E-commerce and on-line product information

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ABSTRACT

The spread of the Internet has spurred the recent growth in e-commerce. E-commerce impinges on design in many ways, not least in encouraging the development of new tools for the presentation of product information: that is, information about the products that are used in design projects. (In the case of building design this might include information about standard doors, windows and fittings.) In this paper we present our development of three experimental tools for presenting and organising product information. The tools represent stages in the evolution of a prototype we call PLA(id) (Product Library Assistant – Intranet for Designers) involving the use of multimedia authoring, Java, and mobile computing. We discuss our experimental prototypes under several headings derived from what are commonly considered the key features of e-commerce: the marketplace, collaboration (the electronic marketplace as a community), geography (and geographical boundaries), navigation, regulation, integration and media (how in some cases e-commerce provides both the medium of transaction and the medium of delivery). So this account of our experimentation with product information tools provides a way of reviewing issues raised by e-commerce and their importance for design decision support systems.

1 ISSUES IN E-COMMERCE

Commerce has been electronic since the advent of telecommunications, but the term "e-commerce" is gaining currency with the burgeoning of the Internet as a medium for commercial transactions. Anyone with a networked personal computer and a credit card can browse on-line interactive catalogues of books, computer games, clothing or airline schedules, place orders and bookings electronically and receive the goods (or services) by post a few days later. E-commerce also subsumes many other kinds of transactions under the ambit of business-to-business communications. Design and e-commerce come together as we think of how design is to operate as a practice (Coyne, McLaughlin and Newton 1996, Coyne et al 1997) within the emerging e-commerce environment. How do designers participate in business-to-business e-commerce with other designers, consultants and suppliers? How do they market and deliver their services on-line? What tools and services do designers need? Designers design

electronic environments. They also populate and exploit the world of e-commerce with their own activities. In this paper we focus on the importance of product information in the emerging constellation of e-commerce activities.

In reviewing the e-commerce literature (Cunningham and Fröschl 1999, Lutz 1999, McChesney, Wood and Foster 1998, Mitchell 1994, 1999) and in our discussions with practitioners, we have identified several key issues raises raised by e-commerce relevant to support systems: display and exchange, collaboration, geography, navigation, regulation, integration and media.

1.1 **Display and exchange: the marketplace**

E-commerce promotes the concept of the market place, an environment where producers and consumers come together to inspect goods, and negotiate and effect transactions: exchanging goods for money. The language of the market place brings with it entailments of merchandise, value, money, payment and transaction. There is the identification of a product, producers and consumers or customers. E-commerce tools provide means by which products can be put on display and exchanges can take place.

1.2 **Collaboration**

In so far as e-commerce is built on the Internet it presents as a ubiquitous, democratic and egalitarian enterprise (Coyne, Sudweeks and Haynes 1996), characteristics not necessarily identified with commerce allied to other communications media: for example those employing high rental, exclusive telecommunications networks. The Internet and the World Wide Web are reputedly open access systems where anyone can be a producer or consumer of information with little cost. Commentators advise that the e-commerce environment supports commerce as a community enterprise, with new opportunities for collaboration between producers and consumers.

1.3 **Geography**

Markets have long been associated with geography, through trade and colonisation, which have motivated transportation across space, geographical exploration, and even the identification and definition of space. The traditional market place presents as a locus to which producers and consumers gather in space. Contemporary markets are also defined in terms of geographically bounded areas with products distributed across space. With the ubiquity of the Internet e-commerce presents as defying geographical boundaries, potentially reducing space to “the head of a pin” (Negroponte, 1995, p.6).

1.4 **Navigation**

Geography, trade and markets suggest movement through space, and the necessity for navigation through networks of connections. With the vast array of information, browsing, search, and navigation become major operations for the e-consumer.

