Technological University Dublin

ARROW@TU Dublin

Conference papers

School of Surveying and Construction Management

2009

Creating a Software Marketplace for the SME Community in the Irish Construction Industry

Alan V. Hore
Technological University Dublin, alan.hore@tudublin.ie

Roger West
Trinity College, rwest@tcd.ie

Alan Redmond
Technological University of Dublin, d99101075@mydit.ie

Follow this and additional works at: https://arrow.tudublin.ie/beschreccon

Part of the Construction Engineering and Management Commons

Creating a Software Marketplace for the SME Community in the Irish Construction Industry

Alan Hore[1], Roger West [2] and Alan Redmond[3]

[1]School of Real Estate and Construction Economics, Dublin Institute of Technology, Bolton Street, Dublin 1.

[2] Department of Civil, Structural and Environmental Engineering, Trinity Collge, Dublin.

[3]School of Real Estate and Construction Economics, Dublin Institute of Technology, Bolton Street, Dublin 1

Email: *ahore@cita.ie, rwest@tcd.ie; aredmond@cita.ie*

Abstract:
The Construction Industry is a sector where Information Communication Technology (ICT) and e-Business are used to a lesser extent than in most other sectors. The high concentration of Small to Medium sized Enterprises (SMEs) in the industry and the typical nature of the service provided, being an on-site and often highly customised service are generally identified as the reason for the low ICT uptake. The majority of Irish companies in the construction sector are SMEs. E-Business has provided the construction SME industry the opportunity to compete globally. The Construction IT Alliance (CITA) has identified a programme that can create a digital SME community that will promote ICT software. In creating this community CITA will be able to provide the construction industry in Ireland with an ICT software service deployed from a centralised data centre. This ICT concept commonly referred to as 'Cloud Computing' will enhance CITA's services in providing ICT uptake to the wider Irish construction industry.

Keywords:
Construction, eBusiness, network SMEs, software.

1   Introduction

The National Economic Social Council (2004) reported that additional housing output had been predicted for the next decade with the balance between supply and demand being achieved in the coming years but it was not clear when the annual housing market output would begin to decline (NESC, 2004). Forward to 2009 and this decline is clearly evident as a sharp downward adjustment has been recorded since the height of the Irish construction industry boom in 2006. According to the Irish government (NSRF, 2007) a part of the National Strategic Reference Framework is the Commission drafted Community Strategy Guidelines (CSG) which purpose is to define key priorities for EU Regional Policy over the period 2007-2013. Such priorities are to promote and encourage innovation, the knowledge economy, research and ICT (NSRF, 2007). The

significance of these priorities is now substantial with the highest unemployment figures now reported in 11 years. This downward adjustment has made traditional Irish based companies move to selling products and services internationally. The need for Irish companies to be more effective and efficient with e-Business technologies to compete with their competitors was the main incentive for this project.

According to Cartlidge (2002), the one thing that all sectors of e-Business are sure about is that the more fragmented the market, the more efficiency benefits e-Business ventures can bring, by uniting the disparate elements of the supply chain (Cartlidge, 2002).

The authors will present the results of a recently completed research project, the Construction IT Alliance eXchange (CITAX) project. In 2006 CITA set about to identify the potential for efficiencies that would lead to savings and faster delivery through the implementation of e-Business in the construction industry. Gatautis and Vitauskaitè (2008) posited that the use of e-Business in the construction sector is very limited and the potential of e-Business to increase productivity and efficiency is not exploited.

Software is very widely used today, yet its instrumental role in the modern digital economy is often overlooked. With market revenues of over €200 billion in Europe and growth rates of between 6 and 8%, software is the largest and the fastest growing segment of the ICT market (European Commission, 2009).

The purpose of this paper is to promote the creation of a new digital hub which will allow SMEs to have access to software that was previously only the domain of large enterprises. This radical concept of a virtual market for SMEs in the construction industry through the implementation of Software as a Service (SaaS) will enhance the effectiveness and efficiency of SMEs. CITA's research in identifying and analysing this innovative concept will enable SMEs to be more competitive domestically and have the opportunity to export their services and products globally.

