

SOFTWARE USAGE IN UNSUPERVISED DIGITAL DOORWAY COMPUTING ENVIRONMENTS IN DISADVANTAGED SOUTH AFRICAN COMMUNITIES: Focusing on youthful users

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ABSTRACT

Digital Doorways provide computing infrastructure in low-income communities in South Africa. The unsupervised DD terminals offer various software applications, from entertainment through educational resources to research material, encouraging unsupervised and peer-assisted learning of basic computer skills and information access, particularly for youth and children.

This study aims for better understanding of user behaviour and the nature and extent of DD interactions. Mixed-methods research is used to investigate usage of the embedded software applications at selected sites, and its relationship to user demographics – age, gender and location. We focus on the quantitative component of the study, while touching briefly on qualitative aspects.

Data analysis indicates trends and significant relationships between age, gender, location, and application usage. Highest use occurs amongst youth aged between 10 and 25. Recommendations are provided for future DDs and similar initiatives.

Keywords: child-computer interaction, community informatics, computer literacy, software usage, digital Doorway, ICT in education.

Introduction

Information is shared and learned by various ways: verbal, written, pictorial, and by technological means, the latter having unique potential, due to the lack of geographical boundaries. Information and communication technologies (ICT) are vital elements of a healthy society, providing means of information retrieval, entertainment, communication and content creation. Computers assist with calculations, record keeping, creation of documents and visualisation. It is particularly important to



expose children and youth to computing technologies, since ICTs can contribute to foundations by which they construct knowledge and enhance their lifestyles. In first-world contexts, children interact with ICT right from early-childhood education at the age of four (O'Hara 2008). The age at which children use technology for the first time is dropping (Louw and Winter 2011). Louw and Winter conducted interviews on ICT use, especially the Internet, by South African 6 to 12 year olds at private schools. Findings revealed that, although parents imposed some rules, use was generally independent and unsupervised.

In complete contrast, in low-income regions of South Africa, there is a need among entire communities for basic computer literacy and access to computer resources. Access to computer infrastructure should be increased in a way that maximises the acquisition of computer skills and information access, while also acknowledging users' desires for acceptance, for fun, and to be entertained. The aspect of engagement in technology is important for children and contributes to their learning experiences (Chimbo, Gelderblom and de Villiers 2011).

Information and Communication Technology for Development (ICT4D) projects would benefit from a comprehensive understanding of users' socio-technical interactions, including their usage of software applications, and how this varies between locations and ages. The process of achieving successful ICT4D interventions requires: understanding the problem, access to technology, sustainable technology, and social/resource factors (Herselman and Britton 2002).

This article addresses the use of Digital Doorway terminals that offer unsupervised learning experiences in disadvantaged communities. With such interventions, it is insufficient just "...to provide the technology and even make it sustainable, without understanding the community and its problems, and ...social aspects." (Gush 2011, 17). An important dimension of overcoming the digital divide is the provision of appropriate content (Harris 2002, 4). This study is concerned with usage of software content as it relates to users' age, gender and location.

Background

In 2002, the Meraka Institute (Information and Communications Technology Unit) of the CSIR initiated the 'Digital Doorway' (Smith, Cambridge and Gush 2005). The project was inspired by Dr Sugata Mitra's innovative Indian Hole-In-The-Wall (HITW) project (Mitra and Rana 2001; de Boer 2009). Dr Mitra began his HITW experiment by placing a computer in a constructed recess in a wall near a slum in New Dehli. The computer had an on-off switch, Windows operating system, Internet connectivity, a touch pad, but no keyboard. The study was based on the hypothesis:

'The acquisition of basic computing skills by any set of children can be achieved through incidental learning, provided the learners are given access to a suitable computing facility with entertaining and motivating content and some minimal (human) guidance' (Mitra 2000:3).

Via a concealed video camera, researchers observed how community members, mainly children aged 5 to 16, interacted with the device, although most of them did not attend school and had no previous exposure to computers (Mitra and Rana 2001). Dr Mitra concluded that unassisted learning through trial and error, as well as peer tutoring, is an effective way of acquiring basic ICT literacy skills. Multiple HITW kiosks were subsequently deployed around India.