Navigational metaphors seem to have displaced those of storage, organisation and indexing, prevalent in the language of database management. For the distributed world of e-commerce, it is unlikely that product data will be found in homogeneous databases with uniform formats and data structures. Navigation becomes a matter of finding what is wanted in the right format, so that comparisons can be made. There are aids to navigation: pointers, bookmarks, portals, records of the paths followed by others, and other attempts to subject the chaos of the WWW to order for the e-consumer.

1.5 **Regulation**

Freedom to roam carries with it obligations and duties. Notwithstanding the ideal of the people's *agora*, markets require regulation. In a putatively free, open and democratic market place issues of trust and reliability come to the fore. In e-commerce, systems of encryption have been established in an attempt to render monetary transactions secure, and tagging of web sites aids control over access to potentially offensive material. Passwords, encryption, watermarking, data streaming and the use of bitcode for Java programs assist in protecting data from unwanted copying and distribution. The default condition for texts and images on the WWW is open access and world readability, which paradoxically highlights the need for greater control.

1.6 **Integration/context**

E-commerce interacts with other business models and technological systems: the virtual office, on-line multimedia information and entertainment, and the mass media. Commentators claim that e-commerce is involved in reconfiguring the relationship between the provision of goods and related services (Cunningham and Fröschl, 1999). For example, if cars are bought directly from the manufacturer then there needs to be some other provision for servicing. E-commerce now constitutes part of the business context of which any enterprise must take account, even if they manage to avoid using the Internet for their own transactions.

1.7 **Media**

In many cases e-commerce provides the medium of transaction but also the medium of delivery. Such products include: textual documents, image files, sound files, digital video, and combinations of these. It includes downloadable software and also on-line education, training, and consulting. In these cases e-commerce promises the complete market environment, for advertising, inspection, procurement, delivery and servicing of goods. Even for non-digital goods, much can be communicated through data channels: descriptions, images, interactive animated models (through pre-recorded QTVR or real-time animations), sound, and even smells. The concept of the virtual market place suggests an environment in which buyers have full sensory access to products on-line through virtual reality. These developments also suggest that sellers

may provide for the inspection and selection of merchandise in ways other than what we are used to in the physical market place: interactive design guides, pulling products apart, setting them in different contexts, laying products out in different ways to make comparisons, trying out products in digital form before committing to an order, and customising the design of products through parameterisation and digital links to the production process.

2 PRODUCT INFORMATION TOOLS

How do each of these issues impinge on the design of tools for managing and presenting product information? We discuss three experiments under the headings suggested by each of the issues raised in the previous section.

2.1 **Local product information organisation using multimedia authoring**

We created a simple system called PLA(id) for visualising and manipulating multimedia information on the computer screen that would provide direct access to on-line product information.

