HOW EFFECTIVE IS THE SOURCING OF BUILDING PRODUCT INFORMATION IN THE REPUBLIC OF SOUTH AFRICA?

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ABSTRACT

The growing use of modern communications is bound to result in substantial changes in the way the world does business, and more specifically in the context of this article, in the increasing use of electronic exchange of construction information between different members of the project team, and with product manufacturers and suppliers. These changes are brought about by the availability of fast, powerful and relatively cheap computers; fast and relatively cheap telecommunication methods, and the rise of global electronic networks, particularly the Internet. These technologies are driving the envisaged rapid growth of electronic commerce. In the next few years, e-commerce will impact in some way or another on businesses, if it has not already done so

The organisation of information, specifically that of construction information, is what is critical to its understanding and efficient usage. With computer systems at each end of the communication, it matters less how items are labelled, but the concepts by which they are organised need to be agreed. One school of thought is of the opinion that full text search and keywords make classification obsolete, but the general perception amongst construction information technology (CIT) specialists, as observed during the review process, is that data need to be organised somehow, and it will be much more convenient if the supplier and user of the data make use of the same structure

KEYWORDS: Building products, construction information technology, standardisation, classification, procurement

INTRODUCTION

Construction is one of the largest industries in the world, but one of the most disjointed. Different types of information are exchanged between the various parties for the purpose of communicating design, construction and contractual matters. As there is no standardised system of classifying and sharing of such information, information is lost along the way. Proper planning to eliminate conflict, duplication and omission in the distribution of procurement and cost information is lacking, and this can be ascribed to the fact that CIT has not fully penetrated the industry. Many professionals and contractors still use old-fashioned paper-based methods of exchanging information, making communication rather slow and inefficient. Advanced and cost-efficient communication technology, based on a nationally accepted and internationally compatible standard, should assist in making the construction industry a more powerful and streamlined machine. This will allow professionals and contractors to collaborate more effectively with partners, staff, building owners, manufacturers, designers, etc on both local and international levels

The primary tools for communicating a designer's intent to the construction team are the construction documents that define the project. They consist of graphic drawings and written text. As legal documents in construction contracts, they are at the core of disputes and are frequently the basis for lawsuits on cost overruns, poor workmanship, and delay of work operations with concomitant late delivery of the project. Construction documentation must therefore be authoritative, accurate, reliable, user-friendly, and enforceable. Standard and particular specifications coupled with easy and reliable access

to product literature information form an integral part of the construction documents or serve as essential resources in the compilation process of other construction documentation such as bills of quantities. An important part of the process of compiling the construction documentation is the sourcing of building product information

In the Republic of South Africa (RSA) a number of companies specialising in building product information systems have appeared on the scene over the last number of years to supplement the small number of companies that were already operating in this field. This article attempts to investigate, *inter alia*, how professionals perceive the effectiveness of the services these companies offer, whether the services satisfy the information needs, and how often these services are being utilised

Manufacturers are increasingly challenged to find better ways to present their building product information at the most opportune time and to the right project team member. Historically catalogues and online libraries of product data have assisted manufacturers in increasing their exposure – but without any real guarantee that the products specified will be the products purchased at the time of construction. At the same time, fierce market competition, fast growth and global projects require architects, engineers, quantity surveyors, contractors, facility managers, etc to move expeditiously, find the best price and locate locally available building products

Advantages that a national standard for classification will provide, such as ease of access, uniformity and compatibility, should contribute to the effectiveness of information sourcing and thereby significantly reduce the time involved in getting answers for requests for information, allowing, or at least assisting, the building and procurement processes to continue more expeditiously

RESEARCH OBJECTIVE

The research objective of this article can be summarised, in question format, as follows:

> *Would the introduction of a universally accepted standard for classification facilitate and enhance search mechanisms and systems from the viewpoint of manufacturers and suppliers of building material products and users of building material product information?*

The main thrust of the research study of Maritz (2003) is the investigation into the effectiveness of the procurement process for the construction industry in the RSA, with particular emphasis on establishing national standards for the classification of construction information that are modern, internationally compatible and suitable to accommodate present and future needs. The abovementioned research objective forms an integral part of the research conducted. The importance of effective product information sourcing as part of the total procurement process is emphasised in the thesis and this article will attempt to highlight some of the salient issues addressed

The possibilities for continued work exist, and it is most likely that one or more working groups will have to spend considerable time and effort in the development of appropriate standards. This can be achieved by an initial discussion of the most important priorities, followed by an investigation into the status of the current standards in use locally and available elsewhere, in conjunction with the status of the information provided by suppliers and manufacturers, and ultimately the publishing of comprehensive classification standards for construction resource information suitable for use by the construction industry in the RSA

RESEARCH METHODOLOGY

In determining what is the most appropriate approach to adopt (the research design), the critical consideration is the logic that links the data collection and analysis to yield results, and thence conclusions, to the main research question being investigated. The main priority is to ensure that the research maximises the chance of realising objectives,

Therefore the research design must take into account the research questions, determine what data are required, and how the data are to be analysed (Fellows & Liu, 2003 : 21)

A descriptive survey (Leedy, 1997 : 196 – 197; Cooper & Emory, 1995 : 121) was chosen for data generation and analysis in the research study of Maritz (2003). The survey process, which produced mostly quantitative data, comprised the design, pre-test and administration of a structured questionnaire that targeted architectural, quantity surveying and consulting engineering practices in the RSA for their view on the effectiveness of local procurement processes (which included the process of managing information for construction)

The first section of the questionnaire covered the demographic background of respondents: line of business, size of organisation, economic sector operated in and location. The second section requested respondents to rate, on a five-point *Likert* scale (Fellows & Liu, 2003 : 147), their perceptions of the statements presented to indicate their agreement/disagreement. In the third and final section the respondents were required to indicate their agreement/disagreement on questions posed by answering, in the greater majority of cases, either "yes" or "no"

The respondents were also invited to express in their own words their views on each subject area in the "open-ended" format that succeeded the different subject areas. These comments were all taken into account in the process of analysis of the results that followed

The questionnaire was compiled in an effort to determine the following main objectives:

- Whether specification drafting for procurement documentation is effectively handled;
- Whether current standard specifications meet the demands of the industry, and, if not, whether the local industry needs a more comprehensive specification system;
- How effectively product information is sourced; and finally
- Whether a need exists for and how national standards for classification systems should be developed