2 ICT Up-Take by SMEs in the Construction Industry

According to Gallaher *et al* (2004), the paper system is still the most common medium for storing and transferring information. The introduction of computer use has done little to create the "paperless office." The fact remains that many of the key decisions makers in organisations do not fully appreciate the interrelated nature of the business processes that support the construction life cycle. The report identifies that interoperability issues occur creating a fragmented business process and organisational structure. It was estimated that the cost of inadequate interoperability in the U.S capital facilities industry is $15.8 billion per year. In 2002, the value of capital facilities set in place in the U.S was $374 billion. The significant magnitude of this figure presents the ideology that even small improvements in efficiency potentially represent significant economic benefits.

In recognising that ICT has the potential to revolutionise the industry and streamline historically fragmented operations the report states that tools such as computer-aided

drafting technologies, 3-D modelling technologies, and a host of Internet and standards based design and project collaboration technologies can reduce the fragmented nature of the industry. However, the problems associated with not being able to manage and communicate electronic product and project data between collaborating firms and within individual companies is compounded by the large number of small companies that have not adopted advanced ICT (Gallaher *et al*, 2004).

Becerik (2004), the internet connectivity and the general use of email and the World Wide Web are viewed as being substantially high in the construction industry. However, Becerik accepted that many other studies demonstrate that new technologies are adopted slowly and ineffectively in the Architect, Engineering and Construction (AEC) industry. For example, 2D Computer-Aided-Design (CAD) was in the market for almost four decades before it became pervasive. 3D is a well-established technology that is only now beginning to enter the main stream. 4D CAD, an incorporation of 3D CAD and time, has started to be used by the innovators of the industry. It appears that larger manufacturing firms are more innovative towards the adoption of new technology than AEC firms, possibly by 3 to 5 years (Becerik, 2004).

According to an Irish government (DETE, 2004) report Ireland was identified as one of the first countries to recognise the potential and challenges of the Internet, with the establishment of an Information Society Commission in 1998, and publication of the Government's first Action Plan for the Information Society. This plan focused on the development of the telecommunications infrastructure and regulatory environment, developing e-Business opportunities, delivering public services electronically and generally stimulating widespread society engagement with the Internet. The report acknowledged that Ireland has a very strong ICT producing sector and has the potential and opportunity to become a world leader in the emerging digital sectors. However, the performance is less than impressive when it comes to the adoption of ICTs by existing enterprises in the non ICT related sectors of the economy. The report suggests that as e-Business opens up the Irish economy to international competition. The authors recommended that Irish enterprises should use ICT as a generator of competitive advantage in the context of the environment they currently operate in and companies should have ICT systems that are robust and secure, in order, to obtain maximum benefit.

In reference to the OECD's published report ICT, e-Business and SMEs (2004), ICT applications were recognised as having the ability to improve information and knowledge management inside a firm and reduce transaction cost and increase the speed of transaction for both business-to-business (B2B) and business-to-consumer (B2C). It was repoted that 9 out of 10 SMEs were equipped with computers at the end of 2000/early 2001. However, it was noted that across the sector internet penetration was generally higher in larger enterprises (OECD, 2004).

It was reported in an e-Business W@tch (2006) survey that the construction industry was a sector where ICT and e-Business are used to a lesser extent than in most other sectors. The two reasons identified for low ICT uptake were:

- The high concentration of SMEs in the construction industry and

- The typical nature of the service provided in construction, being an on-site and often highly customised service.

The eBusiness W@tch 2006 survey data suggested that large construction enterprises were increasing their focus on ICT issues, such as e-procurement systems, collaborative design systems and collaborative document sharing. However, it also stated that there was a low percentage of firms employing ICT as well as a low adoption of Enterprise Resource Planning (ERP) software and advanced e-procurement solutions. The survey also mentioned that construction industry enterprises have little focus on hiring ICT practitioners and ICT training and that the use of eStandards are limited in the construction industry but about in line with the weighted all-sectors average (eBusiness W@tch, 2006).

Hore and West (2005) reported that building materials account for up to 50% of all construction costs and in the field of business to business (B2B) interactions there is a huge untapped potential for productivity gains. Technologies such as Automatic Identification (Auto-I) and bar coding have become widespread within manufacturing, medicine and retail industries but in comparison with the construction industry adoption worldwide it is very piecemeal. Hore and West carried out a survey of over 100 Irish construction companies. The survey analysed the current level of technology uptake in B2B purchasing transactions between building contractors and material suppliers; the driving forces which attract firms to adopt electronic purchasing; the barriers of such adoption and the future development in adopting technology within the Irish supply chain. The key results illustrated a low level of awareness of appropriate technologies and the absence of appropriate industry standards. The need for an increase in the ICT literacy skills of purchasing staff and familiarity with electronic purchasing was also recommended (Hore and West, 2005).