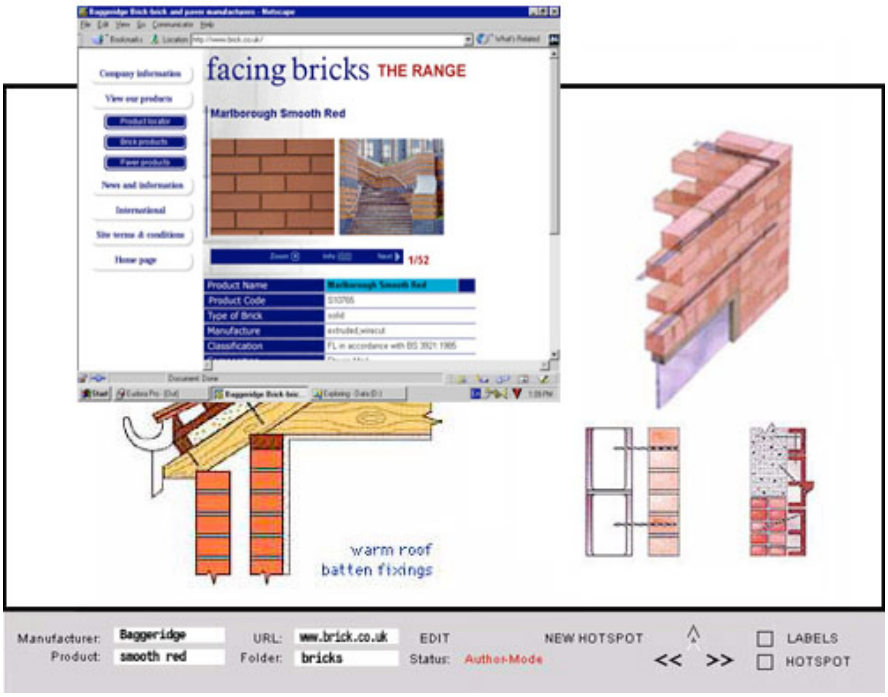

Figure 1: **Display of a product information system using multimedia authoring. Products are represented as icons or scanned materials which are linked to web pages**

This involved the use of a proprietary multimedia authoring tool (Macromedia Director). Designing tools using Director starts from a consideration of multimedia resources: images, digital video, sounds and text, and how they can be arranged on the screen. One can set up a Director file so that the elements are moveable by the user. We also designed the system so that each image has a URL (universal resource locator) associated with it, and double clicking on the image opens a WWW browser and displays the linked web page (figure 1).

2.1.1 *Multimedia and the marketplace*

The system presents the potential for an interactive "market stall" where goods are represented as images or QTVR clips (quicktime virtual reality ie digital video files for simulating the rotation of three dimensional objects) to be manipulated and compared. For a designer the medium suggests something akin to a display or sample board, of the kind an architect might show to members of the design team or to a client for displaying materials, finishes and fittings in proximity to one another. We designed the system so that display boards can also be linked and organised into nested "folders."

2.1.2 *Multimedia and collaboration*

A Director file can be saved in a format that is secure against tampering and that runs autonomously without the Director program. As with any program this can be copied across the WWW to a local personal computer, though the program is not platform independent and there has to be a version for each platform. In the market place metaphor such a system would operate as a product that could be traded for free or sold. It is a product about products, and could also function as a service for brokering information about products, though this is limited to asynchronous file sharing.

We developed a further variant of the multimedia system to explore the possibilities of maintaining databases of product links. A stand alone application at a client computer is in communication with a database at a server. So the client can keep their own database of product links, but also contribute to a shared database (figure 2).

2.1.3 *Multimedia and navigation*

The system provides for such displays to be created and modified dynamically, promoting the possibility of sharing navigational strategies. So the product display board as a way of showing materials and fittings in relationship to one another also develops as a dynamic and structured communications tool, with nested folders to other displays as display objects.

2.1.4 *Multimedia and regulation*

Our experimentation with distributable Director files attempted to deal with information in a standard format. This approach focuses on content and uses the UniClass classification standard for storing and accessing product data and links. This experimentation highlights the difficulties of reconciling the needs for structured data and laissez faire placement (figure 2).

2.1.5 *Multimedia*
At a simpler level, our experimentation with a multimedia product information system shows how high quality graphics can be used for the comparison of "samples" of materials and products. It is possible to scan an image, or even the material itself, and incorporate this into a samples display. With QTVR we were able to simulate the simple physical manipulation of product models. Samples are linked to product supplier web pages.