South African Digital Doorways (DDs) are standalone rugged multi-terminal computer systems, designed for independent, open-ended use, and placed at various strategic sites in disadvantaged areas of South Africa. While the 'One Laptop Per Child' project (Negroponte et al. 2006) aims to equip each child with their own laptop, DD terminals are social entities where groups of users congregate around a central device comprising either three or four workstations. Users benefit both from peer learning (whereby experienced users demonstrate to others) and individual interaction. The design involves a robust hub of activity, rather than individually distributed laptops (although collaborative peer learning is possible in both instances). Unlike HITW terminals, DDs have keyboards, but do not provide Internet access. The DD ethos emphasizes community ownership of the equipment. Learning occurs without supervision or formal training, although peer-to-peer teaching occurs naturally. The high-level objectives (Gush, de Villiers, Smith and Cambridge 2011) are to:

- ◆ Expose users in previously disadvantaged areas to computer technology,
- ◆ Provide technology for social inclusion,
- ◆ Prepare users, young and old, for the information society,
- ◆ Provide meaningful software and content to underprivileged communities.

The target group comprises users of all ages, but primarily youth between the ages of 10 and 25. Figure 1 shows a child interacting with the device.



Figure 1: User interacting with a DD

The most pervasive form of ICT in Africa is mobile telephony. Mobile phone penetration in South Africa is high, over 80% (Hooper 2010), with many users in poorer areas collectively using a shared phone. They are used extensively, primarily for calls, text messaging, and, in the case of youth, social networking, for example, MXit. Yet access to fixed computer infrastructure in disadvantaged areas is low, particularly for school-going youth. In 2009, only 23% of South African schools had computer centres, while in the Eastern Cape and Limpopo, it was 10% and 11% respectively (Department of Education 2009). In addition, only 10.5% of South Africans have Internet access (Hooper 2010).

With the advent of smart phones and mobile small-screen Internet, the role of the conventional computer may be queried. The standpoint of the authors, however, is that the need for 'traditional computers' in the form of DDs is strong, because:

- ◆ Data access via mobile phones is expensive.
- ◆ Few schools in rural or disadvantaged regions have computer laboratories.
- ◆ DDs offer an environment for self-learning of basic computer skills.
- ◆ They reduce Internet dependency by providing extensive sets of resources cached locally on terminals. The embedded software applications include encyclopaedias, health information, agricultural information, maths and science content, free books, educational games.

Research design and methodology

This research was undertaken to ascertain the nature and extent of usage of the embedded software resources, with the goal of using it as effectively and efficiently as possible, maximising the DD's potential to contribute positively to communities. The study employed a mixed-methods research design to gain richer understanding of DD application usage. It extended the quantitative study of Gush and de Villiers (2010), focussing on further quantitative results and touching briefly on associated qualitative findings.

Research Questions

The mixed-methods study was based on four research questions that relate usage to age, gender, locality and future installations:

1. RQ1: How does the age of users affect usage of software and user-behaviour?
2. RQ2: How does the gender of users affect software usage and behaviour?
3. RQ3: How does the locality/physical situation (e.g., school, library) affect software usage and behaviour?
4. RQ4: What is the relevance of these results to future unassisted learning terminals?

The quantitative study involved data from electronic log files and self-administered online templates, while the qualitative study entailed naturalistic observations, researcher-administered paper-based interviews, and self-administered questionnaires. This approach provided a holistic picture of user activity and usage.

Quantitative study

'Quantitative research is a means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures' (Creswell 2009, 4).

Data collection

Data for the quantitative study was retrieved from on-site log files of user demographic information and application usage. User demographic information was collected through a self-registration procedure whereby users could create a unique user name and enter their name, age, gender, and language into a registration template.

Actual application usage was monitored by software that recorded the time and date of each software application accessed, and the associated user. Data from each connected site was compressed and transmitted daily to a central server.

Categorisation of data

The large quantities of data from each site in the study were consolidated by categorisation, elaborated in Table 1. Seven general software categories were chosen and each individual application was assigned to one category.

Table 1: Software categories

Category	Description
Education	Software purely for educational purposes
Edutainment	Games with educational elements
Games	Software for pure entertainment
Office	Office suite including word processor, spreadsheet and presentation software
Reference	Encyclopaedia or reference material
System/DDHome	Includes file navigation and DD Homepage
Video/Audio	Audio and video clips (mostly recreational), and web-cam usage

Users were clustered into age-group categories (see Table 3 later). Gender groupings were: male, female and "unspecified" in cases where gender was not given. Four location groupings were defined: schools; libraries; FET Colleges; and public locations (MPCC, informal market etc.).

Site selection

Of the 210 DD sites, approximately 150 had usable log files. From these a small, but heterogeneous and representative, sample of sites was chosen for in-depth quantitative investigation. The selection criteria were:

- ◆ Diversity – type of venue (library, community centre, school, etc.);
- ◆ Geographical – multiple provinces;
- ◆ Region – rural and township;
- ◆ Numbers of registered users – sites with high user-numbers;
- ◆ Hit-counts per user – high hit-counts.