The problems associated with fragmentation of the construction process and the adoption of Construction Collaboration Technologies (CCT) was analysed in Duffy et al (2007). Analysing from an Irish context, the potential benefits of what CCT had to offer the construction industry were beginning to be realised. Duffy et al, reported that the construction industry was actively involved in the work of CITA in order to seek and improve the use of ICT, including CCT. The lack of distinct research into the possibilities for the adoption of CCT within the SMEs involved in project management roles in Ireland was the main focus of the paper. From this platform an outline of future research would be proposed taking into consideration the potential barriers to adopting CCT within the SMEs project management roles. The expected outcome of the research was a proposed framework for the implementation of CCT in SMEs engaged in construction project management (Duffy *et al*, 2007).

3 Construction IT Alliance eXchange Project

3.1 Background to CITAX

CITA was established as a research project in Dublin Institute of Technology (DIT) in association with the Waterford Institute of Technology (WIT) in May 2001, with the vision of harnessing the potential of ICT in the Irish Construction Industry. CITA was

formally incorporated into a company limited by guarantee with no share capital in November 2005. Membership of CITA is open to all stakeholders in the Irish construction industry who all share the CITA vision and want to participate in fulfilling CITA's objectives.

CITA has identified its objectives as:

- To inform the Irish construction sector of ICT developments.

- To establish and disseminate good practice in the use of ICT in the Irish Construction Industry.

- To encourage ICT related research collaboration between Irish academia and Irish construction practitioners.

- To establish and maintain links with relevant national and international organizations.

- To encourage the strategic use of IT by all firms in the Irish Construction Industry.

3.2 CITA Research Activity

In July 2006 CITA initiated the CITAX project as an industry-led networking pilot project. The CITAX project involved a collaboration of 25 industry partners and a government body. The project aimed to demonstrate that significant measurable economic improvements could be achieved by using readily available ICT tools to radically improve business processes in the Irish Construction Industry. The project was supported by Enterprise Ireland and CITA and was completed in June 2008. The project consisted of five separate but collaborative modules, namely:-

Module 1 – Design

Module 2 – Trading

Module 3 – Electronic Tendering

Module 4 – Project Collaboration

Module 5 – Computer Aided Measurement (CAM)

Each of the modules had clear objectives and by demonstrating these objectives their achievements set out steps for future goals. The general conclusion was that clear economic benefits could be achieved through the pilot projects associated with the modules.

For example CITAX Module 3 (Electronic Tendering) team aimed to demonstrate that there were clear economic benefits to be achieved by organisations that replaced the traditional paper-based system with an electronic tendering process. A pilot scheme was undertaken using FTP (File Transfer Protocol) technology and the results showed

savings of 11% for Professional Quantity Surveying firms, which equates to a saving across the industry of €0.74m per annum; 10% for contractors on their tender costs, which equates to an industry saving of €4.8m per annum and 11% for sub-contractors, which equates to an industry saving of €3.75m per annum.

The European Commission report Sectoral eBusiness Policies in Support of SMEs (2007) commended the fact that CITAX used live pilot projects to show real benefits of eBusiness for the industry (European Commission, 2007).

4 CITA enterprise innovation network (EIN)

4.1 Background

CITA was selected as one of the three networks in Ireland for funding by Enterprise Ireland under the new EIN programme. The project commenced in early October 2008 and is funded by Enterprise Ireland for a three year period. The project will promote ICT and its use in the Irish Construction Industry. The project will involve carrying out detailed research into the particular needs of CITA SME members and other potential new members.

Initially the objectives of this research is to identify the eBusiness and eTendering software products tools and platforms available or potentially available to meet the business needs of SMEs in the construction industry in Ireland. The next phase will be to provide a development strategy for deploying these tools and platforms and the opportunity for CITA to supply an interactive service to its members. The research will also focus on similar work being undertaken in other countries, in order, to understand the main directions of technology development. The knowledge extracted from previous research will be analysed and developed to meet future requirements.