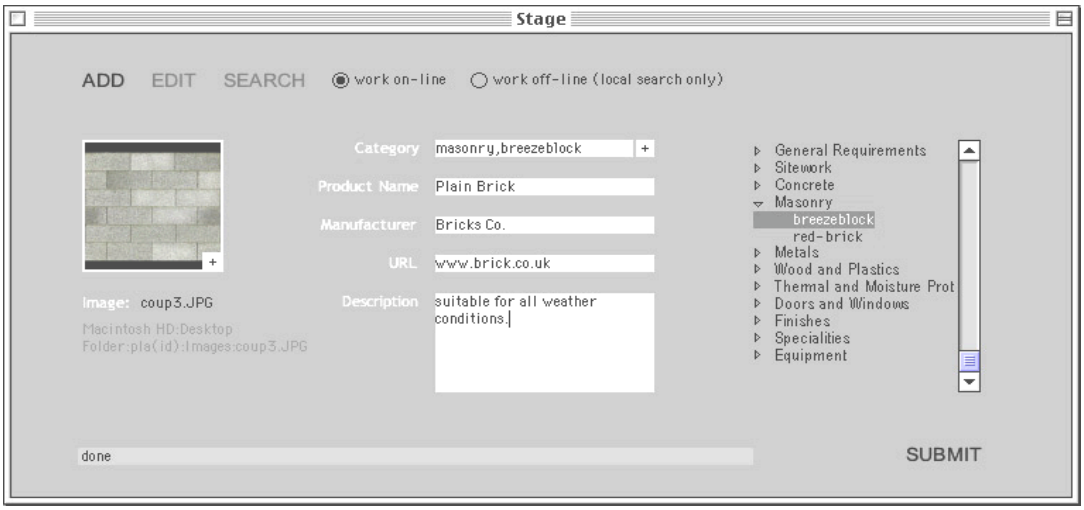

Figure 2: **A version of the multimedia system that makes use of the UniClass system of classifying product information**

2.2 **A Client-Server System Based on Java**

In a second, more elaborate experiment we created a system for sharing product information on the WWW using the Java programming language (Coyne and Lee 1997, Coyne et al 1998, Ofluoglu, Coyne and Lee 2000). With Java one creates application programs that are stored at a web site (a server) and can be accessed by anyone (a client) through the WWW. The main advantage is that the program can be run on any computer that supports a WWW browser. The program is "platform independent." The application is run locally at the client site, but is protected from copying or tinkering by the fact that it cannot be saved to disk. Initially the system was to be a simple tool for sharing and organising bookmarks to product information, represented as icons that any client could move around the web page. Information about the links and the location of icons was transmitted to the server so that other clients could see the screen arrangement (figure 3).

2.2.1 *Java Tools and the marketplace*
In terms of the metaphors of the market place, the Java environment promoted the concept of designers working in groups as consumer-to-consumer collaborators,

providing a graphical medium for designers to inform each other of and share product links. The result was similar to a web page devised in HTML, but where the elements of the page could be moved around and organised dynamically.