LITERATURE REVIEW

The process of collection of information from secondary sources comprised an extensive review of related literature that included the review of classification standards as applied in a selected number of other countries. The countries were the United Kingdom (UK), Australia, Sweden, Singapore, the Netherlands and the United States of America (USA). These countries were specifically selected because of the influence that their systems have had on the development of classification in the construction industry worldwide and/or of the modern, comprehensive and up-to-date systems currently being employed by them

Since the late 1940's there has been a fascination with the intellectual problem of how to organise construction information for subsequent retrieval and re-use in projects. The solution was found in the development of classification systems, standard specification systems, product information systems and cost information systems. The first formal construction classification system, which was called *Samarbetskommittén for Byggnadsfrägor* (from which came the abbreviation SfB), was introduced in Sweden just more than fifty years ago. This system found widespread use over there for the organisation of information in architects' and other professionals' offices. Over the next twenty years SfB and similar developments became the model for building industry classification, specification, product information and cost information systems throughout

Europe, the USA and some other parts of the world (Royal Institute of British Architects, 1969)

However, in the last few years desktop computing, office networking and global communications via the Internet have started to provide the kind of all-pervasive CIT that is needed to make a really big leap forward in construction documentation practices. This article will indicate hereinafter that in many respects these developments still exist in theory only and that much more progress will have to be made before the construction industry will enjoy the concomitant benefits

Problems associated with the Internet

It would be impossible to cover all the features of the Internet in an article of this nature. Far more can be found about its possibilities by consulting the by now considerable number of publications available on this contemporary topic. The literature review conducted by Maritz (2003) indicates that the Internet as an effective source of construction information, at this point in time, is not likely to displace libraries or seriously diminish the value of the reference collections in libraries. The Internet, however, will provide the user with many more options in an information search, for the information is probably available there; all that is needed is to find it and evaluate whether it is suitable. This simple statement hides a multitude of implications and problems. Behrens (2001 : 45) identifies the following ten such problems in this regard*:*

- *The Internet is not a logically organised collection (like a library), which is why it is often called an online anarchy. It was never designed to be the enormous information storage and retrieval system that it has become. There is no single standard way of making information available on the network and there is no single standard way of searching for it*

- *Even if you are a capable searcher who knows how to narrow down a search, you are likely to retrieve far too many sources for your needs, many of them containing similar information*

- *The third problem flows from this, namely that there is far too much garbage made available and this will be retrieved together with the worthwhile information*

- *The next problem is an overflow of the third: you need to be sceptical about your search results, as you cannot rely on the information you find. You need to check that it is authoritative, correct and up to date before you can regard it as useful*

- *Resources on the Internet are not stable. They are ephemeral in that their contents can be changed with ease and they can be removed completely or moved to another site by whoever made them available*

- *The Internet does not provide comprehensive coverage, especially for older information or documents*

- *Access to the Internet can be painfully slow when the traffic is heavy and you could also be cut off through technical breakdowns on the side of the computer or network system, electricity power failures or problems with Internet Access Provider links*

- *The Internet is an increasingly commercial environment (most of the traffic is of a commercial nature) and it has become the new playground for advertisers*

- *Finally, you may need to pay for authoritative information. Whereas some (or even most) of your needs can be satisfied through the resources which can be accessed free, serious research usually involves using commercial databases like indexing and abstract services, most of which require subscriptions*

Mouton (2001 : 35) admits that the Internet has made a huge impact on the information that it makes available, but agrees that it is not without its problems, as is evident from the following assertion by him: *One of the negative effects is that, ironically, it is to some extent more difficult to search for information and retrieve all the sources on a particular topic because information on the Internet is much less structured and codified than in a traditional library. Even the most comprehensive search engines work more on a trial-and-error basis than on systematic and well-designed thesauri and catalogues*

In a recent survey conducted by Murray, et al (2001) on the use of software by South African construction industry professionals they found that proprietary software is widely used, but that there is a lack of knowledge of technological advancement in the use of web-sites and multi-disciplinary web-sites

Internationally the above position is not much different, as Bloomfield & Amor (2001) observed in a paper delivered to the working commission 78 of *Conseil International du Bâtiment* (CIB-W78) conference regarding CIT held recently in the RSA. They pointed out that although the Internet has been identified as a major form of dissemination for the majority of research and publishing organisations in the construction industry, there is no unifying system to tie these sites together and offer their resources to the industry. They further revealed that the use of global Internet search engines provide little help, with extraneous and low quality information being returned along with important information, and that a recent analysis showed that the best search engine only covers 16% of the Internet's estimated 800 million web pages

The views expressed above are shared by Woestenenk (2002b) when he argues that *in CIT research and development little attention seems to have been given to how an industry in which the adoption of IT has been very slow is going to migrate to a product modelling approach to construction documentation. There has been little cooperation to date between the main streams developing new technologies*

Improving the application of CIT is therefore a major international research endeavour in scientific establishments and industry. In this regard the CIB–W78 has been very active for almost 20 years. According to Amor, et al (2001) the objectives of the commission are the following:

- *To foster, encourage and promote research and development in the application of integrated IT throughout the life cycle of the design, construction and occupancy of buildings and related facilities;*

- *To proactively encourage the usage of IT in construction through the demonstration of capabilities developed in collaborative research projects; and*

- *To organise international co-operation in such activities and to promote the communication of these activities and results*

A brief look at the next generation Internet and how it may have an impact on the management of construction information follows below

Preparing for the Next Generation Internet (NGI)

Although certain problems associated with the use of the Internet are highlighted above, it is common knowledge that information technologies and communication are bringing about an industrial revolution based on information on the scale of that which rocked the 19th century and which was unthinkable less than two decades ago. The development of these new means of communication represents an element of increased competitiveness for enterprises and opens up new perspectives in terms of both work organisation and job creation. The diffusion of these new technologies at all levels of economic and social life is thus gradually transforming our society into a so-called 'information society'

