
Multimedia kiosks in retailing

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Abstract

Reviews the very wide potential for the application of multimedia kiosks. It is important that all retailing organizations understand the scope of these applications since kiosks have the potential for eroding the traditional boundaries between retailing, banking, education and training and the provision of information and advice, both to the general public, and also within organizations to employees. Potentially, applications in many of these previously distinct areas could be interlinked. Currently, multimedia kiosks are being tested in a number of different applications. Kiosks can be viewed as a medium through which it is possible to inform, educate, train, persuade or perform information-based transactions. Their potential attraction in all of these roles consists of their relative novelty and the range of different media that can be used to reinforce the message. The future for multimedia kiosks remains unclear. The present tests in a wide range of different application areas should permit the identification of appropriate niches where they can achieve at least one of the following: more effective communication of information; increased sales, showing an appropriate return on investment; improvements in customer service, in environments where they are a priority.

Introduction

Multimedia kiosks are workstations which are specifically designed for public access. They may be standalone or networked through to a larger computer system. The description "multimedia" implies that they present information in a variety of different media, including, for example, text, sound, graphics, images and video. The database which contains this information may be stored on a remote database or on a local optical disk. In a number of environments in which it is useful to offer public access to a database, a kiosk format with the workstation just displaying a screen to the user is robust and attractive. Some kiosks also have keypads and card readers, but the most common means of communication through a kiosk is via a touch screen. Multimedia kiosks are an attractive and interesting means of presenting information, and have been used in advertising, retailing, banking, education and training and the provision of information and advice.

Multimedia kiosks, together with the communication facilities of the information superhighway, have the potential to redraw many of the traditional boundaries both within retailing and between retailing and other customer service-based businesses. Kiosks can be used to provide information and advice on goods and services and to allow the customer to execute transactions associated with, for instance, purchasing goods and services together with banking transactions. This article explores some of the potential and pilot applications of multimedia kiosks in retailing and identifies the factors that are likely to influence the success of such technology.

The potential for multimedia kiosks in retailing

Multimedia kiosks are being tested by a number of retailers in the USA and the UK, and many more retailers are believed to be testing kiosks behind closed doors. They can be viewed as a significant advance in in-store promotions which have, until recently, relied on paper-based product catalogues and promotional brochures, with all of their attendant problems. Norris[1] claims that "the multimedia kiosk is the marketing organization's opportunity to regain control over the ultimate stage in the marketing cycle: the point-of-purchase decision".

A recent survey by Group X and Verdict Research[2] reported a dismal level of ignorance of products and disinterest in customers among UK shop assistants. By contrast, kiosks are knowledgeable, reliable, trustworthy, quick and never get bored, tired or impatient. Fundamentally, kiosks are a means of providing a wealth of product information, tailored to individual needs and presented in an interesting and user-friendly fashion. Kiosks bring otherwise dull – text-based – lists to life with animation, video, stills, graphics, diagrams, maps, audio and text. Customers can use kiosks to:

- view images or videos of the products;
- compare items;
- find detailed product information, including whether it is necessary to purchase associated items such as batteries;
- determine whether a product is in stock
- locate details of substitute items if a given product is not in stock;
- order a product.

Some believe that kiosks are particularly valuable where the consumer is seeking to purchase a more complex product, such as a fitted kitchen or a car. In making such decisions, customers require detailed information, which the salesperson may not always be able to provide. Customers will continue to use kiosks if they help them to make a more informed purchase decision or if they help by saving time. More extended customer evaluation will allow customers to appraise the effectiveness of kiosks on the basis of these criteria.

From the retailers' perspective kiosks can:

- be located in-store or elsewhere, and therefore have the potential for offering a 24-hour shopping service from a variety of different locations;
- allow the retailer to display a wider range of products than they can stock at a given retail outlet;
- allow retailers to collect customer information.

Potentially, marketing organizations can look at which products the customer considers, and identify what is rejected as well as what they actually order.

Some examples of the use of kiosks in retailing

This section describes a number of very different applications of the use of kiosks in

retailing in order to illustrate the range of different contexts in which kiosks may find an application.