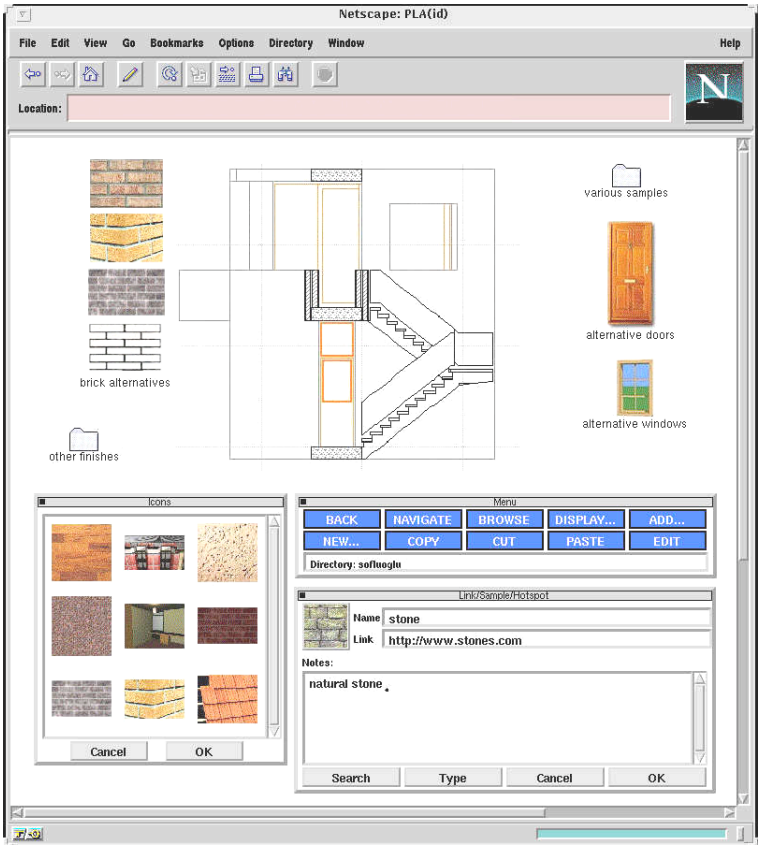

Figure 3: **Screen display of a Java based product information tool, PLA(id)**

2.2.2 *Java Tools and collaboration*

The Java system suggests a professional context in which practitioners cluster around specialised servers that broker their informational needs. So practitioners could use such a tool for sharing product information. Certain practitioners could also act as brokers to organise the information in certain ways applicable to different types of projects. We also provided a facility for users of the system to table comments or reviews of products. So the system is built on a database of links, with various fields containing, the URL, an image, a text descriptor and editable comments by users.

2.2.3 *Java tools and geography (the virtual office)*

Our client-server system using Java could be construed as supporting various forms of the virtual office, where practitioners and firms working on the same project may be spatially dispersed. As we developed the system it became apparent that users of the system could see changes to the screen layout of product images and icons produced

by others in real time. This raised issues under investigation by researchers into systems for computer-supported collaborative work (CSCW) and shared work environments, of access, maintaining integrity, managing who has control and so on.

2.2.4 *Java tools and navigation*
The client-server system, using Java develops the idea of sharing bookmarks and knowledge about links and navigation as a valuable and sharable resource. In the Java version the bookmarks are also stored in a server database that can also be searched.

2.2.5 *Java tools and integration*
We explored certain aspects of CAD integration with our Java-based product system. Most CAD systems produce schedules of design elements that the designer has selected from an element library and that have been incorporated into the design. We adapted the Java-based system so that it could upload schedules, as spreadsheets, to the central server. These are then "parsed" to produce bookmark links that appear as icons on the product information window. URLs can then be attached to these. The schedule provides a way of linking and accessing web information from schedules, so that design team members can inspect a plan, read annotations about doors, and then, via the schedule go to relevant product information about the doors on the WWW. Further sophistications include the provision of inheritance of URLs and other information about products from a database, so that links do not have to be re-created manually every time a schedule is generated. This experiment presents a diminished version of what one would expect from CAD integration: (i) URLs as attributes of elements in libraries and that could be accessed in the context of the CAD system, with the CAD system as a browser, or providing browser access, and (ii) the CAD system is able to automatically upload element libraries and library elements from sites on the WWW. The Java-based system also prompts one to think in terms of distributed CAD, the provision of powerful CAD, modelling and rendering modules, dispersed at different server sites and able to be uploaded as needed. There have been various experiments (by others) in the area of distributed CAD.

2.2.6 *Java tools and media*
With the Java system, textures and finishes can be scanned at the client computer and uploaded to the server. Practitioners in the group can manipulate each other's screen displays of samples.

2.3 **Mobile computing**

We are now investigating the use of hand-held devices for the presentation of product information. Mobile computing severely constrains the amount of information that can be made available and curtails the otherwise promiscuous feast of on-line data provided through the Internet. It also introduces new micro-practices. The vendor, their representative or the customer are encouraged to be mobile. They can meet in the market place, surrounded by the goods, or in the field, the context of delivery or consumption. Hand-held devices also extend the concept of exchange to the instant

exchange of data: “beaming” information from one hand-held computer to another through infra red communication. Vendors and customers can exchange information: electronic business cards, request forms, orders, and product information, while in proximity.

We developed a simple prototype through which the designer has a record of planned visits that might involve the inspection of products. The database includes product lists and UniClass codes. Product information is downloaded to the hand held device during synchronisation with a desktop computer prior to a site visit (figure 4). Such devices can also store web pages during synchronisation using AvantGo (figure 5), or synchronously using a portable modem. (The database and browser are not yet linked in this implementation.)