One of the projects that originated from the European Commission's meeting in Brussels in 1995, as part of the Commission's action plan on Europe's way to the information society, is eConstruct, Project No. IST-1999-10303. The project falls under the European DG13 5th Framework IST Programme, and has as its goal the development of *eCommerce & Business in the European Building and Construction Industry: Preparing for the Next Generation Internet (NGI)*. The project has various partners such as construction companies (end-users), academic institutions (research and development), and software vendors. Another notable partner is the International Alliance for Interoperability (IAI), an international organisation with several Chapters around the world, and which actively promotes interoperability in the architectural, engineering, construction and facilities management (AEC/FM) industries (Woestenenk, 2002c)

eConstuct and its partners have already done a large amount of research and development and have made great strides in developing some of the aspects that the industry needs. Some of the needs identified are:

- Open communication for catalogue information
- Agreement needed on these catalogue "Objects" and their "Properties"
- The requirement of a "flexible" structure – that also supports catalogue specific information
- To be able to find things and compare them
- Inexpensive and easy to use

At the closing ceremony of a seminar and workshop held in Sidney, Australia in October 2001, which was organised by the Australian Chapter of the IAI and attended by delegates from across the globe, it was agreed that although much work has been done to resolve some of the abovementioned needs, workable outcomes and full implementation will only be achieved in the next generation

Due to space and study delimitations, it is not feasible in this article to fully describe and illustrate the work that has already been done in the field of electronic product data transfer and particularly the development thereof by eConstruct and its partners. Further reviewing is therefore limited to a brief overview of the meaning and development status of some of the important terms relating to the electronic development in the transfer of product data and is followed by a diagrammatic illustration (see Diagram 1) portraying how the technology is eventually to be implemented

Current developments

Woestenenk (2002a), one of the foremost leaders in the development of object-oriented approaches for the management of construction information, revealed that a recent initiative by ISO/TC59/SC13 may bring about the cooperation between the main streams developing new technologies referred to hereinbefore. It has initiated an object-oriented approach as an alternative to traditional, view-related classification. From this approach the LexiCon has been developed by the Dutch *Bouw Afsprakenstelsel* (BAS) organisation, which felt the need for an integrated, interoperable information platform

The LexiCon identifies physical objects and spaces as classes of interest for the construction industry, with a scope reaching from the largest construction works (e.g. an airport) to the smallest articles delivered by manufacturers (e.g. nails or sand). The LexiCon is implemented in a database and the application provides an object-oriented interface to the underlying database

The LexiCon will initially be populated with objects selected from existing sources, like classifications and product catalogues in at least two languages, English and Dutch, with the possibility of adding other languages. It is based on ISO STEP and IFC's (see below),

and intends to be populated and maintained by the users on a worldwide scale, combined with local and individual extensions

Standard for Exchange of Product Model Data (STEP) and Industry Foundation Classes (IFC)

At the international level there are a few relevant organisations doing research and development in CIT, such as ISO in which TC10/SC8 (construction documentation), TC59/SC13 (construction information) and TC184/SC4 (STEP) should be mentioned. CIB-W78 is also particularly active in regard to CIT matters

Ingirige, et al (2001) submit that the development of product models such as IFC in construction has been influenced to a great extent by the successful adoption of STEP in many other industries, and suggest three possible ways to share such data, namely by:

- *exchanging of files by e-mail or physical medium. (files attached to e-mails or on diskettes);*
- *using of shared databases; and*
- *using of software interfaces*

Presently most software applications share information using physical files. Data could also be transferred and shared using a database. The main thrust of IFC development is however in the area of software interface development for information sharing and exchange as illustrated in Diagram 1 hereafter

Extensible Mark-up Language (XML) and Web Standards

XML integrates data from different sources that are dispersed and exist in a variety of formats. XML maintains the intelligence of the data all the way through a processing chain. Therefore data can be retrieved from several sources, combined and customised and sent to another level for processing. According to Ingirige, et al (2001) the difference between IFC and XML is mainly between the volumes of information handled. The former is about sharing project information in large volumes whereas the latter concerns transactions in smaller volumes. Several research groups have been involved in the development of XML, but in terms of regions there are two main groups who are currently actively involved in the development process, one in the USA and one in Europe. The group in the USA is known as aecXML and the group in Europe is known as bcXML (under the eConstruct project). Both aecXML and bcXML have thus become web standards. In both cases, it is recognised that there is diversity in national and local regulations which gives rise to conflicts in information flows in different regions

Under the eConstruct project it is proposed to develop the Internet so that XML based structured information could be exchanged between architects, engineers, quantity surveyors, suppliers, contractors and subcontractors. Therefore the web standard developed (bcXML) could facilitate information exchanges within the European construction industry using the Internet as a common platform for user access, but as stated hereinbefore, this process would probably only become fully operative in the next generation

The electronic transfer of data through IFC's and bcXML browser exchange can best be summarised by a graphical presentation. Diagram 1 illustrates how professionals and other users in the construction industry might make use of the Internet for managing all relevant product information in the next generation