Catalogue sales organizations have been at the forefront of tests of the new technology. Kiosks are a form of multimedia catalogue. In the USA, eight cataloguers have been involved in a project with MicroMall, a division of the computer software concern, Microware. The project commenced in April 1993. Merchandise is shown in kiosks with full colour graphics and sound. Consumers make selections through a series of simple touch commands on a screen. MicroMall has installed 26 video kiosks in hotel and office lobbies in Chicago, Illinois and Wilmington, Delaware. Although sales are reported to be slow, cataloguers are fairly pleased with the new project. MicroMall is providing valuable information about customers' shopping habits. Long-term information gathered from this experiment will be used to develop an interactive home shopping presence, either in cable television or via telephone lines[2,3].

In the UK, Argos has been at the forefront of experiments with kiosks and has been piloting kiosks in eight of its stores since October 1993. Sales of alternative products and add-ons have increased by more than 50 per cent. Kiosks also offer Argos a way of cutting queues at the cash desks. Customers no longer have to wait in line only to find that the product has sold out. Now they can check availability at the kiosk, as well as being advised about the purchase of extras and payment. All that remains is for customers to collect the goods from the pick-up point[1].

Woolworth's is using kiosks to market a wider range of music and videos. Its kiosks offer information on some 12,000 compact discs, 4,000 videos and 9,000 audio cassettes. Customers work through menus to discover what is available, and can then listen to video and audio clips, pay for purchases by credit or debit card, and are guaranteed delivery within seven days. Thomas Cook is using kiosks to "bring holiday destinations to life" using video, stills, audio, maps and text. Travellers can wander through a destination, looking at its main attractions on video and on detailed maps of particular areas, and can check hotels, before placing a booking via a live video link. In the branch where the kiosk is being tested, after three months it accounted for 48 per cent of bookings[2].

Thresher's kiosk supports customers in their selection of a wine. Customers are reported to be less embarrassed to reveal their tastes in wine to a computer than they might be to a member of staff.

Marks & Spencer is testing a recipe-based kiosk which creates bespoke dinner-party menus. Customers input data, such as number of guests, number of courses and how much they want to spend. The kiosk suggests complementary wines, prints out recipes and instructions, and guides you around the store to appropriate ingredients.

MFI is testing kiosks which support kitchen design. A further DIY retailer is investigating a package which could support room design and decoration.

Brand-based kiosks are another possibility. For example, Zanussi has placed some 600 information kiosks in white goods' stores to highlight the benefits of its products over those of competitors. It claims a 30 per cent increase in sales through these outlets. The effect of a number of manufacturers following a similar route has yet to be tested[1]. In this context, kiosks are being used to establish a more direct link between consumers and manufacturers.

Clear examples of the potential for changing the competitive dynamics of specific industries are emerging in one or two specific cases. Some believe that drug chains need to re-define their position in the marketplace and that they can do this by becoming the information and communication centres for health care. One of the tools which drugstores might use in this process is in-store information kiosks[4]. Hallmark Card Inc. has recently installed the first of more than 1,200 in-store computerized kiosks which will enable greeting-card buyers to design and print their own customized work. This initiative will support the company in its move towards a just-in-time inventory policy which could trim the tremendous expenses involved in printing more than 1.1 million cards per day. Hallmark's Touch-screen Greetings kiosks will include an Apple Computer Inc. Macintosh Centus 610 and a CD-ROM drive[5]. Another, more focused, retail application is Bell Atlantic Directory Services' test of an electronic *Yellow Pages* prototype system[6].

The Consumers' Association (CA) has forged another interesting link between retailing and information provision. It has begun

placing kiosks in garden centres, ostensibly to give customers information about plants. The kiosks also market the CA's series of books and magazines on gardening. The retailer benefits because customers feel more informed and confident as buyers, and the CA benefits from subscriptions. Garden centres rent the kiosks from the CA, and £15 is returned to the retailer for every subscription that is registered.

This range of examples demonstrates that the potential applications of kiosks in retailing are numerous and varied. Gifts, luxury goods, delicate items, books and music, particularly lend themselves to direct electronic selling, as do other small items which can be sent conveniently through the post. Similarly, bulky items, such as furniture or fridges which customers expect to have delivered, are other candidates. Bookings, financial services and other transaction-based activities are also amenable to kiosks. In other applications, such as in food retailing, kiosks may be used to support and influence the purchase decision.

Kiosks comprise one of a range of new technologies which retailers are investigating. These include:

- electronic shelf labels;
- promotional videos;
- interactive display systems;
- interactive POS systems.