Using these criteria, the ten sites listed in Table 2 were chosen for quantitative data analysis.

Table 2: Sites selected for quantitative study

	Location	Site name	Prov.	Township or rural	Site category	Tot. reg. users (m, f, u)	Guest user hits	Reg. user hits	Data collection period	Months
1	School	Kwam-Hlonipha	LIM	Rural	Education	69 (35, 12, 22)	9133	455	Apr2008-Apr2009	12
		Vezebuhle	MP	Rural	Education	690 (382, 90, 218)	16081	8937	Mar2007-Sep2007	6
2	MPCC	Elandskraal	LIM	Rural	Public	258 (150, 50, 58)	17557	2759	Feb2007-Jun2008	16
3	Library	Emjindini	MP	Township	Public	474 (250, 118, 106)	8683	12634	Feb2007-Jun2009	28
		Kanyamazane	MP	Township	Public	46 (25, 6, 15)	5319	421	Feb2008-Jun2008	4
4	FET College	Letaba FET College 2	LIM	Township	Education	66 (34, 9, 23)	14798	951	Jan2007-Feb2009	13
		Letaba FET Giyani	LIM	Township	Education	306 (187, 50, 69)	3765	7598	Jan2007-Sep2007	8
5	Cust. Care Centre	Msunduzi	KZN	Rural	Public	101 (38, 17, 46)	17752	1841	Feb2007-Sep2008	19
6	Fablab	Soshunguve	GAU	Township	Public	100 (64, 12, 24)	37074	4628	Jan2007-Mar2008	14
7	Informal Market	Kagung	NC	Rural	Public	40 (25, 1, 14)	4253	1899	Jul2008-May2009	10
excludes names registered multiple times, m= male, f=female, u=unspecified LIM=Limpopo, MP=Mpumalanga, KZN=KwaZulu-Natal, GAU=Gauteng, NC=Northern Cape						2150 (1190, 365, 595)	134415	42123		

Qualitative study

Qualitative data provides researchers with a sound picture of 'real life', 'lived experiences' of individuals in a particular situation (Miles and Huberman 1994).

Data collection

At each site, a combination of semi-structured interviews, questionnaires, and observation, was used to obtain data of users' experiences at the DDs. Users were asked pre-determined questions – either verbally (interviews) or in writing (questionnaires). The researchers provided assistance where required. The questions addressed issues of age, gender, environment, and application usage

Site selection

Four heterogeneous sites were selected using convenience sampling (Site 1) and purposive sampling (Sites 2, 3 & 4) (Oates 2006). The sites were a library, school, community centre and FabLab (manufacturing facility), with two in Gauteng, one in Mpumalanga, and one in KwaZulu-Natal. Participants were selected using a combination of convenience sampling and snowball sampling (Oates 2006), as participants invited other participants.

Site locations

Site locations for the qualitative study and the quantitative study are shown in Figure 2.

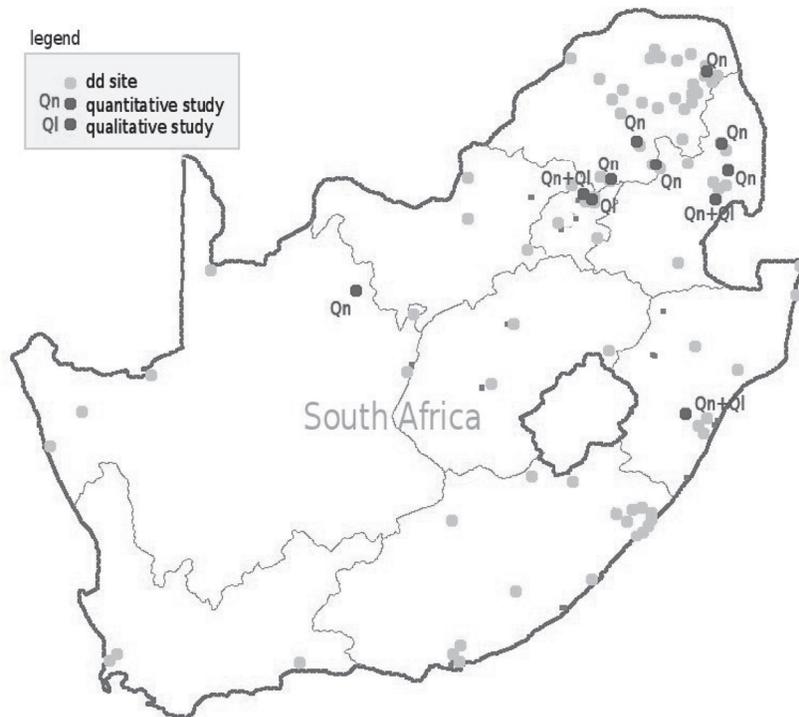


Figure 2: Site locations

Quantitative study – results

The next paragraphs highlight some of the main results (Gush 2011).

