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Challenges in the delivery of e-government through kiosks

Abstract

Kiosks are increasingly being heralded as a technology through which governments, government departments and local authorities or municipalities can engage with citizens. In particular, they have attractions in their potential to bridge the digital divide. There is some evidence to suggest that the citizen uptake of kiosks and indeed other channels for e-government, such as web sites, is slow, although studies on the use of kiosks for health information provision offer some interesting perspectives on user behaviour with kiosk technology. This article argues that the delivery of e-government through kiosks presents a number of strategic challenges, which will need to be negotiated over the next few years in order that kiosk applications are successful in enhancing accessibility to and engagement with e-government. The article suggests that this involves consideration of: the applications to be delivered through a kiosk; one stop shop service and knowledge architectures; mechanisms for citizen identification; and, the integration of kiosks within the total interface between public bodies and their communities. The article concludes by outlining development and research agendas in each of these areas.

Introduction

Online public access kiosks, located in high streets, railway stations, shopping centres and other public concourses are increasingly being viewed as one element of the interface between citizens and governments, government departments, and local authorities or municipalities. Twenty per cent of local authorities or municipalities in the United Kingdom have experimented with the use of kiosks (Phythian and Taylor, 2001). Ashford et al (2002) describe a small study of the application of such kiosks. Other plans for the use of kiosks as an element in e-government strategies are likely to lead to extensive utilisation of kiosks. For example, in Beijing the plan is to install between 2000 and 5000 kiosks across the City by 2003 (Chen, 2002). In particular, kiosks are viewed as being valuable in both introducing IT, but also for the delivery of IT based services to communities in which penetration of PC and telecommunication technologies is relatively limited. Kiosks are viewed as a technology that can assist governments to bridge the digital divide, as they seek to progress e-government initiatives in areas such as e-voting, e-democracy and e-service delivery.

The objective of this article is to identify key challenges in the successful application of kiosks as components in e-government strategies. A review of existing work on the

use of kiosks in the public service setting of health information, and in commercial context identifies some characteristics of the application of kiosks as public access technology. Subsequent sections explore the purpose of e-government and the role of kiosks in the delivery of e-government, discussing specifically:

1. the definition of the roles of kiosks in e-government.
2. the service and knowledge architectures underpinning service delivery, and the notion of one-stop shops or portals
3. customer identification
4. the integration of multiple channels in the delivery of e-government

Previous research on Kiosk Applications and Practice

Online kiosks, public access kiosks, or information kiosks are typically located in a store, in a shopping centre or mall, or in other public environments such as railway stations, motorway service stations and airports. There is a range of variability in the information and services that customers, users, travellers, tourists or citizens can access through these kiosks, and kiosk design shows a comparable level of diversity. Typically the kiosk is a computer located in a stylish (and increasingly branded) box with a screen fixed at a level, which is convenient for users who stand by the machine. Interaction is through a touch screen or, increasingly through a keyboard. Some kiosks also have card readers to support payment or the scanning of smart cards for other applications, and printers, to print, coupons, tickets, maps, or other data as part of service delivery.

Previous research on kiosk applications falls into two categories: research on commercial applications of kiosks, and research on health information kiosks. The first category is of interest because it has explored the wide range of different types of kiosk and kiosk applications and has proposed taxonomies of kiosks. The second category of research includes significant work on the use of kiosks in the delivery of information to the general public, and includes a range of use studies of such kiosks. Both categories are reviewed briefly below, for the insights that they provide into kiosk applications and use. Only one study has been identified on the evaluation of a kiosk designed on behalf of a local authority for public service delivery in Knowsley in the North West of England (Ashford et al, 2002).

Work on commercial application of kiosks has led to proposals of taxonomies of kiosks. Tung and Tan (1998) and Tung (2002) offer a taxonomy of kiosks on the basis of transaction and information provision. This is extended by Rowley and Slack

(2003), who argue that kiosk taxonomies need to accommodate the four dimensions of public access systems; user characteristics; environment and context; task; and, technology. Their taxonomy proposes four categories of kiosk: inform, interact, transact, and relate. This categorisation of kiosks raises issue of roles and functionalities, which must differ across e-government kiosks. Potential applications of kiosks in e-government go beyond information provision.