2.3.1 *Mobile computing and the marketplace*

With mobile computing the trading floor of the market now involves sellers and buyers with mobile phones and palmtop computers exchanging information and in communication with advisors outside the market place. The market place also extends to the “field” the construction site, the context of use and consumption.

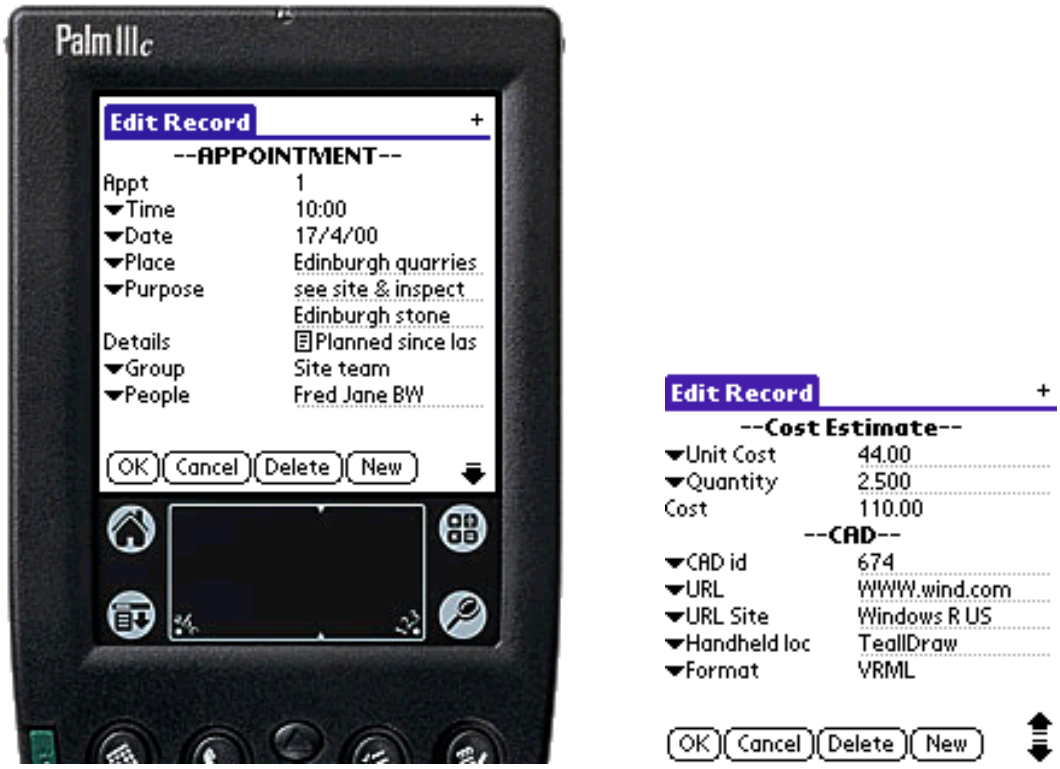

Figure 4: **Displays from a (HanDBase) database on a hand held device based on the concept of the designer itinerary. The second screen shows costing and possible links to CAD library data**