The specific services that the EIN network will provide to its members are as follows:

- An initial one-one ICT consultation IT sanity check, advice on available software packages and backup and data protection policies.

- Access to the virtual EIN.

- Receipt of regular CITA EIN bulletins.

- An invitation to the CITA EIN intra-disciplinary workshops.

- Exclusive access to all research results.

4.2 Focus on SMEs

According to Hague and Woodburn (2006) an SME is a business that employs up to 250 employees. However, Hague and Woodburn also observed the fact that over 99% of SMEs employ less than 50 people and that three quarters of them operate as sole operators. SMEs operate across most industries from complex electronics to traditional business such as manufacturing (Hague and Woodburn 2006).

According to the European Union e-Business W@tch (2006) report, there are approximately 2.4 million construction enterprises in EU-25, of which 97% are small enterprises with fewer than 20 employees. The industry employs about 14 million people, corresponding to about 7% of the European work force and 28.5% of industrial employment.

In a recent report by DKM Economic Consultants the authors estimated that in the Irish construction sector close to 100,000 workers or almost 40% of total persons employed at Q2 2008 worked in companies with less than 5 people. These companies experienced the lowest decline in employment over the past year (DKM, 2008).

According to the Irish government in 2007 the amount of SMEs in the construction sector during the boom period was more than half of the 227,400 workforce. The majority of this workforce was either self-employed or worked for companies with less then 10 people. However, research has also noted that small enterprises generally make less use of more advanced ICT than larger companies. Just under half of small enterprises engaged in innovation activity in 2004 compared with two thirds of larger enterprises (CSO, 2007). Nevertheless, as indicated, in a recent paper by Hore et al (2009), the construction industry has started to shift its focus towards SMEs with software applications such as Enterprise Resource Applications (ERP) and Product Lifecycle Management (PLM), producing new packages to cater for SME requirements.

4.3 Methodology

The CITA EIN project will follow a formula that is similar to the successful CITAX project discussed earlier in this paper (Figure 1).
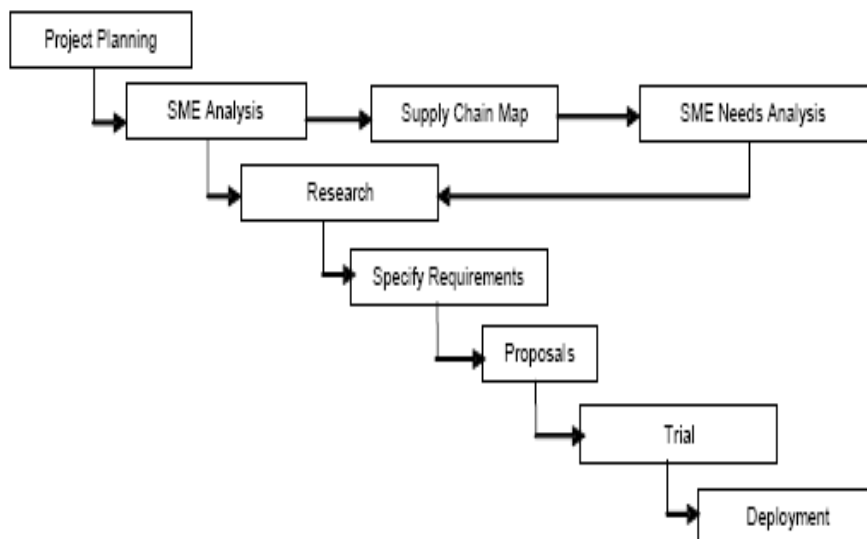

Figure 1. CITA EIN Work Stages

- Project planning – promoting the message of the potential of IT to the SME sector in the construction industry and securing members of SME EIN Network.
- Analysis of needs – identifying the need of SME companies, particularly in the areas of eCommerce and eTendering. Mapping Irish construction industry SME supply chain (production of database).
- Research – identify leading solutions & technologies internationally
- Specify requirements – having undertaken research among our target members and looked at international best practice, create specifications that address the specific needs of the SME sector.
- Call for proposals – establish programmes that will deliver the specifications created in consultation with the industry members.
- Trial – test the solutions that emerge from the process with initial adopters.
- Deployment – encourage the implementation of the solutions across the industry.

