Urban real estate information systems: the suppression of radical innovation.

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Abstract

Information and communications technologies are continuing to bring about significant changes in society. These changes may be viewed as the direct consequence of technological advances, which in turn rely on scientific discovery. This paper adopts a different model predicated on the view that the rate of technological uptake depends upon recognising social and business needs and overcoming the barriers to innovation – particularly the forces that suppress radical potential. The validity and significance of this approach is examined by reference to real estate information systems.

Keywords: real estate, property, innovation, information systems.

Innovation brought about by new technology disrupts existing processes, practices and roles and produces either conscious or unconscious resistance by those who feel threatened. The introduction of a computerised national land information system, for example, impacts on the roles of professionals involved in real estate conveyancing, reveals information about land ownership that certain groups may prefer to remain secret, and requires government to devote limited resources to changes in legislation.

Progress in all spheres of human activity necessitates change. It is impossible for either an individual or an organisation to improve by staying the same. No change may be an option but it involves risk because others may change and, in a competitive sense, move ahead. It has been suggested that continuous innovation is a pre-condition for sustaining competitive advantage (Porter, 1995) a view that is reinforced by the performance of high-technology companies, nourished by new ideas and their implementation (Manseau, 2001).

As the real estate sector in the UK has adopted information and communications technology (ICT) more slowly than other sectors of the economy (Dixon, 1995; Cash, 1999), there is a need to understand fully the barriers to innovation. It is argued that new technologies are constrained and diffused only insofar as their potential for radical disruption is suppressed (Winston, 1996). Applying this model of the suppression of radical potential to real estate, it is suggested, provides a better understanding of the use of ICT within the industry, and aids the development of strategies to facilitate its use in more creative and appropriate ways.

The approach adopted here consists of a review of the relevant literature to compare the merits of a model of innovation based on technological determinism with one that proposes that new technologies are only introduced when users are able to control their potential for radical disruption. This methodology is supported by the use of real estate examples. The objective is to stimulate debate and identify the case for further research, with the longer-term aim of improving performance in this sector.

Innovation and diffusion

Most new ideas essentially consist of technological innovation and it has been observed that we often use the words "innovation" and "technology" as synonyms (Rogers, 1995). ICTs in particular provide the opportunity for radical innovation in industries where information processing and knowledge management are core, such as the real estate sector.

Technology is widely accepted as a major stimulus for change in society (Twiss, 1992) and in the second half of the 1980s information and communications technology (ICT) has provided more than just a new competitive weapon for commerce (Willcocks, 1997), it has led to the transformation of our material culture (Castells, 1996).

As Freeman (1988) states:

> "The contemporary change of paradigm may be seen as a shift from a technology based primarily on cheap inputs of energy to one predominantly based on cheap inputs of information derived from advances in microelectronic and telecommunications technology."

Since the development of microelectronics in the 1970s, some spectacular predictions have been made about the impact on society of the technologies of information processing and communication, with the terms Information Revolution and Information Society being commonplace (Negroponte, 1995; Leer, 2000). Other sources are more circumspect (Brown, 2002), arguing that the forces involved are more complex and less predictable than superficial analysis suggests.

There is evidence all around us and throughout modern history that the impact of technology is often patchy and unpredictable. As Braudel (1979) has put it, "first the accelerator, then the brake". And this is particularly so within the real estate sector in the United Kingdom, where the responses to the opportunities offered by ICT have been very mixed.

Many commentators view technology as a driving force, its progress impeded only by the ignorance and stupidity of those unable to envision or adapt to the brave new world. The assumption behind this technological determinism is that new technology emerges from scientific study and then inevitably changes society, with most of us behaving like spectators (Williams, 1974). It is rather like arguing that people like stories because the printing press was invented. As Winston (1996) states:

> "The state of the market, or better, of society is the crucial factor in enabling the development and diffusion of any communications technology or in hindering it."

This is not to suggest that technology does not have an impact on how we live. Since the first Industrial Revolution in the last third of the eighteenth century technology has completely transformed the nature of society. But the rate of change in different geographical, economic and social sectors varies enormously. As Castells (1996) argues:

> "The interactivity of systems of technological innovation and their dependence on certain 'milieux' of exchange of ideas, problems, and solutions are critical features that can be generalised from the experience of past revolutions to the current one."