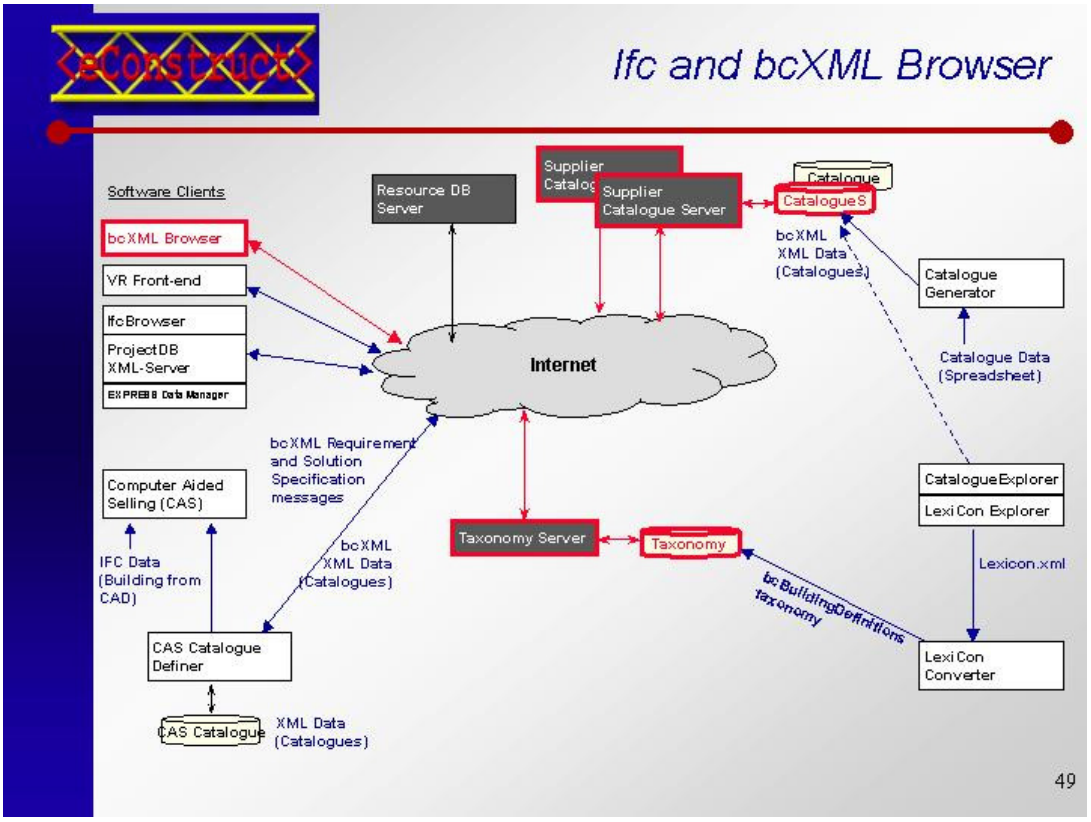

Diagram 1: Diagrammatic portrayal of electronic transfer of data through IFC and bcXML browser exchange (Source: Woestenenk, 2002c)

Summary

With digital electronic data number codes and rigid classification systems may not be essential. Certain aspects, however, which are the classifications, hierarchies within subclasses, and consistent definitions, will continue to be of importance. Such standardisation will remain a useful and critical tool for those developing the software and also for those applying the software. When objects are defined for object-orientated technology, it is important that the objects always reside within the same class and subclasses, and that they mean the same thing to all participants. An overall classification table and thesaurus that is a consensus standard will be an important reference in the development of advanced CIT

Questions that can rightfully be asked are, firstly, where does the RSA fit into this global picture and, secondly, what measures should be taken by the local construction industry not to be left behind in what is taking place in most first world countries with regard to information management? It may be argued that some core processes, mainly drafting and specifying, production of bills of quantities and design in architectural and engineering disciplines, have been automated to a significant degree. Computerisation of these processes has progressed steadily over some twenty or more years, but in fact there has been practically no integration of the information being processed. Drawings, specifications and bills of quantities, for example, remain largely in their own domains with only occasional efforts being made to integrate them systematically

The impediments to CIT adoption are well known. They include low or negative profitability, low education standards, typically small size of firm and the transitory nature of projects and project teams. While each of these shortcomings might be addressed to some degree it seems unlikely that the fundamentals will change in the near future. This has the outcome that progress can only be in stepwise fashion, with

each step being consistent with widely available technology and its uptake by the industry in general (Goh & Chu, 2002)

Woestenenk (2002b) presented his view on the immediate future in an article entitled *The Lexicon - A bridge between theory and practice* in which he made the following observation*: However, construction IT research and development often involves academic schemes with little relation to everyday reality or ambitious ideas involving global change on a massive scale. Rarely, if ever, is there any vision of how a fragmented, under-funded, uncoordinated industry with multiple participants is to get from "here" to "there". The objective of re-engineering the processes of design and documentation across the industry is frustrated because nobody is working out how to do it - all the attention is going to some distant future and hypothetical state and not to how we can do it incrementally as the technology advances and becomes increasingly affordable and cost-effective*

A gap therefore exists between the "now" and "then". At the present moment the construction industry in the RSA has to put up with procurement documentation that is often of inferior quality because of the lack of adequate model documentation that can be used as a basis or the difficulties being experienced in product information sourcing. Unfortunately, no immediate solutions to alleviate these problems have come to the fore and the idealistic scenario envisaged above appears to be some decades away.

DATA COLLECTION

Sampling method

As mentioned hereinbefore, a descriptive survey process was chosen by Maritz (2003) for the data generation and analysis. In a survey of this nature the researcher poses a series of questions to willing participants; summarises their responses with percentages, frequency counts, or more sophisticated statistical indexes; and then draws inferences about a particular population from the responses of the sample (Leedy, 1997 : 196)

The potential survey population could have been made up of architects, engineers, quantity surveyors, other building professionals such as landscape architects, town and regional planners, and contractors, subcontractors, manufacturers, suppliers, property developers, etc. Such a population would have amounted to literally tens of thousands of people, making the survey too costly, and logistically almost impossible. After careful consideration it was decided to draw the survey sample from the practices of only three of the abovementioned professional disciplines, namely architects, engineers and quantity surveyors. Two factors were determinant in making the decision, namely the specific expertise that the person belonging to one of these selected professional groupings would possess regarding the subject matter, and the manageable size of the target population

Response

Table 1 represents the responses received from the selected disciplines

	ARCHITECTS	ENGINEERS	QUANTITY SURVEYORS	OTHERS	TOTAL
No of questionnaires issued	997	169	286		**1452**
No of questionnaires after adjustment	850	145	245		**1240**
No of questionnaires received	166	39	66	3	**274**

Response rate	**19,5%**	**26,9%**	**26,9%**		**22,1%**

Table 1: Total number of valid responses received categorised according to discipline

The target number of completed questionnaires that was set during the planning stages of the survey amounted to a minimum of 250 valid responses. This figure was a target of between 15% and 20% of the total number of questionnaires delivered, which is a generally accepted statistical norm for this type of survey (Hussey & Hussey, 1997 : 163). This target has been exceeded as 274 responses were received. The response rate of just more than 22% for the selected sectors combined is therefore deemed to be satisfactory

Trends indicated by data collected

For the sake of convenience the objectives of the survey are recited as headings hereunder, and they are followed in each instance by abbreviated inferences made and conclusions drawn based on the frequency distribution generated by the descriptive statistical exercise. As a result of constraints that commonly would dictate the length of a paper of this nature, only Objectives 5 and 6 (out of a total of 7) are discussed. These two objectives dealt in particular with the effectiveness of sourcing for construction information

Objective 5:

To investigate whether the Internet and/or individually customised on-line product information systems will suffice and in fact replace the need for a separate standard specification

	TOTAL	GRAPHICAL PRESENTATION 0 20 40 60 80 100	LINE OF BUSINESS ARCHITECTS	QUANTITY SURVEYORS	ENGINEERS
Total Responses	**267**		164	65	38
Disagree	**50**		32	12	6
%	**18.7**		*19.5*	*18.5*	*15.8*
ly Disagree	**54**		28	20	6
%	**20.2**		*17.1*	*30.8*	*15.8*
Undecide	**57**		33	15	9
%	**21.4**		*20.1*	*23.1*	*23.7*
Moderate	**74**		50	12	12
%	**27.7**		*30.5*	*18.5*	*31.6*
Strongly Agree	**32**		21	6	5
%	**12.0**		*12.8*	*9.2*	*13.2*
Mean	**2.94**		3.00	2.69	3.10
S.D.	**1.31**		1.33	1.24	1.29

Table 2: Separate standard specifications are something of the past, as all relevant information can be obtained from the Internet or from product libraries such as QPL, SPECXpert, etc (Statement 1.12 of the questionnaire)

The sample mean (2.94) of the total for all respondents, and that for quantity surveyors (2.69) in particular, have ratings of below the neutral position of 3, which is an indication that they did not agree with the above statement

Of the "open-ended" responses presented on the specific subject area the following comment from a respondent was considered typical:

Obtaining technical information from the Internet is time-consuming and often information is incomplete; printed format still has a role to play

The literature review conducted by Maritz (2003) highlights the problems that still exist in adapting to the use of IT for information exchange in construction, and identifies the organisation of information as the most important drawback. This view is shared by Montiere (2002) who reported the following on the problems being experienced in the business world with the application of IT:

Slechts een op de vijftig computertoepassingen in bedrijven werkt goed. De rest kan de toets der kritiek niet doorstaan. Hier is sprake van onvoldoende prestaties

Dit is de onthutsende resultaat van een onderzoek dat het bureau Forrester heft gedaan onder 87 directeuren in Noord-Amerika en 25 directeuren in Europa die specifiek verantwoordelijk zijn voor die informatietechnologie (IT) binnen hun bedrijf

From the foregoing the inference can be made that, although the Internet is fast becoming an important instrument for information sourcing, electronic systems currently available for construction resources information need further development before they can be effectively applied

Objective 6:

To establish how often, and which of, the current available product information systems are consulted, and whether they in fact satisfy the present needs

Grouping of questions 3.1 to 3.4

- How often do you use the product information systems listed in question 3.1?
- Do you feel that the current available product information services satisfy your information needs?
- Do you feel that the proliferation of individually customised product information systems is 1) essential; 2) of some help; or 3) a waste of money?
- Do you think that a unified classification system for organising information will assist specifiers, measurers, etc in locating construction information more effectively?

Figure 1 hereunder shows the frequency and percentage distributions of responses received from the total for all respondents, whilst figures 2 to 4 (inclusive) thereafter show the frequency and percentage distributions of responses received from each profession separately

An evaluation, in the form of a brief discussion, of the realisation of the sample's response to each question under Question 3 in the questionnaire is given following Figures 1 to 4 hereunder, which is amplified/supported/not supported by "open-ended" comments where applicable

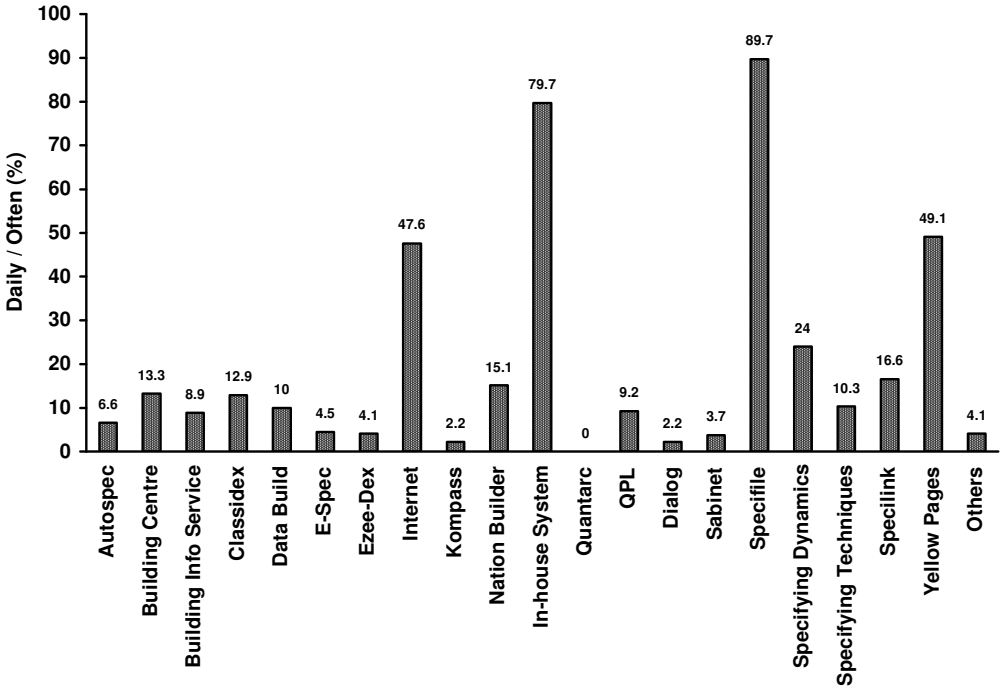

Figure 1: The regularity of use of available product information sources - Daily / Often (Question 3.1 of the questionnaire)

Figure 1 presents a graphic illustration of the responses received on the regularity of use of available product information sources. The presentation makes it abundantly clear that little use is made of the greater majority of available product information sources

It is evident, however, from the results in Figure 1 that the use of Web-based tools and technologies is gaining significant momentum in the construction community, as an increasing number of professionals and contractors begin to understand the critical role of the Internet in their day-to-day business operations. Figure 1 illustrates that nearly 50% of the respondents use the Internet daily or often in some form or fashion, and that it is already rated the fourth most important means of obtaining building product information in the RSA. Some obviously rely on the Internet more than others – it all depends on how technologically advanced the company is – but chances are that it will be used to manage at least some of the business processes