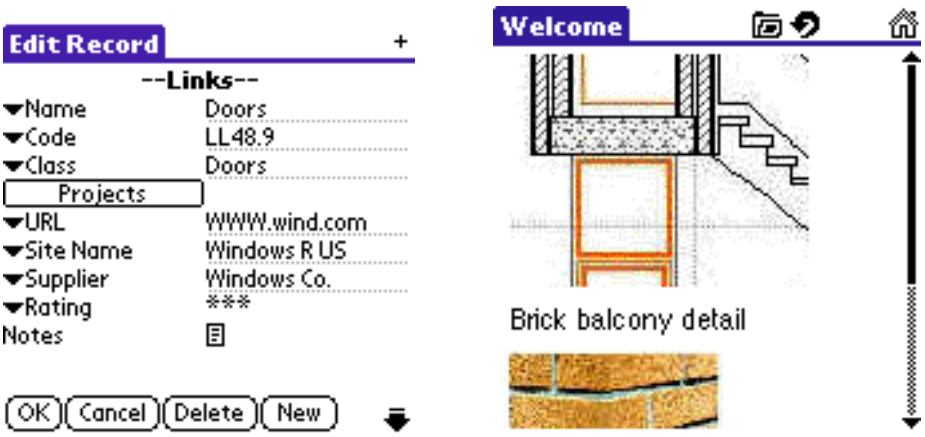

Figure 5: **Product information stored in a database on the handheld and at a web site downloaded and viewed using AvantGo software**

2.3.2 *Mobile computing and collaboration*
Mobile computing presents collaboration in a new light. Palmtop users can interact in-situ by passing information to one another through infrared (IR) communications. Contrary to virtual reality, which reputedly trades on proximity over distance, mobile computing seems to support people coming together in the same space (taking notes at meetings, comparing schedules, exchanging business cards), while keeping contact with a "home base." People can once again meet at the market place rather than just on-line, but the boundaries of the meeting place are extended.

2.3.3 *Mobile computing and geography*
With mobile computing one is free to roam. The technology resonates with the interests of the designer, who has traditionally undertaken the grand tour, sketchbook in hand, to collect inspiration for the next project. Designers, particularly architects, visit sites, undertake surveys, inspect work in progress, taks that may be supported by mobile computing. From the point of view of e-commerce, mobile computing emphasises getting back into the field, the user context, site, the point of sale, and the client meeting. The designer can consult clients, tradespeople and contractors with product information and digital samples in situ rather than just on-line from the office.

2.3.4 *Mobile computing and navigation*
The handheld device invokes the paraphernalia of the mobile designer, which includes maps, plans and survey instruments. If the networked desktop computer invokes concepts of navigation through data space, the handheld invites navigation around cities, museums, markets, buildings and construction sites, abetted by navigation devices such as digital maps and GPS (global positioning systems). The relationship between the two invites inspection. Is it possible to navigate through a CAD model of a building at the same time that one navigates through the site, and would there be any benefit from being directed to products in-situ?

2.3.5 *Mobile computing and regulation*
Mobile computing inflects concepts of regulation and boundaries. Data exchange and communications standards are undergoing revision in light of the narrow bandwidth of two-way radio network communications. Handheld computers communicate with desktop computers and servers, the protocols for which impose new constraints. Furthermore, if ubiquitous computing suggests a certain freedom of access, contributing to the democratisation of the workplace, it also suggests that we can never escape the machinery of networked communications. Laptop computers, mobile phones and digital recorders are seen as invasive by some.

2.3.6 *Mobile computing and integration*
Certain hand held devices can be connected to desktop or laptop computers for synchronisation of data. Our prototype assumes that it is feasible to download files when needed according to meeting or excursion schedules. Mobile computing raises the prospect of integration between a range of devices: servers, desktop computers, laptops, mobile phones, pagers, global positioning systems (GPS), electronic books, bar code readers, hand held scanners, digital cameras, and mini-disk recorders and players, through device integration, modems, cables and radio and IR (infrared) communications.

2.3.7 *Mobile computing and media*
The technologies for mobile computing are limited at this stage but suggest possibilities for exploring relationships between the product in situ and the products in digital simulation. The designer could use one to supplement the other. Mobile computing also suggests possibilities for recording, inventory, identification and navigation between sites.

3 CONCLUSION

We have identified on-line product information as the main point of contact between design and e-commerce. Even without examining the issue of financial transactions via the WWW, we have shown that it is technically feasible to connect to and enhance the e-commerce environment of product information.

We have also shown that the environments within which systems are developed influences the direction taken in that development. For example, certain development tools emphasise the multimedia aspects of e-commerce, others emphasise possibilities for interconnection, and others bring issues of mobility into the discussion. In its own right the WWW is a heterogeneous development environment able to stimulate research in many directions.

4 ACKNOWLEDGEMENT

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