Research Question 1: Age versus application usage

The values in Table 3 and Figure 3 show the registered users across the ten sites, according to age group. The highest percentage was in the 14–17 age group (23.62%), closely followed by 10–13 (23.29%) and 18–21 (20.18%). The other age groups showed considerably lower numbers of registered users. Of the users registered at the ten sites in the quantitative study, approximately 70% were 21 or younger, while 77.5 % were 25 or younger, indicating that the primary user-group at these sites comprised children and youth.

Table 3: Registered users per age group

Age group	Description	Registered users	% of total
6-9	Junior primary school learners	42	1.95%
10-13	Senior primary school learners	501	23.29%
14-17	Secondary school learners	508	23.62%
18-21	Post-school and tertiary-level/FET College	434	20.18%
22-25	Young adults	181	8.41%
26-60	Older adults	202	9.39%
0-5; 61+	Other	283	13.16%
Total		2151	100%

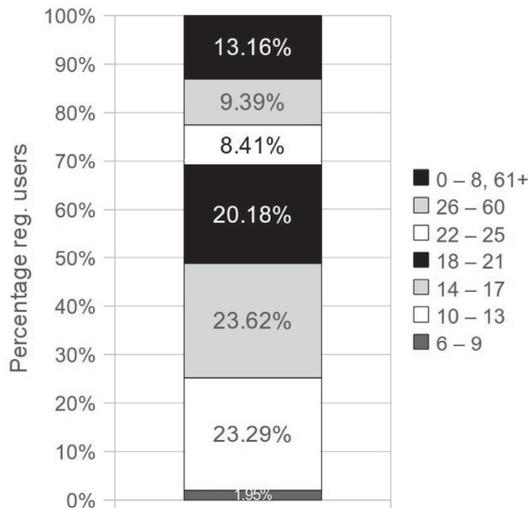


Figure 3: Registered users per age group

Figure 4 displays applications hits per category for each of the age groupings, enabling comparison both of general category application usage within the same age group, and of differences in application usage between different ages. Data outside the 6–60 range was not used.

We notice a downward trend in games usage with increasing age, declining from over 40% for 6–9 year-olds, to 18% for users over 26. Games remain the top- or second-most popular activity among all age groups. Pure education has low usage levels, with just one category (26–60) displaying a value over 10.5%. However, when education and reference are combined, a different picture emerges, with the 14–17 and 26–60 age groups showing equivalent usage levels at 33.7% (9.4 + 24.3) and 34.3% (12.3 + 22.0) respectively, followed by the 18–21 group at 24.5% (8.5 + 16).

Figure 4 shows high use in the reference category by users aged 14–17 (24.3%), probably for school projects, and 26–60 (22%). The high usage of DD homepage/ navigation category in the 22–25 age group (21.5%) is also noteworthy. The low use of office suite applications (open office word processor, spreadsheet, etc.) is possibly attributable to the absence of printing facilities at most sites.

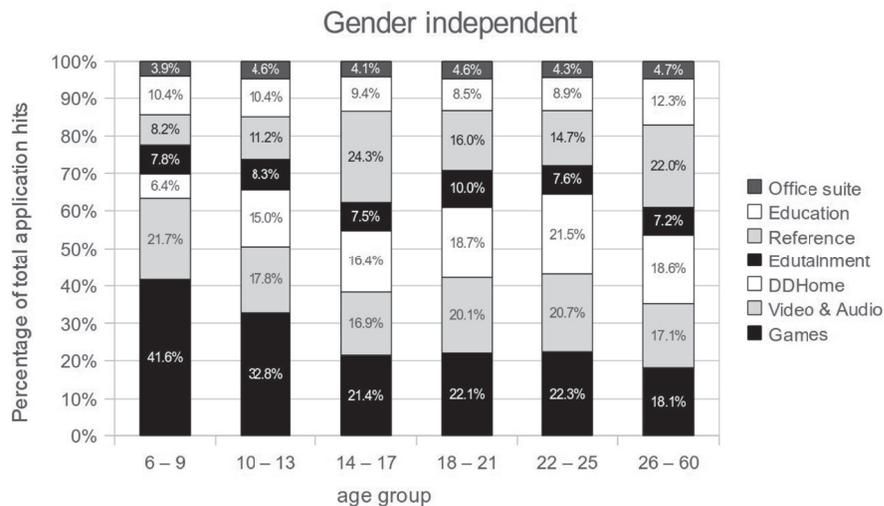


Figure 4: Application hits per age grouping and category (gender independent)