The most significant body of research on kiosks in public sector contexts has been conducted in the context of the use of kiosks for health information provision (e.g. Nicholas et al, 2002c, 2003c). In the United Kingdom various department of Health initiatives (Williams et al, 2002a) which have promoted the central significance of information for patients, as they seek to ensure that decisions about care are patient focused and reflect the needs and wishes of those receiving healthcare. The NHS-Direct initiative incorporates a range of information services, including a web site (Nicholas et al, 2002a), a telephone hotlines (Munro et al, 1999), touch-screen kiosks (Nicholas et al, 2000, 2001a,b) and pilot digital interactive television services (Gunter et al, 2001). Work in this area suggests a number of lessons that might be translated to e-government kiosk strategies:

1. *Information needs.* Assessments of information needs prior to the implementation of such services are rare (Coulter et al, 1999), and this has led to a mismatch between what the service offers and what patients perceive themselves to need. One category of information that is overlooked is psycho-social information, that is often gathered from other suffering from similar conditions is important. Interactivity and community can be very valuable. There is also a considerable level of use of general electronic health information, in pursuit of general well being (Lindberg, 1998). One way of assessing information need is to monitor use. Nicholas et al (2001a, 2003a), report on approaches to evaluation of use, including issues such as metrics, and the use of transaction logs. They suggests that divining need from use statistics is far from straightforward.
2. *The Demographic profile of users.* Various studies have examined the gender distribution of web site or kiosk users, with differing outcomes, but in general at least 50% of users are women (Nicholas et al, 2002a). Another interesting demographic is age. Interest has focussed on use by the elderly and children (Nicholas et al, 2001b, Williams et al, 2001). One factor that comes to light in several of these studies, is 'agent' or 'intermediaries as users; parents, carers or health professionals may search on behalf of

someone else. Another dimension, that may impact on use, is membership of an ethnic minority; there is evidence that ethnic minorities have low IT take-up (Chisholm et al, 1999) and that language may be a barrier in the use of such services (Jones and Gill, 1998a).

3. *Roles of different channels.* Transaction log research on Web, kiosk, and DiTV usage has identified considerable differences between the use made of these platforms. DiTV users spent approximately five to six minutes on a session compared to three to four minutes for Web users, and about one minute for a kiosk. Kiosk users may be under time pressure, and be unwilling to spend time investigating an unfamiliar system. (Nicholas et al, 2001c).
4. *Quality of information and related issues.* Despite information professionals and researcher's quite proper preoccupation with criteria for the quality of information. there is evidence to suggest that the public is inclined to be uncritical of the quality and authority of information (Williams et al, 2002b)
5. *Anonymity.* Nicholas et al (2003b) raise the issue of 'search disclosure'. They suggest that information users of digital health information services, moderate their information seeking behaviour according to the degree of anonymity that they feel that they have during the process.
6. *Kiosk location.* Nicholas et al (2002b) report on the impact of location on the use of health information kiosks, and the relative success of location in health shops and supermarkets when compared to the response in hospitals and surgeries.

Definition of the role of kiosks in e-government

Consideration of the role of kiosks in e-government needs to be undertaken against the context of the objectives of e-government initiatives in general. Many commentators view e-government as a radically new opportunity to re-invent and re-organise the relationships between governments, as policy makers and service providers, and citizens. For example, a recent OECD report (OECD, 2001) focuses on e-government as a means of enhancing citizens engagement in defining the process and content of policy making. Macintosh and Smith (2002) argue that such engagement allows governments to reach a wider audience, provide relevant information, engage in two-way dialogue with that wider audience, and support active participation. Evangelidis et al (2002), suggest that:

'e-government is not entirely a technology phenomenon. It is about re-inventing and re-organising the way service providers (public/private) and citizens (or users) interact in the society' p.401.

At a less philosophical level, the Electronic Service Delivery toolkit (www.esd-toolkit.org) identifies the following ten transactions within e-government:

Providing information

Applications for service

Booking venues, resources and courses

Collecting revenue

Consultation

Paying for goods and services

Procurement

Providing access to community, professionals or business networks

Providing benefits or grants

Regulation (such as issuing licences) (Inman, 2003).

A further factor that needs to be taken into account are the different roles that kiosks can play. For commercial contexts, Rowley and Slack (2003) suggest four distinct roles of kiosks: inform, interact, transact, and relate. These may also be applicable in public service contexts:

- Inform kiosks focus on information provision, or, promotion. Much of the research on the use of kiosks in health information provision fits into this category.
- Interact kiosks support information exchange between the user and the kiosk. The customer provides some information about themselves, or their preferences, and the system makes recommendations, or provides additional information on the basis of this input.
- Transact kiosks are concerned with the execution of transactions, such as the purchase of a ticket, or the payment of a bill. ATM's fall into this category.
- Relate kiosks involve features that draw people into a community or a relationship with the kiosk provider. They offer opportunities for communication, and have been carefully designed from a marketing communications perspective to draw users into a relationship with the kiosk provider.