In the case of technological innovation in real estate, an improved understanding of the social, cultural, economic and educational factors would permit a more accurate analysis of the rate of diffusion of information systems which may justify some positions in addition to identifying the barriers to change.

Reflecting in general on the way technological developments unfold, the question that arises is whether they are "pushed" forward by the unarguable logic of being able to do things better, or "pulled" along by society's needs, with some innovations accepted but others blocked? The technological determinists, who hold the former view, believe in that superior technologies will prevail, sooner or later. They concentrate on the virtues of the innovation and neglect the complexity of the diffusion process.

The United Kingdom's National Land Information System (NLIS) provides a useful illustration of the shortcomings of the concept of technological determinism, and provides an excellent example of the factors that may suppress innovation. It would also provide a useful research study, in the form of an international comparison of the introduction land information systems.

The efficiency of the property market is dependent on good quality, accurate information that is available as conveniently as possible. Obviously a comprehensive, computerised system available throughout the country would be preferable to a collection of locally held, land registers or even a national system that is paper-based. The technology to accomplish the former has been available for a considerable length of time but NLIS is only just coming into being for England and Wales. In Scotland, in contrast, much more progress has been achieved, not because they know more about the technology, but because of a different legislative framework, and an alternative view of access to information. Dale (1997) highlighted this differing approach with the following example:

"In England and Wales, the price paid for a property is still deemed to be secret, as is the amount for which it has been mortgaged. In Scotland, attitudes are different and such information is in the public domain."

The Sasine Register in Scotland (http://www.ros.gov.uk/) dates back to 1617. It is a register of transactions (deeds of sale, mortgages, etc) relating to land. The Scottish Land Register, which

contains data from the Sasine Register, was established by the Land Registration (Scotland Act) 1979. The Association of Geographic Information website (http://www.agi.org.uk/case-studies) states:

"The development of the innovative Registers Direct service will make this information readily accessible from a desktop computer equipped with a modem. Computerisation of the register began in the early 1980s and by 1983 all of the significant registers were being created and maintained on computer."

In contrast, it was only in July 2000 that there was an announcement by the Lord Chancellor that Macdonald Dettwiler had been selected as the preferred bidder to provide the NLIS hub services. (http://www.nlis.org.uk/docs/).

Another illustration is the recent decision to establish an automated land information system for the Russian Federation (Corbley, 2002). The Land Reform Implementation Support programme (LARIS) is jointly funded by the World Bank and Russian government and is run by the Federal Land Cadastre Service (FLCS). As a preliminary to establishing the land information system it was recognised that reform of property rights and land transactions was fundamental to establishing a market economy, which itself depended on comprehensive political reform. The innovation is being driven by political, social and economic imperatives not technological development, although the latter forms an integral part of the mix.

Real estate information systems

The importance and significance of property has been recognised throughout history. It has been explained, for instance, that Sir John Fortescue demonstrated to Henry VI that his political stability and his capacity to maintain his estate were linked (Guy, 1988). As Denman (1978) has stated:

> "Property is a social and juridical institution, a commonplace in the anatomy of all civilised societies. In human relationships it is a vehicle of power and in the land context a determinant of the occupation, possession and ownership of land."

It has been estimated that real estate is the second or third largest contributor to overheads for most businesses (Roythorn, 1997). Another study reveals that more than half of the organisations interviewed claimed to have property assets worth 30% or more of their total asset value (Avis, 1989).

Land is the source of all material wealth (Simpson, 1976) and as such it might be expected that rigorous efforts would be made to use ICT to aid the development, management and appraisal of real estate. Unfortunately, the evidence shows that in general within the United Kingdom the sector has been slow to innovate compared with other areas. Also, much of the innovation that has occurred has

been driven by those operating on the fringe of the sector, such as property software companies and academics.

It seems paradoxical that a sector that appears to be quintessentially an information-based industry should be so resistant to the opportunities provided by the Information Revolution. Understanding why this is so is not straightforward because of the complexities the real estate industry - with its diversity of functionality and wide range of organisational type - and the paucity of research on this topic.

From the general literature on innovation it is reasonable to surmise that the suppression of the radical potential of ICT within real estate is caused by a combination of influences, including political, cultural, economic, financial and educational. In addition, there are issues related to balancing access to information and privacy, the application of standards (e.g. for data transfer) and the degree of disruption caused by any new technology. These factors are commented on in the examples that follow but the author is cognisant of the need for further research aimed at removing barriers to innovation.