The supermarket of the future already exists in Windsor, at Anderson Consulting's Smart Store Europe. It includes a barcode reader in the larder that automatically registers a replacement order when items are removed. This information is transmitted down a telephone line to the supermarket, which either delivers the order or prepares it for collection. Checkouts are no longer necessary, with self-scanning trolleys and personal barcode readers[2]. IT has the potential to revolutionize traditional retailing. Testing kiosks and other interactive technology provides retailers with an insight to the electronic world of the future.

Applications of kiosks in other areas

One of the attractions of multimedia kiosks is that they can provide information, advice and the opportunity to perform service transactions across a wide variety of different envi-

ronments. The potential implications of such applications for the retailer are twofold:

- (1) Wide use of kiosks in a variety of different applications will make the technology acceptable and familiar to a wider audience.
- (2) The boundaries between retailing and other applications of kiosks may be eroded and new business alliances formed.

Potentially the most significant parallel application of kiosks is in the banking and financial services industry.

Banks have been at the forefront of developments in multimedia kiosks. With their experience of anti-theft mechanisms (ATMs), they are in a good position to explore new types of public access terminals. Banks are using kiosks to extend the range of services on offer to customers, to improve customer service and to make access to banking transactions available in a wider range of locations including in-store locations. A typical example of the range of services which can be offered is provided by the NRS in-store kiosk from NRS Financial Systems Inc., which contains the NRS Bankstar Transaction automated cheque-cashing system, with monitors and keyboards built into the computer space. Services available from the kiosk include payroll cheque cashing for both customers and non-customers, money order sales, utility bill forwarding service, Western Union money transfers and credit-card cash advances[7]. Similarly, Dayton Hudson's Mervyn division has installed ATM-style credit kiosks in four of its northern California stores. The kiosks, called "Mervyn's Express", perform all credit functions for existing or new credit customers through touch-screen commands. The kiosk gives information on account status, balance and payment-due date and answers other inquiries. Credit limits on existing cards can be changed at the kiosks. Customers can apply for a charge card through the kiosks, using a bank card, an American Express or Discover card[8].

Banks are also recognizing the marketing potential of such technology. An increasing number of banks are investing in ATM machines, which they can use to promote bank products and services to cardholders, and also to raise revenue by selling retailers advertising space on the ATM screen. Bank of America's Seafirst (Seattle) subsidiary uses

ATMs to sell stamps, gift certificates and bus passes and to check account statements[9].

In many situations, there is a fine dividing line between advertising and advice and information. CD-ROM has been widely adopted as a publishing medium for information of all kinds, including encyclopaedias, reference works, directories, full-text databases and data banks. An increasing number of these CD-ROM products are multimedia[10]. It is a small move forward to use these and other locally or internally produced multimedia CD-ROMs in kiosks which are available to the public. Examples of such implementations are numerous, diverse and growing. Here we draw together a few examples for illustrative purposes:

- Toronto's Royal Ontario Museum uses multimedia technology to explain what the exhibits are, to provide much more information than can printed labels, and to make pieces not currently displayed available for viewing as images[11].
- In the state of Maryland, all residents eligible for welfare get their benefits electronically, drawing from 1,800 ATMs and POS terminals at 3,000 grocery stores across the state.
- Some state and local agencies are deploying kiosks in shopping malls, libraries and other public areas. These kiosks handle car registration, job matching and information referrals[12]. A prototype unemployment office with self-service kiosks, the Touch Illinois system is the joint project of the Illinois Department of Employment Security (IDES), IBM's Advanced Interactive Systems Group and the Interactive Transaction System's Group at IBM's T.J. Watson Research Center[13]. Another public service application of kiosks has been installed in the front of the municipal courthouse in Long Beach, California. Two Auto Clerk kiosks, consisting of a touch-screen video monitor, a keypad, a credit-card reader and deposit bin, lighten the load on clerks in the courthouse and make dealing with the judicial system more straightforward[14].
- The US Postal Service is installing the first of 10,000 interactive multimedia kiosk "Postal Buddies" in the Washington, DC, and San Diego, California, metropolitan areas. The devices are intended primarily to process change of address notifications, which cost the postal service \$1.3 million

- annually. In addition, the devices can print customized business cards, stationary and mailing labels[15].
- It is a small step from using kiosks for information provision and advice to their use in education and training. A number of companies are experimenting with the use of multimedia kiosks in education and training of employees – for example, Digital Renaissance and VMI. Employees can receive information on video, audio, or in graphic and textual formats[16].
 - Pacific Bell has developed the “Knowledge Link”, which employees use at kiosks to access information about changing regulations at their own convenience[17].
 - Saatchi and Saatchi North America Inc. replaced a standard file of written employee benefit communication documents with multimedia kiosks and an interactive voice-response telephone system capable of explaining benefits, handling enrolment and modelling future benefits in a quick and easy way[18].