Statistical analysis of age versus application usage

Pearson's Chi-square test was used to investigate statistical significance between age category and application category usage. The resulting value was statistically highly significant, on the 0.1% level of significance. Thus the two variables, age and user application usage, were statistically significantly dependent, implying that application use was dependent on age, or changed with age.

Analysis was supplemented by the Cochran-Armitage Trend test which determines whether trends in application usage over age, differ statistically significantly between applications. Three separate, pair-wise tests were performed, to investigate differences over age between:

- ◆ Games and video/audio;
- ◆ Games and DD homepage;
- ◆ Games and reference.

Results indicated that there were statistically significant relationships (dependencies) between the frequency usage of games and video/audio; games and DD homepage; and games and reference. Over ascending age categories, there was a statistically significant decreasing trend in games utilisation and increasing trend in corresponding video/audio utilisation, DD homepage utilisation, and referencing utilisation. These trends can be visualised in Figure 4.

The popularity amongst youth of games, should be used to advantage by content developers wishing to present educational material in an engaging fashion.

Research Question 2: Gender versus application usage

Figure 5 displays the percentage of male (55%), female (17%) and unspecified gender (28%) users who registered at one of the ten sites. The female: male ratio was only 4:13. At one site, Emjindini library, the ratio of girls to boys was almost 1:2; substantially higher than the overall averages and ratios. However the low usage by females at most sites, is a cause of concern.

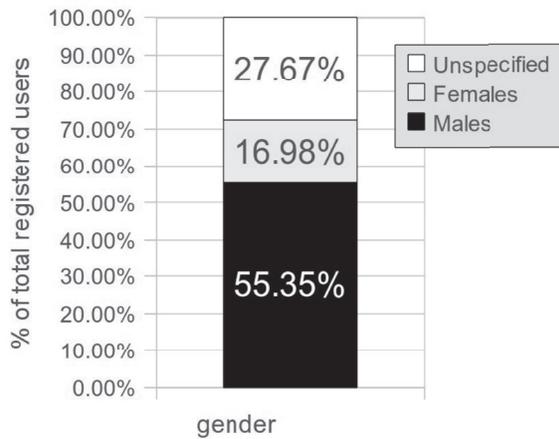


Figure 5: Percentage of registered users per gender

If application hit-count is measured instead of registered users, the female: male ratio is even lower, at 13:62, that is; actual usage indicates less usage by females than appears from registration numbers.

Figure 6 displays percentages of registered users per gender, per age group. For males, the most account registrations occurred in the 10–13 group, and for females, in the 14–17 group, with approximately 70% of both genders being under 21 years.

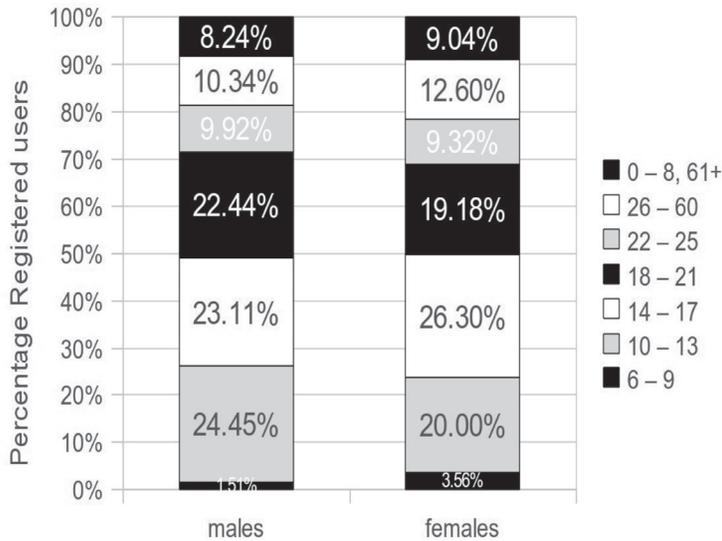


Figure 6: Percentage of registered users per gender, per age group

Figure 7 displays percentages of male and female registered users per age group, as a proportion of registered users in that group. These results further confirm the high proportion of male- to female users across all age groups.