4.4 Key Performance Indicators

A number of key metrics of performance are indicated in Table 1 for the CITA EIN project. The 6 key performance indicators are measurable and reflect the impact of the work to be carried out. These indicators will be addressed and assessed, at CITA's general meetings in order to evaluate the progress of the research. In the most recent general meeting held at the end of April 2009 it was established that CITA has attracted 16 actual members, held 2 SME ICT conferences and 4 steering committee meetings.

4.5 Progress to-date

As part of the research into defining the services that will be provided to the EIN members, a series of interviews have already being undertaken with companies that represent a broad spectrum of activity within the construction industry (Table 1).

This spectrum of companies included; one quantity surveying practice, three supplier organisations, one engineer practice and four consultant architects. Most of the companies interviewed have reasonable ICT infrastructure and the majority of the companies have specific software to address particular elements of the construction process. For example, in relation to the Architects 3D modeling was primarily used to provide clients with a visual simulation appearance of their construction project. The main problems presented from the survey were a lack of adequate disaster recovery planning and high capacity broadband. However, the current economic climate has made a number of companies focus on the short term revenue.

Table 1. CITA EIN Key Performance Indicators

Metric Description	Year 1 Metrics	Year 2 Metrics	Year 3 Metrics	Total
Number of new SME members joining CITA. Measure: Additional new members	40	100	150	290
SME IT Conference Attendance to match/exceed the number of new SME members. Measure: Number of conferences	1	2	2	5
Steering group established and meeting on a regular basis Measure: Number of meetings	1	4	4	9
A minimum of 2 working groups established and meeting regularly to deliver agreed objectives Measure: Number of group meetings	6	24	24	54
Number of companies undertaking eBusiness	0	30	100	130
Number of companies tendering electronically	0	40	100	140

5 Research Finding To-Date

As part of CITAs EIN initiative to promote ICT and innovation in SMEs in the construction industry, a software directory has been created with an index of ICT vendors. The future process is to establish these vendors into software categories such as; Feasibility / Design / Project Management / Quantity Surveying and Document Control. In developing CITA's methodology the e-Business and e-Tendering software vendors enlisted on this directory will become participates engaging with on line surveys and structured interviews. The results of these surveys will create a strategy to assist in the development of the best products, services, platforms and ideas.

The ICT vendor database directory will not only act as an advisory network tool. The software vendors from the list could adapt to creating new products built for Application Service Providers (ASP) or provide completely new offerings. According to SIIA, (2001) software as a service commonly referred to as the Application Service Provider model is heralded by many as the new wave in application software distribution. With the vendors products registered to CITA's service an SME customer could log on to the server and down load the vendors software paying only a rental charge for a specific period of use (pay-as-you-go). This would allow the customer to

have the benefit of not having to pay high capital fees for software that they may only use from time to time. The vendor reaps the economies of scale as there will be a high rental demand with no maintenance obligations.

6   Selected Examples of Related International Research

6.1   RICS (Royal Institution of Chartered Surveyors)

In February 2009, Building Cost information service (BCIS) conducted an e-Tendering Survey in conjunction with RICS QS & Construction IT Business Group to update the information from a previous survey conducted in February 2006. The report compares the responses from the 2006 survey sample with the full 2009 survey sample and responses from members issuing 50 or more and 100 or more tenders per year. The key findings are:

- Electronic document transfer is increasing – the percentage in both electronic and paper formats increased by 13%, while the percentage sent only in paper formant decreased by 20%.The growth in electronic only documents transfers in firms issuing larger numbers of tenders trebled.

- Increased use of physical media to distribute electronic tender documents – the use of disks or other physical media increased by 17% and by 26% and more in firms issuing greater numbers of tenders. The percentage of documents sent via email fell 18% and is substantially lower in firms sending out more tenders.

- RICS member's sentiment towards e-Tendering remains strong – 68% of responding members felt that the ability to tender projects by electronic means will enhance their service in the market place to some extent.

- Benefits of e-Tendering – more members than in 2006 agreed strongly that e-Tendering offers lower administration costs.

- Concern about the costs and client's sentiment towards Web based e-Tendering ranked highly – lack of client demand indicated a response of 54%, client won't pay 48% and cost of service/software 45%.

BCIS is convinced that Web based e-Tendering minimizes the administrative overheads associated with tendering, streamlines document handling, speeds up tender processes, eases the demands on managerial resources, provides added security and makes it easier to comply with best practice recommendations (Martin, 2009).