Location of kiosks

The location of a multimedia kiosk may be of central importance to its function and its success. It is therefore appropriate to focus for a moment on the issue of location. The most obvious location for a kiosk is wherever the retailer may be able to reach customers or clients. One of their main advantages in many applications is the opportunity to place them in locations where the bank or retailer does not otherwise have a presence. Potential locations include:

- in-store (the organization’s own);
- in-store (another organization’s store);
- in or outside banks (as ATMs);
- in supermarkets;
- in shopping centres and malls;
- in libraries and leisure centres;
- in major tourist attractions;
- in coffee shops and bars;
- in hotels, airports and train stations;
- at trade shows and exhibitions;
- on university campuses;
- in the foyers of office blocks.

In all of these environments, kiosks can be viewed as providing an additional attraction to customers, and may be welcomed by the proprietors of the location as a source of additional revenue, an enhanced customer

service on the location and as an opportunity to project a more exciting high technology image. They may be particularly attractive when they offer an opportunity to divert the customer during the “waiting experience”, as in airports and train stations[19].

There are, however, hazards in placing kiosks in locations other than the home location. Even as a medium for information, advice or promotion, it is important that the data be tailored to the client group which will access the kiosks in the given location. More significantly, however, if a customer wishes to perform a transaction, such as placing an order, there must be a mechanism for ordering, collecting payment and delivery of goods. These represent some significant challenges, if, for instance, transactions are being performed in an international arena. Also, in such environments, potential users do not have available to them personal assistance, either to support their use of the kiosk or to offer further elucidation about the product.

It is conceivable that if kiosks become popular there will be competition for the best sites in, say, shopping malls or major supermarkets. This is likely to lead to mutual arrangements between retailers and banking institutions and others which will constrain available locations for specific players.

In the first instance, most organizations are testing multimedia kiosks in their own stores or premises. In-house testing avoids the need to negotiate alternative locations, and facilitates closer observation of how the kiosk is being used as well as offering opportunities for service personnel to support customers in their use of kiosks. Banks are the exception: they are exploring the placing of kiosks in stores and other locations. Other organizations may subsequently seek to learn from banks’ experiences in the location of kiosks.

Databases and the technology

The applications of kiosks involve a range of different levels of technological sophistication. The basic requirement is a multimedia terminal which has a computer with sufficient RAM and either a hard disk or a CD-ROM and player. In some applications, such as in a tourist information office or with a store guide which provides a guide to the location of products in a store, a standalone configuration is sufficient. However, in any application where it is necessary for a number of termi-

nals to share access to a database – which might be real time – some type of networking will be necessary. For example, if customers are to be allowed to place orders through a kiosk, the kiosk must provide access to a shared real-time database which indicates stock levels and can provide estimates of delivery times. Typically, this database will be held at a central location and communication will be via a dedicated data network. Some organizations already have such networks in place to support their POS systems, but the increase in traffic on the network triggered by the use of multimedia kiosks is likely to require an upgrade of the network.

Kiosks usually have high-resolution screens to support the display of images. The user interacts via a touch-screen interface. The user touches buttons on the screen and thereby selects specified transactions. Some kiosks also have card readers, keypads and keyboards. The limitations of touch screens in these applications still have to be fully tested.

The kiosk provides access to a database. Arguably, one of the most expensive elements of these systems is the creation of a database. Databases are expected to include text, audio, graphics, images and videos. Videos, particularly, can be expensive to produce to a professional standard. As products and their specifications change, all elements of the database will need to be updated. Since, in most applications, multimedia kiosks will replace other systems or paper-based product descriptions or catalogues, the information has always needed to be available, but the extension in the range of media in which the information is stored is likely to increase database creation and maintenance costs. In addition, as in any situation where an organization moves from print-based information to electronic information, the “publishing process” is fundamentally affected. Issues such as the update frequency of the database and the implications of such updates for links with the inventory database need to be addressed.