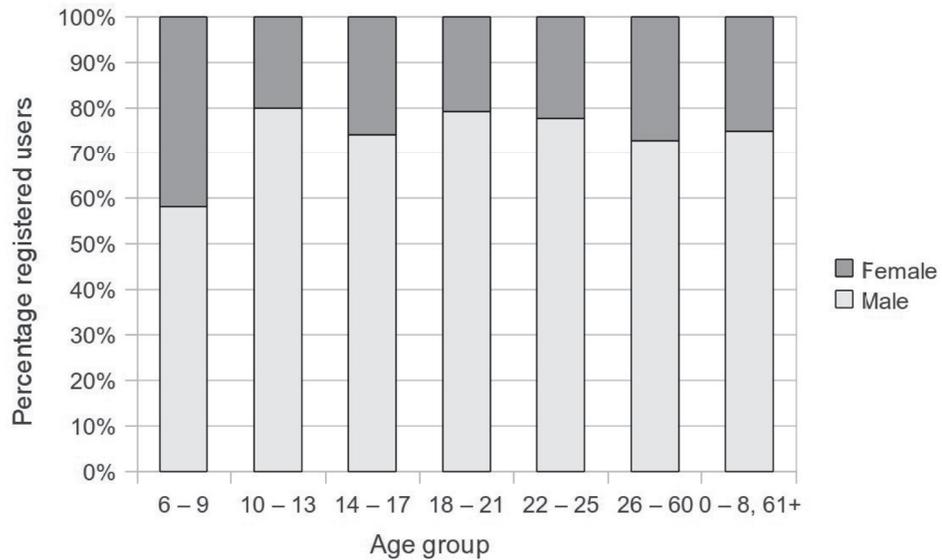


Figure 7: Percentage registered males and females, per age group

Table 4 and Figure 8 show percentages of males and females accessing the various general categories. Figure 8 (from the last two columns of Table 4), shows the values for each gender as percentages of the total of both genders. This emphasises the greater use by males than females, and also shows that for males, games are most popular, followed by video and audio, then the DD homepage and navigation applications. For females, games are most popular, followed by reference material, then video and audio.

Table 4: Percentage of males and females accessing each category

General Application Category	Usage of applications according to gender (M=male,F=female)					
	Totals per gender		% of app. usage per gender		% of total usage (M+F) of ALL applications	
	M	F	M	F	M	F
Games	6035	1396	23.5%	25.1%	19.3%	4.5%
Reference	4328	1247	16.8%	22.4%	13.8%	4.0%
Video/audio	4757	1060	18.5%	19.1%	15.2%	3.4%
DDhome and nav.	4650	768	18.1%	13.8%	14.9%	2.5%
Education	2527	525	9.8%	9.4%	8.1%	1.7%
Edutainment	2282	334	8.9%	6.0%	7.3%	1.1%
Office suite	1119	226	4.4%	4.1%	3.6%	0.7%
Total	25698	5556	100%	100%	82%	18%
					100%	

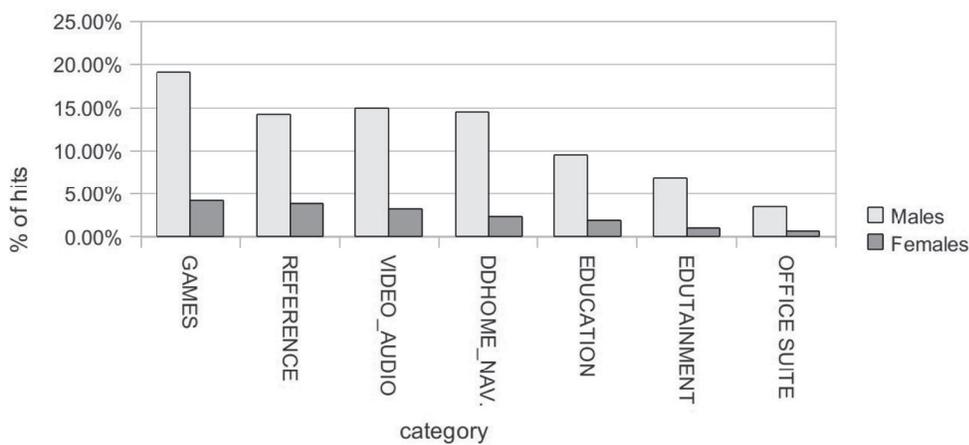


Figure 8: Percentage of male and female hits for a particular category versus total hits

Pearson's Chi-square test was used to determine the degree of significance between gender and general application category usage (hit-counts). The results were statistically highly significant on the 0.1% level of significance, confirming that application use patterns differ between genders.