There have been some notable successes using ICT within the real estate sector, both for industry-specific applications and for general-purpose office automation. Property management systems are now widespread, and there are numerous specialist computer packages for investment valuation, development appraisal and commercial and residential agency. Also, on-line, market intelligence systems, such as Estates Gazette Interactive and FOCUS, have emerged to exploit the power of the Internet. Similarly, the use of office automation tools, like word processing, spreadsheets and e-mail, is routine in real estate offices.

But these “successes” have essentially been based upon the automation of mundane tasks rather than a genuinely innovative approach to real estate practice. There is evidence of a lack of a strategic vision within the sector (Dixon, 1998) and it has been shown that many organisations are a long way from realising the full potential of ICT (Waller, 2000).

There is a parallel lack of emphasis on training and education to meet the demands of this new commercial environment. A survey conducted on behalf of the Property Computer Show in 1999 (Cash, 1999) revealed that 51% of the property firms interviewed had not spent a single day on ICT training during the previous 12 months.

This lack of innovation is not unique to the UK. It has been reported (Han, 2001) that in Singapore’s property management companies, computer applications are lagging behind the advancement of computer hardware and software. Even in the US - seen by some as the originator of the Information Revolution (Castells, 1996) - it has been observed that resistance to technological advances penetrates the entire real estate sector (Sherwood, 2001). Another opinion is that far too many realtors view the technology as a threat, in much the same way as the Luddites of the first Industrial Revolution (Tuccillo, 2000).

Incremental and disruptive technologies

It is useful to make a distinction between incremental technological change and disruptive technological change (Norman, 1999). The adoption of the mobile telephone is an example of the former. Although real estate professionals have enthusiastically adopted the new technology they have continued to work within the traditional paradigm. In contrast, the use of ICT for the production of printed material (eg reports, brochures, journals) has fundamentally changed the process and significantly reduced the number of personnel required to undertake it (eg copy typists and printers). For example, when the first computerised composition system was introduced into the Estates Gazette offices in the early 1980s the workforce of printers needed to produce the journal was reduced from sixty to fifteen. Later the process of page composition was shifted from the print room to the desktop.

The nature of this distinction requires further analysis. In the example cited the mobile telephone is used to facilitate, rather than replace, the activity being undertaken. The complex interaction that takes place between individuals in a business context (eg negotiations) is simply undertaken using a more convenient communications device – one that releases the parties from the restriction of specific locations.

In the case of document production a completely new technological solution – desktop publishing - has virtually replaced a traditional industry – printing. The scale of the disruption caused by this revolution was vividly highlighted by the industrial action that took place in the mid-1980s, when News International transferred the production of newspapers to Wapping.

E-mail is another example of an incremental, non-disruptive technology that has been readily adopted by real estate professionals. Mercedes-Benz installed Verimation's Memo office automation package as early as 1988 (Kirkwood, 1997) but it was not until the beginning of 2000 that e-mail was being used widely by UK real estate professionals, as reflected in an Estates Gazette survey (Kirkwood, 2000).

The survey, undertaken in the form of a questionnaire faxed to 170 industry professionals, was designed to identify the level of e-mail use, the competence of users and their perception of this form of communication. The results demonstrated widespread commitment to the technology and an appreciation of its ease and convenience. However, at that date, 68% of respondents still did not access their e-mail away from the office, thus failing to exploit the 'store and forward' concept that is one of e-mail's most valuable features.

This reluctance to embrace the benefits of e-mail fully could be explained by a number of factors. First, lack of awareness of all its features and potential was evidenced by many of the replies. Second, it takes time to establish a robust infrastructure to support remote working. And finally, and most

significantly, follow-up interviews indicated a reluctance on the part of senior managers to give staff the opportunity not to be tied to the central office – a clear example of suppressing technological change for perceived business benefits.

Real Estate Applications

The principal application areas for ICT within real estate are property management, property maintenance, commercial and residential agency, valuation and appraisal and property portfolio management. These are examined below using the model of innovation proposed earlier. Cutting across all these areas are the technologies of geographic information systems (GIS), which has become established as a distinct field of academic study.