Importantly, one kiosk does not fit all, and kiosks are typically designed to suit their application, both in terms of input/output devices and interfaces, and also in terms of their housing, presentation, and location.

Not all e-government applications can be delivered through a kiosk. Figure 1 summarises some of the differences between a kiosk and a web site as an interface. In general tasks that can be completed quickly and are accessible to a high percentage of the population are most appropriate for kiosk presentation. Being clear about what a kiosks can and can not do is an important precursor to success. This goes beyond designing the task and information that can be accessed through kiosks to a consideration of the objectives of kiosks. For e-government applications, these objectives are likely to be a subset of the objectives of e-government.

	Kiosks	Web sites
Range of information and services	Limited, targeted	Can include wide range of services with background information
Human agent back-up	Unavailable in the public concourse	Available through telephone and e-mail
Length of interaction	Must be completed in one short visit (less than 5 minutes)	Can involve several episode over a period of time, including email interaction
Location	Public space	Private space, such as home, office, workplace,
Access to other documents	Low	As required
Recording of transaction	Possible if print record available.	Printing usually possible. Sometimes electronic records can be maintained.
Interface requirements	Easy and quick to use	Easy and quick is still good, but complexity that requires learning can be acceptable.

Figure 1: Comparing kiosks and web sites

Kiosks have potential to offer opportunities for e-voting, e-democracy and citizen participation in democratic decision making, and the delivery of information and e-services. Kiosks might be used in any of these arenas by national, county (or state) or local government (or municipalities) and the various departments at each level. Taken together, this might generate a plethora of potential applications for kiosks. It is therefore important that a kiosk strategy moves beyond experimental pilot kiosks,

with one-off application, to a strategy that prioritises kiosk applications on the basis of their appropriateness. Without such clarity of intent, citizens may be in danger of encountering either very complex multi-function kiosks, or banks of kiosks each of which supports a different application, in busy public spaces. This point is reinforced with reference to the complexity of public service delivery. For example, The Netherlands, a relatively small European country, has a national government with 13 ministries, 12 provinces, and 504 municipalities. Most of the services (70%) are generated at the municipality level. Each municipality delivers between 200 and 400 kinds of products and services to its citizens. Different countries have different structures, and services that are delivered by public sector organisations in some countries may be delivered by private sector organisations elsewhere (Leenes and Svensson, 2002). The implementation of e-government is a complex and ambitious project that requires considerable prioritisation, scheduling and planning. This complexity points towards the need for coordination across different government agencies in the definition of kiosk objectives. The concept of the one stop shop is visited in the next section. Whilst kiosks will never fulfil all of the needs of a community and its citizens, there must be some consideration of integration and coordination, in the definition of their roles.

The small case study in Appendix 1 describes a kiosk in the tourist information office in Aix-en-Provence, France, that was evaluated in August 2002. This illustrates how insufficient attention to the design of knowledge and service provision through a public service kiosk can impair usability. We argue that this derives from an insufficiently crystallised view of kiosk objectives. This application features a large database, in which tourists can access much information that is of little relevance to them, complex and lengthy menu structures, and a less than optimal search mechanism. This poor design with its ambiguity of objectives leads to slow and tedious information searching, and queues at the kiosk. This case study surfaces two questions for e-government strategy in relation to kiosks:

1. Which services should be made available to which citizen groups through kiosks?
2. Does the one size fits all option work, or do governments, and their agencies need multiple kiosk designs and service and knowledge architectures for different locations and intended audiences?

Kiosks as one-stop shops – managing service and knowledge architectures

The literature of e-government makes considerable play of the concept of the 'one stop shop' (e.g. Wimmer, 2002, Jacumeit, 2002). Proponents of this concept argue that the one stop shop (or the portal) is attractive to citizens, because this portal can act as a familiar point of interaction with government. Both web sites and kiosks can function as one stop shops. Such one stop shops might offer:

- online information
- communication (through e-mail)
- online services, such as registration, vehicle registration, passport request, and tax form completion
- access to online publication
- online payment systems
- e-voting
- e-democracy and participation
- people networking.

Most of these functions could be offered via kiosks, and kiosks might be viewed as the 'one stop shop' for those without access through other avenues to e-government. Hence the pros and cons of the 'one stop shop' concept are relevant to any discussion of the potential applications of kiosks as a channel in e-government.

One of the very real challenges of the one stop shop are the underlying architectures necessary to achieve a sense of seamlessness for service requesters. This requires attention to all of:

- the organisational architecture and alliances necessary to service delivery,
- the technological architecture that allows the interface to intelligently refer queries to the appropriate service agency, and
- the knowledge architecture that structures the knowledge base under menu options, and defines documents, and sections within those documents.