Factors which will determine the success of multimedia kiosks

According to Dataquest, a high-technology research firm, the US multimedia sector will grow from US\$1.9 billion in 1992 to US\$9 billion by 1996[20]. Market Intelligence Corp. further projects that the multimedia market will reach US\$24 billion by 1998[21].

Fox[22] recognizes that “the technology remains rare and experimental in the retail industry”. He asserts that one of the factors hindering the wider adoption of kiosks is that kiosks have no proven return on investment (ROI) for retailers. Kiosks, he asserts, are used to improve customer service without increasing labour costs; but the notion of customer service improvement may be too vague in an industry based on quick bottom-line results. He cites the example of Lechmere, which has tested an interactive self-order and payment system called “Lechmere Express”. Lechmere finds it difficult to judge whether the orders placed on the kiosks are incremental or would have occurred without the machine’s presence. Lechmere has viewed kiosks as a means of gaining competitive advantage by improving its customer service. In some of the non-retail applications described earlier, kiosks may justify their existence by reducing labour costs or by providing an improved channel of communication. In all of these contexts, kiosks are currently experimental, and attempts to measure their success using these parameters are fraught with problems. However, more fundamentally, the measures of success which are based on, for example, return on investment are fundamentally flawed. They provide only the answer to the question: “Are kiosks successful in generating a return on investment in this location, with this application and the function currently offered by the kiosk and under the current interface?” It is important that tests of kiosks go beyond this bottom-line assessment if designers and implementers are to learn how to tailor the technology to specific applications. Important issues which need to be investigated include those outlined below.

Customer profile

A key issue is: which customers use the kiosks and what do they do with them? From a retailer’s perspective, kiosks would be judged a success if those customers with high spending power used them to assist with purchases, yet some use is associated with browsing and playing. Only with some basic answers to such questions as who will use kiosks is it possible to start to consider how the kiosks might be made more attractive to more customers and their impact broadened. Transaction logging can determine the types of search which customers perform, but may yield no infor-

mation on the customer profile. Although the question must then be asked whether browsing and playing are legitimate uses of kiosks if they lead indirectly to sales. Any detailed analysis of the design of the interface would seek to focus on the “serious” use of the kiosks which, for instance, supported the customer in completing a transaction, or locating some information. It is possible to link searching on the kiosk directly to orders only when orders are placed via the kiosk. However, even in such circumstances it is difficult to evaluate the impact of the kiosk in the product selection process. Since, furthermore, customers are unlikely to remember their search strategies at a later time, the only means of collecting information on this would appear to be customer surveys at the point-of-use and by sensitively attending to customer comments and complaints when they report being unsuccessful in the use of the kiosk. There is some evidence to suggest that some customer groups are likely to be resistant to the use of such technology. For example, Woolworth’s experience is quoted by Norris[1]: “we trialed the kiosk systems last year, but what we actually found was that, although the young buying public loved using them, they didn’t have the budget to buy much-so didn’t justify the cost of the technology”.

Location and application

Success with kiosks is likely to vary significantly from one location and one application to another. For example, one UK retailer is experimenting with kiosks to display white kitchen goods. This is particularly useful because it usually displays these goods as part of a complete kitchen, and it can be difficult for customers to view the entire range of, say, cookers which the retailer sells. This application may be much less useful for a domestic-appliance retailer which was able to display most of these goods in store and appropriately grouped. There is no doubt that the success of kiosks will depend on the selection of specific applications. Equally, the location of the kiosks, as discussed in the previous section, may be a significant factor in determining success.

Interface design

The evaluation of interface design must be both formative and summative. In other words, interfaces must be evaluated both during their development and also once they

have been made available for public use. This is another way of saying that interface design is a continually evolving process. Multimedia interfaces, and even GUI interfaces in public access environments, are relatively new phenomena, and this evaluation process has therefore only just begun. Richards and Robinson[23] maintain that interfaces need to be tested, for example, for:

- top-level functions, including user guidance, index and search features;
- operational functions, such as execute, break and escape;
- navigational functions, which deal with movement within the database, and ergonomic functions, such as the layout of screens, the use of colour and terminology.