Many of the basic processes involved in **property management** are ideally suited to computerisation: the establishment and maintenance of property databases; the preparation of estate accounts; the monitoring of diary dates; and, service charge management and accounting. Consequently, this was one of the first areas of real estate to attract the early attention of systems developers. For example, Jones Land Wootton introduced a computerised accounts system in the early 1970s (Stapleton, 1981). It is also the sub-sector that contains the largest number of systems at the annual Property Computer Show (PCS) in London.

Property management systems are essentially property databases linked to accounting procedures, with real estate professionals being responsible for the maintenance of the former and accounts staff taking control of the latter. As the purchase of systems must inevitably be justified on financial grounds it is not unusual for the accounting functions to dominate and for property information, particularly of a non-financial nature, to be peripheral.

Real estate professionals may lose influence because accountants control the financial engines of such systems. Unlike accounts staff, who are obliged to enter data in advance of regular accounting functions (e.g. quarterly reports) much of the data entered by real estate professionals is optional (e.g. lease terms, areas). A pattern can emerge of failing to update data, which creates uncertainty about the validity of the database that in turn leads to a lack of commitment to update. Consequently, the innovative use of such systems to aid the strategic management of portfolios is probably the exception rather than the rule.

In this case the suppression of the radical application of ICT results from a combination of an anti-technology culture and an absence of appropriate education and training. As Dixon (1995) states, there is a need to:

> "Promote the education of senior managers in matters relating to the strategic use and value of IT."

Property maintenance, which functionally forms part of property management but in practice is frequently regarded as a separate, technically based activity, has attracted less attention from property software companies. Less than five maintenance systems are listed in the PCS Property Software Directory 2002. The majority of maintenance systems are developed in-house to suit local requirements and there is a lack of standardisation.

The maintenance of the built environment is important to everyone and contributes significantly to the economy directly through employment in the building industry and indirectly in the impact is has on our homes, offices and factories (Seeley, 1976). But innovation in this field is influenced more by political will and the establishment of standards and improvements in the education of maintenance managers than by technological capability.

All the technical elements needed to establish comprehensive maintenance management systems are currently available – computer networks, database systems, remote data capture devices and digital photography. But innovation in this field is suppressed by an absence of appropriate political leadership, a lack of strategic vision by managers and the need for universal standards for data capture, storage and exchange.

The field of **commercial and residential agency** presents a contrasting example of the suppression of radical innovation, dominated as it is by the vested interests of the professionals involved.

Agents are categorised as intermediaries and it has been observed that they may have a significant effect on economic activity, accounting for over one quarter of US gross domestic product (GDP) (Spulber, 1999). Essentially this brokerage function helps to facilitate the relationship between buyers and sellers.

Typical agency software provides database structures for storing details about properties, companies, agents, applicants, clients, tenants and landlords. Functions include the creation of requirement files, a diary of events, mailing lists, archiving and the storage of comparables. Systems are sold on their capacity to undertake applicant and property matching, and to generate property particulars automatically.

In addition, listing services on the Internet have emerged, which have become highly developed in the US but are still rather fragmented in the UK. The technology allows prospective purchasers to search on-line and even undertaken virtual tours of properties.

It has been observed that ICT significantly reduces the matchmaking role of agents, and forces them to develop other professional services (such as expert appraisal) critical to real estate transactions (Wimmer, 2000). But it appears that these changes are forced upon agents by the demands of more

enlightened clients. As the Internet spreads, people become more aware of its potential from a range of non-property applications and then demand the same level of service from the real estate industry.

There is very little evidence that the majority of agents have proactively investigated the use of ICT to improve either efficiency or quality of service. Many agents have in the past viewed these developments as threatening and disruptive and have instead sought justification for suppressing the technology. A combination of enlightened clients and the standards set by other industries, such as banking, has forced them to change.

The **valuation and appraisal** of real estate is undertaken for a wide variety of reasons including sales, purchases, development and taxation. This activity in practice consists of a blending of art and science. Valuers, or appraisers as they are known in the US, use their market knowledge and their judgement to supply the inputs for variety of mathematical models, such as discounted cash flow techniques.

Computer systems have been developed both in-house and as packages to support this activity. The models used range from traditional, rather discredited techniques (e.g. Term and Reversion) to advanced systems, such as multiple regression analysis (MRA) and Monte Carlo risk analysis.