Due to public sector functional disaggregation, the creation of virtual one stop shop e-government services involves multiple service providers. In addition, the technology that is used by individual providers to provide their share of bundled services cannot be assumed to be interoperable. The regulatory frameworks under which public agencies are governed can be complex and fuzzy. For perfectly legitimate concerns associated with citizen privacy, two government agencies that wish to collaborate in service provision may be subject to legal or regulatory controls that prevent them from sharing citizen data (such as names and e-mail addresses).

Kraaijenbrink (2002) identifies three categories of problems for integrated service delivery in the Netherlands:

- Problems on indistinct and subdivided tasks and responsibilities, including legal constraints and uncertainty, and establishing links between national and local government.
- Problems that arise from a focus on the autonomy of each participating organisation – when organisations cooperate they need to adapt their own identities, cultures and ways of working.
- Problems of scale, including insufficient staff, insufficient financial capacity, and in a large integrated project, ensuring privacy, authenticity and security,

One-stop e-government across national boundaries poses another layer of complexity, since public services from different countries will normally operate in different languages and be governed by distinct regulatory frameworks.

In the context of the technological architecture, it is necessary to:

- Develop ontology's and ontological indexes, service naming schemes, and service repositories.
- Create a set of invocation pointers to the service implementations in these service repositories.

Gousos (2002) proposes a layered one stop shop architecture for a one stop shop service provision scheme, and reviews the technologies that might provide the various components. This leads to considerations of the way in which the elements of this model and their technologies can be distributed amongst the platforms of the service providers. Such models suggest that success would depend upon a high level of cooperation between IT professionals and departments in different government agencies.

Citizen Identification

Many e-government applications require citizen identification, but with all public access systems it is difficult to know who is using the workstation, and, indeed, whether a user is acting on behalf of someone else. With home-based PC's, there is at least some match between user and user address, but this is not the case for kiosks. In many current applications of kiosks, apart from ATM's, public access means anonymous access. The e-voting context illustrates the dilemma associated with the identification of citizens (e.g. Cranor, 2001). Key issues in e-voting are: authentication of the voter, verification of the right to vote, security of vote

transmission, anonymity of the voter, and, guarantee of the vote counting process. One way to seek voter authentication and identification is through the issue and use of a smart card, which could be used in any public access kiosk or other workstation. In some countries and states, all citizens carry such cards, but in others this would require the issue of special cards. In addition, whilst authorisation of the smart card is straightforward, authentication of the user of the smart card, is less straightforward. A common solution is to use a PIN number, or password or code. This may enhance the validity of authentication, but for a service or process that is used infrequently, like e-voting, PIN numbers are apt to be forgotten. Other options include biometrics, or voice signatures, but typically these involve relatively complex and expensive technologies, that might not be suitable for public application (Watson and Cordonnier, 2002)

Integrating Channels for e-government delivery

'It seems that government and health organisations are providing digital information platforms without due regard to the different functions, attractions, difficulties and audiences that these two platforms might have.' (Nicholas et al, 2003a, p.15)

E-government can be delivered through the web, mobile phones, and public access kiosks. Citizens will seek options in accessing service providers, and will demand the option of consulting information on the move, as well as through fixed machines in their office, home, or even their train seats. Whilst the respective roles of technologies are likely to change over the years, different technologies and combinations of technologies are likely to be useful for different purposes. For example, Morath (2000) suggests that the following factors need to be taken into account in considering the technology of preference for specific users and specific tasks:

- *Lifestyle* of the market segments
- *Penetration of technology*, both in general, within specific countries, and within specific segments
- *Bandwidth* and other characteristics of connections
- *Cost* of the equipment and the ongoing cost of the use of connections
- *Reliability*, with problems most likely to be associated with connection
- *Size of display*, which affects the information and interaction options that can be made available at one time

- *Input options*, ranging from touch screen, keypad, to full function keyboard and, ultimately, voice.
- *Integration* with other functions, such as calculations, the creation and storage of local databases and documents.
- Opportunity to maintain a *print record* of any transactions or information.