Although general guidelines are available on how these criteria might be met (see, for example, Sneiderman[24]), these need to be interpreted and applied in a number of different environments. Indeed, the use and understanding of multimedia information, as distinct from information conveyed by text, graphics or numbers is a research topic in its own right.

Evaluation must take account of both the functional features of the interface and the users’ perceptions of the experience of using the kiosk. Functional features will determine whether common searching and browsing tasks can be completed efficiently and effectively. Users’ perceptions will provide an indication of the extent to which their expectations of the kiosk were achieved.

Effectiveness of related services

Kiosks will only ever represent part of the customer experience. The success of kiosks will, for example, depend to some extent on customers understanding which transactions can be dealt with through the kiosks and which transactions must be dealt with by a person-to-person exchange. This interface between kiosks and personal service will be crucial in many situations. In addition, where kiosks, for example, trigger a further transaction – such as the ordering of goods or the opening of a new bank account – the kiosk is only the first stage. The quality of the total service includes features such as delivery time and the speed with which customers receive bank cards so that they can start to use their new account. In summary, kiosks should not be seen in isolation, but must be viewed and

used as an integral part of the total customer service. The interface between those parts of the customer experience offered by the kiosks and those offered by human intervention must be largely the responsibility of the human service agent. Computers have their limitations. They can only answer questions; they cannot offer personal experience or useful pieces of information, and each terminal can only serve one customer at a time.

Effective public access terminals

Extensive work on on-line public access catalogues and CD-ROMs in libraries have demonstrated, six key lessons:

- (1) People like using OPACs and will browse, sometimes for long periods of time, thereby provoking queuing.
- (2) OPACs have been successful “shop windows” for libraries encouraging a high-tech image and more extensive exploitation of stock.
- (3) Success with the user specification of search strategies depends on the interface and the search facilities available, the users’ understanding of what they are trying to do and their ability to understand how this can be achieved in the systems.
- (4) Different interface designs are useful for users with different levels of experience of the system, often leading to the mixture of menu-based and command-based interfaces supporting novice and expert mode use of the system.
- (5) The greater the range of functions supported by the system, the greater difficulty the designer has in presenting an easy-to-use interface, and the greater the difficulty the user has in making effective use of the interface.
- (6) Demands for speedy and effective document delivery have escalated.

Once some of the issues which allow for the appropriate development of the technology for a specific application have been explored, retailers and others can revisit the issue of return on investment. While it is important to ensure that the technology is being used to its best effect, economic considerations will ultimately determine its fate. We are likely to witness an even more widespread experimentation with kiosks as retailers, bankers and providers of education, training and informa-

tion seek to investigate the balance between technology and economics.

Conclusions

This article has attempted to review the very wide potential for the application of multimedia kiosks. It is important that all retailing organizations understand the scope of these applications, since kiosks have the potential for eroding the traditional boundaries between retailing, banking, education and training and the provision of information and advice, both to the general public and also to employees within organizations. Potentially, applications in many of these previously distinct areas could be interlinked.

Currently, multimedia kiosks are being tested in a number of different applications. Kiosks can be viewed as a medium through which it is possible to inform, educate, train, persuade or perform information-based transactions. Their potential attraction in all of these roles is their relative novelty and the range of different media which can be used to reinforce the message.

There are two types of implementation – standalone and networked. In standalone implementations, the technology is relatively cheap on a per-kiosk basis, although the need to purchase and maintain, say, hundreds of such kiosks could accumulate for an organization. Networked applications permit real-time updating of central databases and therefore support organization-wide transactions, but need to deal with the costs associated with networking. Testing a limited number of standalone kiosks is relatively inexpensive, but the investment in the more extensive application of the technology could be significant. An important consideration in many applications is the investment needed to create and maintain an accurate database.

The future for multimedia kiosks remains unclear. The present tests, in a wide range of different application areas, should permit the identification of appropriate niches where they can achieve at least one of the following:

- more effective communication of information;
- increased sales, showing an appropriate return on investment;
- improvements in customer service, in environments where this is a priority.

If multimedia kiosks tread a path similar to that of many other technological developments, such niche applications will emerge, and there will subsequently be a slow and measured move towards the wider use of multimedia kiosks. The pace of such developments will be constrained as much by economics and market forces as by the speed of technological advance:

What's needed is the leap of faith by retailers and other marketeers that will turn multimedia from a interesting toy to a genuine marketing tool[25].

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