6.2   e-NVISION

In 2008 the e-NVISION consortium had decided that the main contribution to the construction industry is not the development of another powerful platform, but the definition and conceptualisation of new e-Business scenario and the development of a data model that will provide the basis of standardisation of the concepts managed in construction processes.

The overall objectives of e-NVISION is to

- use e-Business platforms to enable SMEs to model and adapt particular business scenarios requested by their customers and suppliers;

- to integrate all their enterprise applications following a service-oriented architecture; and

- to incorporate legal, economical and social services, with the final goal of facilitating their participation in the Future European e-Business Scenarios.

Four future scenarios were identified by e-NVISION based on know-how (knowledge and experience) of SMEs involved in projects and how they would work in the future, such as; e-Tendering, e-Site, e-Procurement and e-Quality (Tarka, 2008).

6.3   CIFE (Centre for Integrated Facility Engineering)

CIFE (based in the University of Stanford) has a mission to be the world's premier academic research centre for Virtual Design and Construction of AEC industry projects. Cheng *et al* (2008) outlined a web service framework that connects, invokes and integrates loosely coupled, heterogeneous information sources and platforms. The report analysed the traditional method of conventional centralised portal systems which is an effective tool in collaboration and interoperability in a construction supply chain. However, the issues of information ownership rights and proprietary privacy hinder sharing among companies, as companies prefer to have their own database system. In distributed network architecture, each organisation has its own database and portal system. The database and portal system are hosted by either one organisation or a third party. The network grants the rights to view or access data and documents for a specific period of time. SC Collaborator is the prototype web-based platform that is designed to provide an economical and desirable platform for AEC companies, which are usually SMEs in size and are often reluctant to invest in a system that requires frequent changes.

The report illustrates two example scenarios; Procurement interactions and material delivery management. In the procurement interaction scenario the usual prolonged dependency on time and configuration of communication channels between buyer and supplier are quickly removed in the SC Collaborator due to its service architecture. The organisation simply creates an account in SC Collaborator for their trading partner, and exchange IP addresses which facilitates the addition, replacement and removal of trading partners.

The second scenario (material delivery management) demonstrates the online collaboration and information flow among a general contractor, subcontractor and suppliers using SC Collaborator to manage material delivery. The scenario illustrates how SC Collaborator distributes vital information (delay notices) to the required partners and how the system analyses all options before assisting the subcontractor in making a schedule delay for the affected task which results in the project participants obtaining an updated schedule to plan and revise their tasks (Cheng *et al*, 2008).

7 Software as a Service

The future of ICT is a service deployed from a centralised data centre across a network providing access to the applications from a central provider (Software as a Service). This solution offers the opportunity for companies to select their ICT priorities and then choose from the growing menu of applications being offered through service providers. With access to a service platform customers can use the latest technology tools integrated with existing infrastructure. The concept of renting rather than buying provides lower initial costs through incurring licenses for the amount that is needed (SIIA, 2001).

For the vendors of SaaS it makes good sense because the vendor can achieve economies of scale. The software as service vendor has a high degree of control over its application and is thus a prime candidate for the adoption of horizontal infrastructure integration strategies (Foster and Tuecke, 2005).

SaaS is simply software which is delivered from a server in a remote location to your desktop. Many observers of the past would claim that there is nothing new about this idea. In the seventies, this was called time-shared computing. It was expensive and not very flexible because in the pre-internet era, accessing a remote server meant implementing a private network. These networks often used whatever they had for long periods of time because the change process was so daunting. Integration across applications from multiple software vendors was a task for highly-skilled (and very expensive) System Integrators. In relation to the mistakes in the late 90's and at the turn of the 21st century what's different this time?

1. Market Requirements – most SaaS vendors have become much better at listening to potential buyers.

2. Stronger Business models – today most SaaS vendors plan to monetise their software (or 3rd party software they license for distribution) by either making a charge for each user or reach transaction or by using an advertising model.

3. Better Financing – SaaS is now a respectable business that has an excellent chance of generating positive cash flows and profit.

4. Market Focus – some original ASP vendors focused on SMEs, selling largely to companies with 5 to 200 users and 20 to 500 employees.

5. Outsourcing for Outsourcers – between the ASP round and the SaaS round, most of the vendors discovered that it was better to partner for infrastructure than to invest in and run it yourself.