This list of characteristics is useful because any new technologies can be evaluated in terms of these criteria. Linking technologies together in different configurations might also provide solutions that navigate the constraints of one technology, by capitalising on the strengths of another. For example, linking a Portable PC through a mobile phone gives many of the advantages of a PC, but also allows mobile communication. Internet cafes are becoming popular with users who do not otherwise have Internet access. Such cafes have all of the functionality of the standard PC linked configuration, but offer access to demographic segments where penetration in terms of PC ownership remains limited. On the basis of the above criteria, the PC linked to a telephone line offers maximum flexibility in terms of the range of information that can be provided, and the ease of interaction. Governments need to establish an Internet presence, but some may also have potential community segments in which the penetration of digital TV is high, or in which the fascination with mobile phones allows them to deliver short and sharp marketing messages, brief items of general and product news, and opportunities to effect simple transactions. Ultimately governments need a strategy for multi-channel service delivery and communication that embraces kiosks, telephone, the web, letters and personal contact.

Conclusion

Kiosks are being identified as a technology that may have a role in widening access to government services, and policy making, and encouraging citizen participation. They are one of the technologies that can contribute to the success of e-government. Kiosks may have a role in the delivery of a number of e-governments elements, including e-voting, e-democracy, citizen participation in democratic decision-making, and the delivery of information and services, but in order for these applications to be a success governments need to:

1. Define kiosk objectives, prioritising the delivery of specific applications through kiosks, from potentially thousands of applications. Kiosk objectives need to take into account:

- a. The key issues on which governments wish to engage and be seen to engage with citizens
 - b. The complexity and length of tasks that can reasonably be performed at a public access kiosk
 - c. The constraints and potential of kiosk technology, in terms of data entry, printing, user identification, information provision, communications, transactions, payment and service delivery.
 - d. User expectations, and behaviour regarding kiosks.
2. Explore the service and knowledge architectures necessary for integrated, or one stop shop government, embracing:
 - a. The organisational architectures and alliances necessary for service delivery
 - b. The technological architecture that allows the interface to intelligently refer queries to the appropriate service agency
 - c. The knowledge architecture that structures the knowledge base.
 3. Explore solutions for citizen identification, including smart cards, PIN's, and other technologies, such as biometrics and voice signatures.
 4. Develop an e-government strategy that:
 - a. Proposes the optimal technology for given applications
 - b. Achieves integration across channels, in terms of information, services, and interface.

Each of the areas identified above has an associated research agenda:

1. Kiosk objectives
 - a. Kiosk applications portfolios and their overarching aim.
 - b. Task mapping for kiosks, in terms of appropriateness
 - c. Task mapping for kiosks in terms of user willingness and engagement
 - d. Use and user profiles for different kiosk applications
 - e. User formulation of judgements of e-service quality
2. Service and knowledge architectures
 - a. Interorganisational and departmental alliances, and the impact of culture and working practices
 - b. Technology interfaces, including ontology's, and ontological indexes, service naming schemes and service repositories.
 - c. Knowledge architectures for distributed databases, with complex security and access protocols.
 - d. Service delivery architectures that support seamless service delivery.
3. Citizen identification

- a. Development of application of smart card and PIN technology in a wider range of contexts.
 - b. Assessment of user response to different identification options
 - c. Development of other technologies, such as biometrics and voice signatures.
4. Integration of channels
- a. Development of technology interfaces and integration
 - b. Development of task mapping to specific technologies
 - c. Understanding use preference for technologies in relation to tasks and applications.

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Appendix 1

CASE CAMEO: ONCITY.FR KIOSK

Location: Tourist Information Office, Aix-en-Provence

Audience: Visitors to Aix

Information Architecture:

1. The main screen shows a number of buttons, and menu options.
2. The tourists initial response would be likely to be to press say the Entertainment and tourism button – but this was very slow to respond.
3. Accordingly the tourist might try the button Aix, then bars and cafes, perhaps in pursuit of something to eat. This leads to a list of bars, with addresses, but with no further details. Another approach is to use the search engine, and enter the name of a specific bar (e.g. Grange) in order to locate its address through the kiosk. The search is very slow, and if the search term can not be located, the computer ‘hangs’.
4. Another route forward might be to click on the right hand mouse button to activate the ‘practical information’ menu option. This has the following sub-categories:
 - Emergency and public services
 - Transport
 - Town and City Maps
 - Administration and documents
 - Education

Each of these categories has a significant collection of information, typically arranged under another set of subheadings, a number of which have subheadings that might lead to information that would be useful to tourists, but often this information is embedded in a wider database much of which might only be of use to citizens. For example: emergency and public services includes: emergency numbers, police and justice, car parks, health, social services, embassies and consulates, employment, and sport, leisure and culture. Such a database requires a complex menu system, responsive touch screen or keyboard, and a fast search engine in order to support quick retrieval and to avoid queues. It has none of these.

Language: Users have the option of selecting a language. The choice of English causes all dialogue and some data to be displayed in English, but parts of the database are only available in French, and the unsuspecting English language user finds themselves dropped into French when they choose certain menu options.