Females spend significantly less time on DD homepage and edutainment than males, and more time accessing reference-related applications. This reinforces that, while overall usage by females is low, the usage that does occur, demonstrates more committed use of educational reference material, particularly by teenagers.

Research Question 3: Physical situation versus application usage

Comparisons were done of application usage in the general location categories, namely libraries, schools, FET colleges and public locations. Figure 9 displays the percentage category usage per location category for each of the seven general categories.

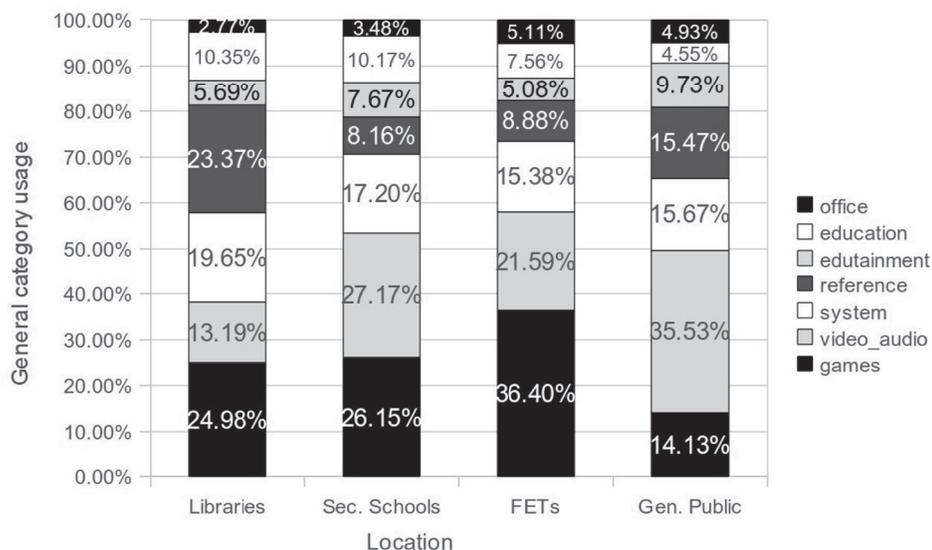


Figure 9: General category usage percentages, per location grouping

Sites in the library category displayed almost equal values for games usage and reference (24.98% and 23.37% respectively), followed by system-related applications (navigation /homepage etc. at 19.65% usage), video and audio applications (13.19%), education (10.35%), edutainment (5.69%) and office applications (2.77%). The reference category percentage (predominantly Wikipedia) was greater at libraries (23.37%) than other locations. This use is predominantly by scholars aged 14–17. DDs in the secondary schools category displayed only (8.16%) usage of reference materials, but high usage of games category and video/audio applications (26.15% and 27.17% respectively). Usage of DDs at schools for reference purposes was confirmed during site visits, but the numbers indicate that users at schools were more interested in entertainment and exploration.

It is interesting that FET colleges showed highest usage in the games category (36.4%), higher than any other location category. Second highest is video and audio (21.59%), followed by system/DD homepage (15.38%). While still low at 5.11%, office application usage is higher at FET colleges than any other location category, despite printers not being attached to the DDs. The low use of reference applications (8.88%), indicates that reference resources on the DD are inadequate, or inappropriate, for FET college-level students.

Sites in the general public category displayed highest usage in the video/audio category (35.53%), followed by system and navigation (15.67%), reference (15.47%) and games (14.13%). At the lower end were edutainment (9.73%), education (4, 55%) and office applications (4.93%). Educational resources were under-utilised (4.55%) at less than half the levels for schools and libraries.

Pearson's Chi-square test obtained results that were statistically highly significant on the 0.1% level, implying that application usage was significantly dependent on location.

Findings regarding local content on the DDs

A more detailed analysis of the edutainment category shows the value of including local South African content. Two applications, namely "What What Mzansi" (a quiz game) and "Themba's journey" (a game about life skills and choices) were developed locally, for South African culture, with teenagers as their main target. Figure 10 displays a breakdown of edutainment usage per specific category, for 156 DD sites (including the ten in the quantitative study). Table 5 shows that hit-counts in the edutainment category comprise approximately 11% of total hit-counts at sites without these local games, but doubled to 23% at sites where the two local games were available. This emphasises the value of educational content that is relevant and entertaining.