6. A better educated market – advancing from net-native applications and partnership approach users of SaaS found that they could access applications quickly and decisions could be made quicker as there were few up-front fees to pay (Wohl, 2008).

Ramanujam (2007) outlines some key points as to why SaaS/On-Demand would be a smart choice for companies;

- No facilities – SaaS allows you to get out of the business of managing a premise-based facility so attention can be redirected towards the customer.

- Pay As You Go – pay for usage rather than for software licenses and hardware infrastructure.

- Easy Roll-out and Maintenance – make IP-based adoption easier by avoiding on-site installation and maintenance.

- Spread Out Cost – avoid huge capital expenses and installation fees as you spread subscription costs out across time.

- Frequent Updates – give yourself access to "Best of Breed" technology that will allow a company to stay ahead of your competition.

- Focus on Growth – pass the onus of supporting growth on to the SaaS vendor.

- No Day-to-Day maintenance – pass the responsibility of system performance, uptime disaster recovery and backup on to the SaaS vendor (Ramanujam, 2007).

In a recent Connecticut report, companies are to conversely consider SaaS especially if the company has a limited capital budget, limited ICT support, and a distributed workforce in a sales or service oriented business. The benefits for SMEs include; managed growth, regulatory compliance and competition without also dealing with a variety of challenges relating to ICT. It is more easily affordable, immediate in its impact, and provides modular functionality in a way that is easy to extend and change, and easy to integrate with other systems. Essentially SaaS means financial value, new technology, and improved operations (SaaS Realities, 2008). To-date research studies such as Rackspace and Computer Economics indicate that SaaS is widely being used and the consumer adoption rates are increasing with economic benefits exceeding the cost of the investment. The advantages to both consumer and vendor have been previously identified; SaaS creates a "win win" situation for vendor and consumer alike (Wohl, 2008).

8   Conclusion

As one looks forward, there would not be a single shared vision of the nature of construction process and product delivery to which all future research would relate. However, for the benefit of making our respective implicit visions more visible, it is possible to construct scenarios of the future to which our ongoing research efforts may relate (Amor *et al*, 2002).

The success and effectiveness of ICT in today's world economies have clearly shaped our environment. ICT has improved our supply chain management process, communication ability and business, and still new innovative solutions are being adapted. However, taking other industries into consideration the construction industry

still trails behind, being reluctant to shift from traditional techniques. The downward adjustment in the Irish construction sector has presented the industry with the new challenge of remodelling and rethinking ICT. The largest amount of persons employed in the construction industry in Ireland work for small enterprises. These small enterprises make less use of more advanced ICT than large companies and are generally credited as the main contributor to the reluctance of ICT uptake. However, it is widely acknowledged that if SMEs increase the practice of using ICT they will develop and become more efficient which will able them to compete more effectively both in their domestic and overseas markets.

The aim of CITAs EIN research programme and development process methodology clearly identifies a staged programme that has the ability to address the need to promote ICT in the Irish construction industry and research SMEs pattern needs to develop a strong e-Business environment. It is CITA's vision that by creating a digital community and carrying out research that will identify the more effective products, CITA will be providing a service to the Irish construction SME industry that will enable them to have the opportunity to compete on the global stage with the industry's most enhanced and effective ICT products. It is accepted that a specialised software provider can target global markets; a hosted application such as CITA could instantly reach an entire market, making specialisation within a vertical market not only possible, but preferable. SaaS has the ability to allow SMEs in the construction industry to have access to functionalities and markets which were previously only the domain of large enterprises. In creating a digital SME community derived from an ICT vendor database directory CITA will be able to provide a service to the construction industry in Ireland which will enable software to be distributed over the internet. Cloud computing will undoubtedly improve the competitive positions of SMEs in Ireland. Providing them with technology investments that were previously consider unattainable due to high capital costs. As SaaS lowers high barriers to entry it is perceived that new levels of growth, development and opportunity will exist for SMEs in the Irish construction industry.

9   References

Amor, R., Betts, M., Coetzee, G. and Sexton, M. (2002), Information Technology for Construction: Recent Work and Future Directions, ITcon, **7**, 245-258.