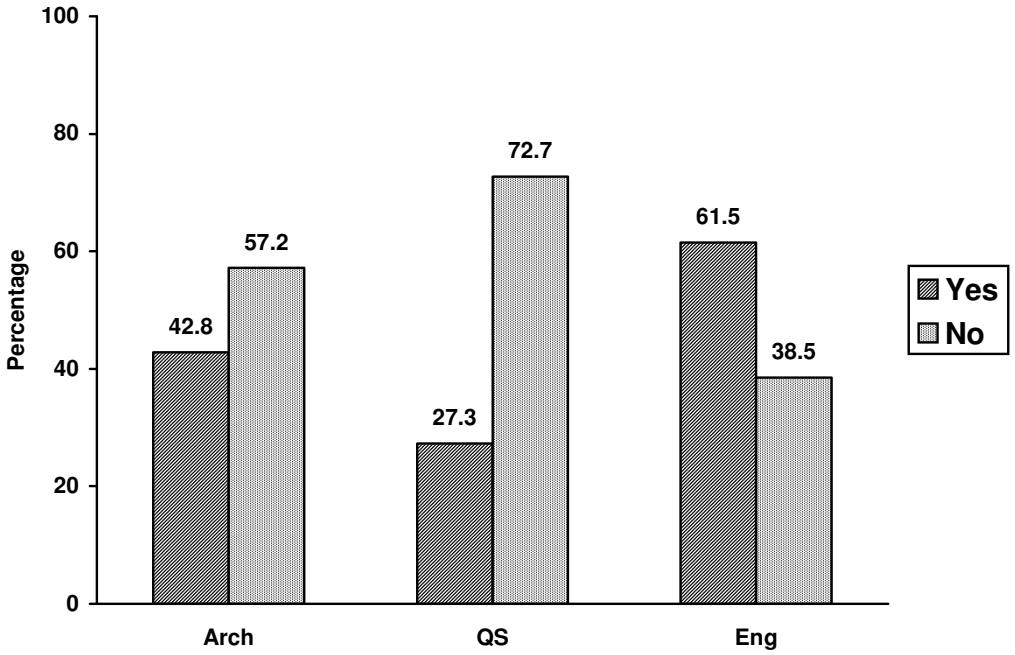

Figure 2: Sufficiency of current available product information services (Question 3.2 of the questionnaire)

The graphic presentation in Figure 2 of responses received for question 3.2 shows that the quantity surveying profession is the least satisfied when their perception of the sufficiency of current product information services is evaluated. The inference that can be made from the responses received for this question is that the industry, in general, but more specifically quantity surveyors, does not regard the availability of product information as sufficient

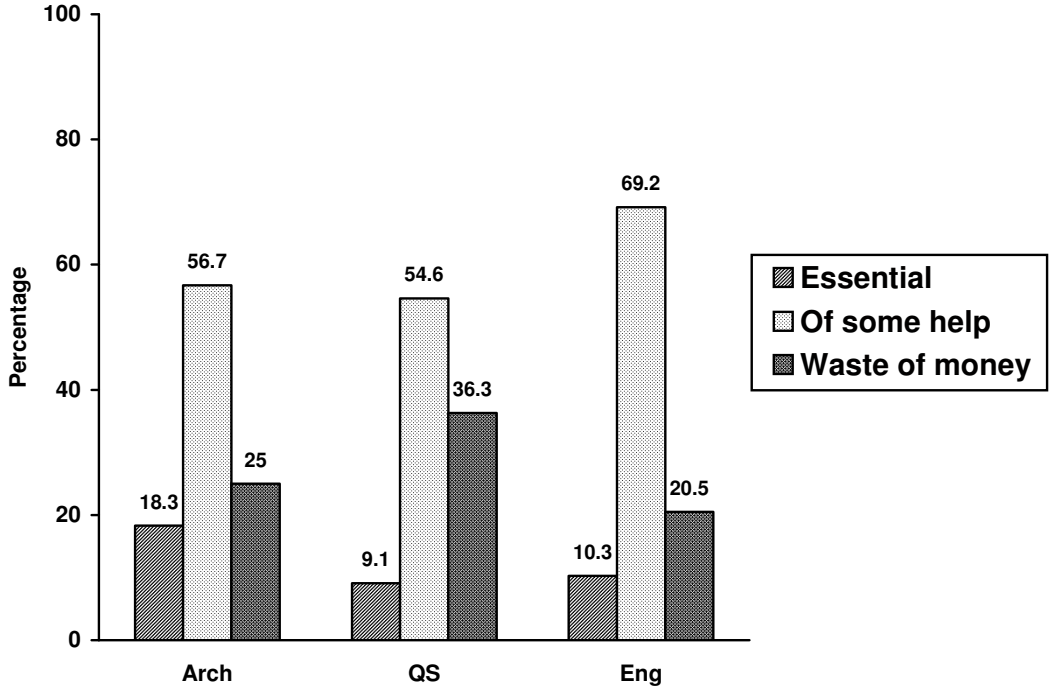

Figure 3: Relevancy of individually customised product information systems (Question 3.3 of the questionnaire)

Figure 3 is based on the responses received on the question of the relevancy of the several individually-customised product information systems that are currently on offer in the RSA. The results indicate that although the majority of respondents regarded the systems as 'of some help', a significant percentage from each profession viewed them as a 'waste of money'

A selection of some of the more notable "open-ended" comments received on the specific issue regarding the degree of effectiveness of the management of product information sourcing in the RSA are presented verbatim below:

> *Many companies are withdrawing from the currently available systems, which makes the systems even more inadequate. One unified system would attract all players*
>
> *The affordability of such a system is of some concern if it is initiated as a profitable enterprise. [Classidex, as an example, is unaffordable for small to medium size practices (despite its comprehensiveness) which is a pity]*
>
> *Everyone has something of value, but if it were not for our database that the company has initiated we would be in a predicament. Because no one of the listed companies has a decent variety – too many manufacturers are withdrawing*
>
> *Current computer-available information is still very limited*
>
> *How do you implement such a system in a fragmented industry like ours?*
>
> *The current product information systems/libraries do not satisfy the measurer's needs*
>
> *Information systems that encroach on user computer hard disc space are not acceptable to us*
>
> *There is a need for information to be accessible. "Brochure"-type sheets are not relevant to this age*
>
> *A comprehensive, integrated system would be very helpful*
>
> *Most of these database/info systems are laborious and time consuming; hence they need some obvious restructuring*
>
> *Computer search engines are fast and efficient and do not need a unified classification system. The yellow pages have worked perfectly for many years – and that is an alphabetical classification system (very simple)*
>
> *Internet-based systems are inefficient, time wasting and very costly (phone bills). If manufacturers/or others want us to use their products, they must pay for getting their information to the specifiers*

