measurement work is performed electronically. A scale rule is now redundant. This even applies to Bill of Quantities production where difficulties have existed in the past in terms of the detail required. Mr. Carrick cites the example of the Hydraulics Trade. Hydraulics can traditionally take up to 20% of total BQ production time yet using CostX the complete trade can be measured electronically in a fraction of the time using traditional measurement approaches.

The firm now has over 60 staff members who are proficient users of the CostX program. In the early stages, the use of CostX was restricted to cost plans and estimates but as staff began to experience the significant time savings with this tool they began to demand that they also use it for BQ production. Once gaining expertise in its use, staff were very reluctant to turn back to traditional approaches. This led to further developments with the program that enabled full electronic BQ measurement. Worker satisfaction in the office soared and the firm began to attract interest from quantity surveyors seeking employment, particularly young student/graduate quantity surveyors. As a result, the firm have been able to form a team of some of the brightest and innovative quantity surveyors in the country.

Mr. Carrick sees this as the greatest benefit of all. He states that it doesn't matter how good your systems are, the crucial component is good quality staff. In fact, he has found that it is easier to secure good quality clients than it is to secure good quality staff. CostX and other business practices have given them a competitive edge over many rivals for the limited number of good quantity surveyors available in the market. This has had a huge impact on the success of their business.

The next major benefit is with the response times for their clients and other project consultants. The firm's most valuable services lie in the early feasibility and cost planning stages of a project. In these early stages, the firm regularly has meetings with the client and project team where the cost plan is projected on to two screens, one for the drawings and the other for the cost plan/budget. They find this an extremely popular and effective approach with their clients. This is particularly the case with design change proposals. The ability of the program to quickly calculate the effect of design changes/revisions has changed the landscape in which the firm deals with their clients and raises their services to a much higher professional level. The potential impact of changes can be immediately visualised on the screens in front of the whole team. An added advantage is that the client and project designers are forced into taking ownership of the cost plan/budget and responsibility for design stages.

In the past, using traditional approaches, it would be very time consuming to measure and cost design change proposals and changes to the project budget were often viewed as the "QS's fault". In this forum, it becomes very clear what the change is, who is responsible for the change and what the end impact on the budget will be. This dynamic real-time analysis is extremely powerful and provides enormous assistance for designers and clients in ensuring their projects are within budget. The program enables far more effective communication with

the client in the design development as they can clearly see the design changes and the cost effect simultaneously. This is really “designing to a cost” and really places the QS in the proactive driver’s seat rather than often being a “reactive passenger” in the back seat.

Clients continue to be impressed. Mr. Carrick cites a recent example where a project client saw the firm’s cost plan presentation and was so impressed that he commissioned them to use the presentation technique on another of his projects. This involved using the CostX program to highlight areas of the building (accommodation, circulation, rental areas and the like) rather than working from traditional schedules. The ability to examine the functionality of the room layouts and costs in a visual form (and the effect of changes) was very beneficial.

Response times for clients have been slashed. Mr. Carrick cites examples of staff returning to the office at say 4pm from a project meeting where design changes have been proposed. In the past it may have taken a numbers of days before the QS could respond due to the need to remeasure quantities and re-price the works. Now it is not uncommon for that staff member to send through their report on the changes within an hour by 5pm before they leave for the day.

As with Mitchell Brandtman, this has reduced the need for staff to work long hours to meet deadlines. This is another major bonus in terms of worker satisfaction. These are real examples of implementing smart systems to not only improve the bottom line of the business but also to create a satisfying workplace environment and allowing staff to have appropriate time for an “outside life”.

The ability to automatically re-calculate the effect of drawing changes on measurements has proved of enormous benefit in BQ production. This is the typical problem that QS firms face using traditional approaches – amendments during the BQ preparation period. This leads to excessive working hours as work is required to be remeasured as deadlines need to be met and increases the frustration and stress levels of staff. These remeasurements also typically place tremendous strains on the firm’s profit levels for the BQ production, sometimes to the point where firms actually lose money. Using CostX, this problem is greatly reduced.

Turner Townsend Rawlinsons have eight offices around the country. Their IT infrastructure and the use of programs like CostX have enabled them to work in a virtual seamless office throughout Australia. Staff from different offices can be working on the same project as location becomes irrelevant. This enables the firm to easily shift work around offices as workloads change from one city to the next.

6.4 Further Developments

Another development that the firm is working on is a CostWeb real time cost library model. This involves the pricing of current projects in trade format and converting them into an elemental form thus facilitating even more sophisticated cost planning utilising real time current market cost data. This is another giant step forward. The next development in Version 2.2 of CostX is the seamless links with the Autodesk® Revit® program. The Revit® program is one of the most widely used programs around the world for building information modelling and will enable CostX to be utilised in a 3D object oriented design environment.

7. Conclusion

In some respects, the rapid improvements and developments within programs like CostX are perhaps too far ahead for many in the profession/industry who have yet to venture down the electronic measurement and estimating path. For these firms, fundamental shifts in their business practices are required and this all takes time to develop. However, the competitive advantages already being realised by firms such as Mitchell Brandtman and Turner Townsend Rawlinsons are likely to provide more of a catalyst for change in the profession than anything else. The longer firms delay their entry into the automated quantities world the further other firms with these capabilities will progress and add to their competitive advantage. The strategies taken by these firms to embrace these technological tools and adapt their business practices accordingly provide considerable inspiration and assistance for not only other quantity surveyor firms but for the profession generally in Australia.

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