Becerik, B. (2004), A Review on Past, Present and Future of Web based Project Management & Collaboration Tools and their Adoption by the US AEC Industry, International Journal of IT in Architecture, Engineering and Construction, Volume **2**(3), Mill Press, 233-248.

Cartlidge, D. (2002), New Aspects of Quantity Surveying Practice, Butterworth-Heinemann publication, Oxford, UK.

Central Statistics Office (2007), The Small Business in Ireland Report 2007, CSO publications.

Cheng, P.C, Law, K. and Bjornsson, H. (2008), A Distributed Portal-Based Platform for Engineering & Construction Supply Chain Interoperability, CIFE Technical report #TR173, Centre for Integrated Facility Engineering, Stanford University.

Department of Enterprise, Trade and Employment (DETE), 2004, eBusiness Strategy: Optimising usage of ICTs by Irish SMEs and micrenterprises, Irish Government Publications, Dublin.

Department of Finance, National Strategic Reference Framework (NSRF), 2007, Supporting and Enabling Dynamic Regions: EU Policy 2007-2013, Irish Government Publications, Dublin.

DKM Economic Consultants (2008), Review of the Construction industry 2007 and Outlook 2008 to 2010.

Duffy, K., Graham, B. and Thomas, K. (2007), Assessing the Potential for Construction Collaboration Technologies (CCT) in Small to Medium Enterprises in the Irish Construction Industry. In: Boyd, D (Ed) *Proceedings 23rd Annual ARCOM Conference*, 3-5 September 2007, Belfast, UK, Association of Researchers in Construction Management, 461-462.

Enterprise & Industry Directorate General (2006), e-Business W@tch: ICT and e-Business in the Construction Industry, Sector Report No.7/2006.

European Commission (2007), Sectoral e-Business Policies in Support of SMEs, Innovative Approaches, Good Practices and Lessons to be learned, eBSN Report, 43-46.

European Commission (2009), Software 2.0: Rebooting Europe's Software Industry, Report of an Industry Expert Group on a European Software Strategy, Version 3.0

Foster, I. and Tuecke, T. (2005), Describing the Elephant: The Different Faces of IT as Service, Q Focus, Enterprise Distributed Computing, Queue July/August 2005.

Gallaher, M.P, O'Connor, A.C, Dettbarn, J.L and Gilday, L.T, (2004), Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry, U.S Department of Commerce Technology Administration, National Institute of Standards and Technology (NIST), American Government Publication, Maryland.

Gatautis, R. and Vitkauskaite, E. (2008), European Conference on Product & Process Modelling: eWork and eBusiness in Architecture, Engineering and Construction, CRC Press, 2008, 673-680.

Hague, P and Woodburn, S (2006) Small & Medium Enterprises Equal Big Opportunities, B2B International Ltd.

Hore, A.V and West, R.P. (2005), "Attitudes towards Electronic Purchasing in the Irish Construction Industry", *2005 CIB W92/T23/W107 International Symposium on Procurement Systems*, Las Vegas, USA.

Hore, A.V., Redmond, A. and West, R.P. (2009), The Future Scenario of Creating a digital SME Community in the Irish Construction Industry, *Istanbul, CIB W78* (unpublished).

Martin, J. (2009), BCIS eTendering Survey Report, Royal Institution of Chartered Surveyors publication.

National Economic Social Council (NESC), 2004, Housing in Ireland: Performance and Policy, Irish Government Publications, Dublin.

Organisation for Economic Co-operation & Development (2004), ICT, E-Business and SMEs, OECD publication.

Ramanujam, B. (2007), Moving SaaS/On-Demand from Dream to Successful Reality: A Practical Solution to Real-World Problems with Contact Centre adoption SaaS/On-Demand, available on http://www.cypcorp.com/leadership/ index.php

Saugatuck Technology (2008), SaaS Realities: Business Benefits for Small and Midsized Business, publication by Saugatuck Technology Inc, Westport, USA, available on http://whitepapers. zdnet.com/abstarct.aspx?docid=372344

Software and Information Industry Association (2001), Software as a Service: Strategic Backgrounder, SIIA publication, Washington, DC, U.S

Tarka, M. (2008), European Conference on Product & Process Modelling: eWork and eBusiness in Architecture, Engineering and Construction, CRC Press, 2008, 691-701.

Wohl, A. (2008), Succeeding at SaaS: Computing in the Cloud, published by Wohl Associates.