Figure 1 illustrates that, of the 21 product information sources that were known to be operating at the time when the survey questionnaire was drafted, only four were regularly consulted. Two of those four, namely the Internet and the Yellow Pages, are general information sources, i.e. they are not specifically designed for use by the construction industry, and the regularity of use for both those sources was rated below 50%. Of the remaining two information sources that were regularly consulted (regularity of use was 79.7% and 89.7% respectively) one was the respondents' in-house system,

whilst the other was that of a commercial product information distributing company (Specifile)

It is generally accepted that in-house systems have certain shortcomings as an information source, the most important being that they are not comprehensive and not regularly maintained. Even large practices find it difficult to properly resource the maintenance of their in-house systems, with the result that it may be several years since they were last reviewed. Such systems would also be inconsistent across offices with regard to their style, content and structure. It can therefore be argued with a reasonable amount of certainty that the information in any of the in-house systems would be supplementary only to the information provided by commercial companies that practices subscribe to, and that such information would most likely be stored in hard copy format only. The in-house system would also most probably not make use of a recognised bibliographic classification method

The advantages of using independent product information companies can be identified as:

- More current than in-house systems
- Lower cost than in-house systems. Cost of subscription would be less than doing your own thing to the same level of quality
- More comprehensive than in-house systems
- Help service to locate information would generally be available
- Familiarity with indexing system
- Personal contact with knowledgeable field representatives

The disadvantages of using independent product information companies can be identified as:

- Relevant material often not included
- Must be subscribed to
- Absence of a national standard for classification, as different companies use different methods of arranging product information
- Limited integrating possibilities with consultants' own production systems

The respondents were not requested to rate the effectiveness of individual companies, but were asked to rate in general the sufficiency of the available information sources. These results are illustrated in Figure 2, and show that 57.2% of the respondents from the architectural profession and 72.7% of the respondents from the quantity surveying professions were not satisfied, whilst 61.5% of the respondents from the engineering profession indicated that they were satisfied. A probable explanation for this contradiction might be that information sourced by architects and quantity surveyors is much more varied than that sourced by civil engineers

The general conclusion that can be drawn from the responses received in the above grouping of questions is that product-information-sourcing in the construction industry is not handled effectively in the RSA, and therefore does not satisfy the needs of consultants, contractors, manufacturers, suppliers, etc. The fact that in-house product libraries were rated the second most important source for product information is further testimony that current product-information-systems do not provide an effective service to the industry

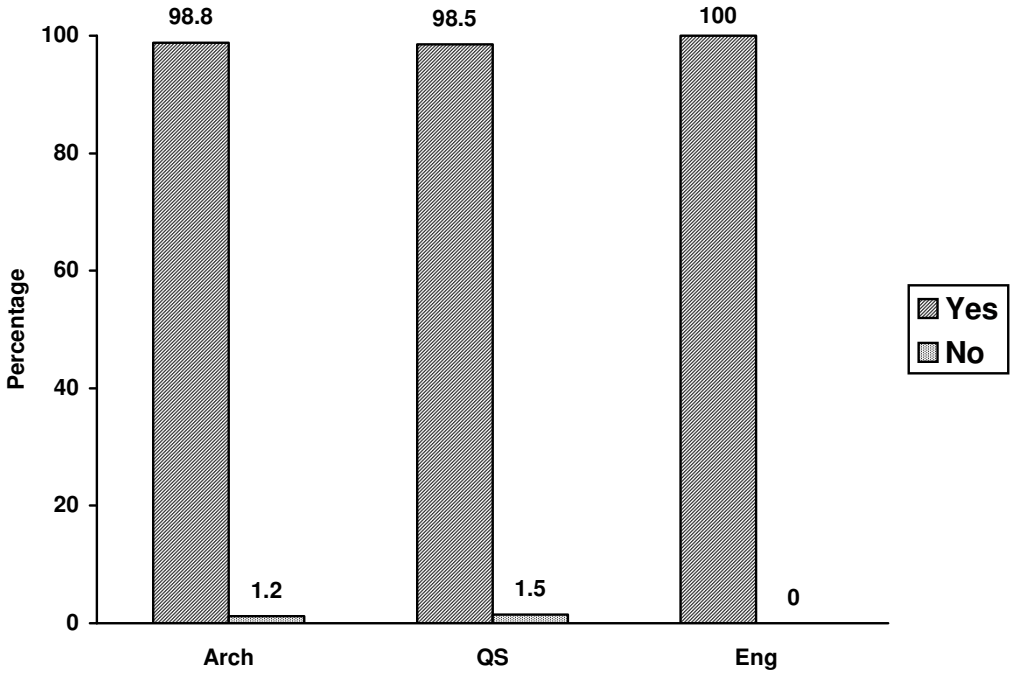

Figure 4: Is a unified classification system for the organising of construction information essential for the South African construction industry (Question 3.4 of the questionnaire)

The graphic presentation above is based on the responses received for question 3.4, and indicates a frequency distribution for "Yes" of virtually 100%. The trend is, therefore, clearly positive, which makes further comment superfluous. Suffice to say that virtually all the respondents supported the development of national classification standards, and that these standards should be developed along similar lines as those in countries that have already done the necessary exploratory work in this field of information management

SUMMARY AND RECOMMENDATIONS

This article presented and analysed primary data collected from 271 practices in the respective professions of architecture, quantity surveying and civil engineering, mainly with regard to the effectiveness of product information sourcing and the establishment of national standards for classification of construction cost information and construction resources information

The research has shown that various initiatives in the field of construction information management are being undertaken to promote interaction in AEC/FM industries. It has further been pointed out that although the Internet potentially forms the ideal open, low-cost communication platform for the building and construction industry, in practice the Internet is currently only used in a limited way. The most important reason for this has been identified as 'insufficient structuring of information'