However, in general there is an antipathy towards more sophisticated methods of appraisal in the UK, with most practitioners characterising the process as more art than science. Consequently, although the use of software for valuations is now widespread throughout the profession, there is little evidence of the innovative use of ICT. This conservative culture has led to some suspect methods being enshrined within computer software.

The suppression of innovation within this sector results partly from the professional culture, partly from a misunderstanding of methods and outputs (Sykes, 1990) and partly from secrecy about data. Increased access to data, for example, would enable computer-assisted mass appraisal to be undertaken by MRA.

Active **property portfolio management** involves the re-structuring of portfolios of properties using a combination of buying, selling, lease restructuring, development, redevelopment and refurbishment (McIntosh, 1985). The portfolio manager's objective is to optimise the financial returns from the property and, hence, some measure of these returns, no matter how crude or naive, is required.

The complexity of property combined with the intricacy of many of the valuation models and the detailed data used necessitates the use of computers for processing purposes. Portfolio managers would be severely limited if their decisions had to be based on computations undertaken by hand. It could reasonably be agued that this specialist activity has only emerged because of the availability of cheap processing power and purpose-designed software.

Nevertheless, only a handful of property portfolio systems have been developed for sale since Stephen Sykes designed one of the first, COMPAS, for chartered surveyors St Quintin in London in 1982 (Kirkwood, 1984). Currently there are less than five fully comprehensive portfolio packages available in the UK, plus some systems developed in-house by financial institutions.

One of the major constraints to innovation in this highly-specialist sub-sector is the combination of high development costs and very limited market opportunities. Such systems are only purchased by organisations with multi-million pound portfolios to manage and are of little or no use to the large number of small to medium sized real estate practices. In addition, these are systems that require high levels of competence in both investment valuations and systems use.

A **geographic information system (GIS)** links a computerised map, in digital form, to underlying information about objects shown on the map, held in a relational or object-oriented database (Clegg, 1992). This form of technology potentially cuts across all real estate applications and offers a wide range of functionality from simple map production and information retrieval (e.g. terrier data) to spatial analysis (e.g. site finding and valuation). The following examples illustrate this diversity.

Sanderson, Townend and Gilbert, of Newcastle-upon-Tyne, has successfully used GIS to identify sites for retail clients (Kirkwood, 1998). Data were sourced for postcode boundaries (Geoplan), raster mapping (Bartholomew), digital mapping (Goad), demographic data (CACI) and business information (www.yell.co.uk). Targeted analysis was used to identify potential sites for business operation. This approach, however, depended on the specific skills of a limited number of users and, possibly for that reason, was not replicated across the profession. There may also be a perceived threat that the technology replaces traditional functions.

In 1999 Staffordshire county council's property and estates division pioneered the use of a geospatial data management system developed by Laser-Scan of Cambridge. This employed object-oriented (OO) technology in a way that was particularly appropriate for property applications. The property and estates division needed a system based on real-world objects, which could automatically apply updates throughout the entire database. In essence, this involved creating a model of the world, rather than just a record of it. This approach has been adopted by other authorities, possibly because there is a wider skills base to draw upon than small and medium-sized surveying practices. Nevertheless, progress is slow because of the complexity of the technology, the capital investment required and the disruption to existing practices.

In contrast, simple technologies are adopted quickly. Promap, for instance, originally consisted of 12 CDs containing Ordnance Survey (OS) large-scale, digital mapping and small-scale AA mapping (1:200,000) for Great Britain (Kirkwood, 1999) . The system, which is now available via the Internet, provides a powerful, flexible tool for locating, customising and printing maps. It was adopted quickly throughout the real estate sector in the UK. The reasons for this are a combination of simplicity and

ease of use, targeting of a limited but important functionality and lack of threat to existing roles and responsibilities.

Conclusions

This paper has attempted to present sufficient evidence to support a model of technological innovation driven by the needs of society and the demands of customers, rather than the more widely held concept of technological determinism. In the specific case of real estate information systems, the examples contained within this paper illustrate that innovation is dependent on political, social and cultural drivers in general and the demands of real estate clients in particular.

Accepting this model of ICT innovation in real estate implies a significant alteration in the strategies, tactics and educational methods employed to foster progress in this field. It means a shift in focus away from emphasising the 'self-evident' benefits of the technology towards the more challenging task of understanding the complex interaction of political aims, social needs, professional concerns and client requirements that determine the amount of technology that is acceptable at any given time.

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