The research has indicated that there is a strong need for utilising information systems more effectively. The following recommendations are provided with the view of assisting decision-makers in future planning:

- A specialised committee(s), similar to such committees as the Construction Project Information Committee (CPIC) in the UK, or the Construction Industry IT Standards Technical Committee (CITC) in Singapore, should be initiated to spearhead development in CIT. Such a committee should represent all

stakeholders at all levels in the South African building and construction industries. In this regard it is suggested that Boutek of the Council for Scientific and Industrial Research (CSIR) should take the leading role, as much research work has already been carried out by their experts in certain areas of CIT (notably in Web-enabled knowledge based approaches to life cycle development, CAD design technologies, e-Commerce product information sourcing, e-Tendering, etc)

- Work groups should be set up to develop national standards for construction classifications. These work groups should involve all stakeholders, and in this regard it is the author's opinion that the Procurement Forum of Standards – South Africa (STANSA), under the auspices of the Construction Industry Development Board (CIDB), is the organisation best suited to control the development, publication and maintenance of the classification standards

  The development of such standards should take international trends and the latest developments into account, and it is therefore recommended that the proposed work groups should seek active participation and cooperation with international organisations such as CIB and IAI

REFERENCES

Books, reports, dissertations, thesisses, conference papers, articles, etc.

AMOR R, BETTS M, COETZEE G & COOPER G. 2001. *Information technology for construction: Recent work and future directions.* Paper presented at the proceedings of the CIB-W78 International Conference: IT in Construction in Africa. 29 May – 1 June 2001; Mpumalanga, RSA

BEHRENS S J. 2000. *Bibliographic control and Information sources.* University of South Africa, Pretoria: Unisa Press, RSA

BLOOMFIELD D & AMOR R. 2001. *I-SEEC: An internet gateway to European construction resources.* Paper presented at the proceedings of the CIB-W78 International Conference: IT in Construction in Africa. 29 May – 1 June 2001; Mpumalanga, RSA

COOPER D R & EMORY C W. 1995. *Business research methods.* 5th Edition. ISBN 0-256-13777-3. Richard D Irwin Inc., USA

FELLOWS R & LIU A. 2003. *Research methods for construction.* 2nd Edition. Blackwell Publishing Company, Oxford, UK

GOH B H & CHU Y L. 2002. *Developing national standards for the classification of construction information in Singapore*. Paper presented at the conference of the CIB-W78 International Conference: Distributing knowledge in building. 12 – 14 June 2002, The Aarhus School of Architecture, Aarhus, Denmark

HUSSEY J & HUSSEY H. 1997. *Business Research: A practical guide for undergraduate and postgraduate students.* Macmillian Press. Hampshire and London, UK

INGIRIGE B, AOUAD G & SUN M. 2001. *Awareness of information standardization in the UK construction Industry: A preliminary survey by the Siene network.* Paper presented at the proceedings of the CIB-W78 International Conference: IT in Construction in Africa. 29 May – 1 June 2001; Mpumalanga, RSA

INTERNATIONAL ORGANIZATION OF STANDARDIZATION (ISO). 2000. *Building construction – Organization of information about construction works – Part 3: Framework for object-oriented information exchange.* Unpublished report. Norway

KELLER & WARRACK. 2000. *Statistics for Management and Economics.* 5th Edition. Duxbury, California, USA

LEEDY P D. 1997. *Practical research, planning and design.* 6th Edition. Macmillan, New York, USA

MARITZ M J. 2003. *Towards establishing national standards for the classification of construction information in the Republic of South Africa.* Unpublished Ph.D. thesis. University of Pretoria, Pretoria, RSA

MONTERIE A. 2002. *Grote investering in IT vaak verspilling van geld.* De Telegraaf. 30/09/2002; Amsterdam, Netherlands

MOUTON J. 2001 *How to succeed in your Master's & Doctoral studies. A South African guide and resource book.* Pretoria: J L van Schaik, RSA

MURRAY M, NKADO R & LAI A. 2001. *The integrated use of information and communication technology in the construction industry.* Paper presented at the proceedings of the CIB-W78 International Conference: IT in Construction in Africa. 29 May – 1 June 2001; Mpumalanga, RSA

NKADO R & MEYER T. 2001. *Competencies of professional quantity surveyors: a South African perspective.* Article published in Construction Management and Economics (2001) Volume 19, pp. 481 – 491. Taylor & Francis Ltd., UK

ROYAL INSTITUTE OF BRITISH ARCHITECTS. 1969. *Construction indexing manual.* London: RIBA Publications, UK

SOUTH AFRICAN BUREAU OF STANDARDS. 1998. *ARP 013: Rules for the structure and drafting of standards.* 2nd Edition. SABS. Pretoria, RSA

TOLMAN F, VAN REES R & BÖHMS M. 2001. *Building and construction extensible mark-up language (BCXML): The C2B/B2C scenario.* Paper presented at the proceedings of the CIB-W78 International Conference: IT in Construction in Africa. 29 May – 1 June 2001; Mpumalanga, RSA

WOESTENENK K. 2002a. Personal communication. 1 October, Ede, The Netherlands

WOESTENENK K. 2002b. *The Lexicon – A bridge between theory and practice.* Unpublished report. Ede, The Netherlands

WOESTENENK K. 2002c. *eCommerce & eBusiness in the European Building and Construction Industry: Preparing for the Next Generation Internet (NGI).* Unpublished report. Ede, The Netherlands

Internet

INFORMATION SOCIETY TECHNOLOGIES (IST). *ECommerce & eBusiness in the European Building and Construction Industry: Preparing for the Next Generation.* Internet: http://www.europa.eu.int/information_society. Access: 6/16/02

INTERNATIONAL COUNCIL FOR RESEARCH AND INNOVATION IN BUILDING AND CONSTRUCTION. *Introduction to CIB.* Internet: http://www.cibworld.nl/pages/gi/pages/pastpres.html. Access: 8/27/01

INTERNATIONAL ORGANIZATION OF STANDARDIZATION (ISO). *Co-ordination of classifications for productmodelling and established building classifications.* Internet: http://www.bsab.byggtjanst.se/pdfpub/ifc/w78ppt.pdf. Access: 9/6/01