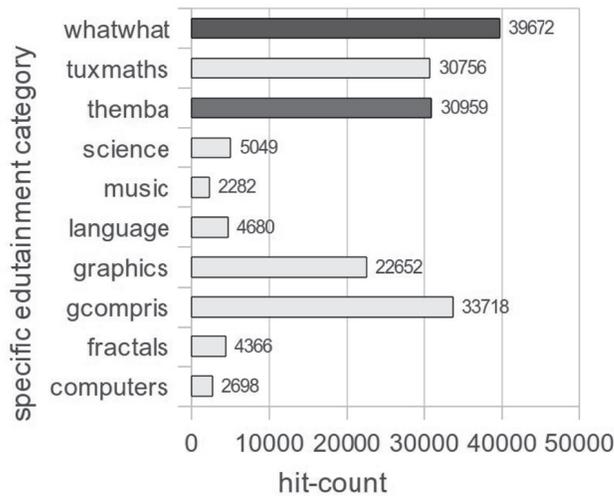


Figure 10: Hit-counts for edutainment category

Table 5: The effect of local games on edutainment category hit percentage

	Edutainment Hits	Total Hits	Edutainment/Total Percentage
Sites without local games	41605	380966	10.92%
Sites with local games	144715	629013	23.01%

Research Question 4: Lessons learned, and applicability to future learning terminals.

In regard to future learning terminals, and the desires and needs of target users, the results of the three research questions provide some key insights:

- ◆ Given the unassisted nature of interaction, user registration procedures should be simplified and made more accessible, particularly for younger users.
- ◆ Tutorials and vocalised multilingual guides could provide direction to new users, and information about DD content.
- ◆ Games are most popular with younger users and college students. Such usage decreases with increasing age.
- ◆ Use of reference material by teenagers occurred more in libraries than at DDs in schools.
- ◆ Older users are keen to explore and navigate independently through the system.
- ◆ Users under 26 dominated usage, possibly because their needs are addressed more effectively than those of older users.

- ◆ The open encyclopaedia and reference material are valuable content, used extensively by many younger- and some older users.
- ◆ At certain sites, the female to male ratio is higher than at others. In general, however, many more males than females use DDs.
- ◆ There is a statistically significant association between gender and certain categories of applications, with proportionally more use by females than males of reference material. While overall usage by females is low, the more committed use of educational reference material by teenage girls is encouraging.
- ◆ Application usage varies according to location.
- ◆ There is high usage of entertainment and multimedia content at all locations.
- ◆ Local content that is both educational and engaging is very popular. The DD provides a suitable platform to combine education and entertainment.
- ◆ Many useful resources on the DD are underutilised, requiring interventions to increase usage. In particular, the use of educational resources and reference material should be explicitly encouraged at DDs located in schools.
- ◆ Recreational video content is popular and should be exploited for the presentation of educational and informational material.

Qualitative study – overview

The qualitative approach was beneficial in understanding complex social and environmental aspects of DD usage. The interviews, questionnaires and observations at the four selected sites, contributed to establishing a richer picture than that achieved by quantitative analysis alone. In addition to confirming quantitative findings, the data provided valuable new insights regarding the actual environments and their impact on usage and users' experiences. The findings were site-specific, and not necessarily generalisable, but illustrate that:

- ◆ Usage at each site was different, although similarities emerged.
- ◆ The availability of supervision influenced user activity in positive ways by. For example, there was high and effective usage of the DD in a library where librarians were closely involved with users.
- ◆ At completely unsupervised sites, boys dominated usage, and games were the main activity.
- ◆ At partially supervised sites, such as libraries and some schools, usage was more varied, and the use of the reference applications much higher.
- ◆ Teenagers accessed information for school projects.
- ◆ At certain sites, DDs had been turned off or needed maintenance, raising concerns over site administrators not providing information to the installation team, and impacting usage negatively.

The interviews and questionnaires among users of both genders, showed that DDs are used predominantly by boys. When participants were asked what additional software and functionality they required, they indicated interest in content focused on their interests as well their needs. This confirmed the value (and potential) of the DD beyond basic ICT literacy and entertainment. There were requests for further hardware and devices, for example, USB ports and internet connectivity. Printing facilities are generally unavailable, except at some libraries. The complexities regarding printers and internet are beyond the scope of this article, but the requests warrant re-consideration.

Key external and internal factors affecting DD usage became apparent:

- ◆ External factors included: time of day; location; screen visibility impaired by direct sunlight; availability of electricity; crowding – which restricted access for other users (in particular, girls), personal demands; and the influence of authority figures.
- ◆ Internal factors included: language barriers; perception of the content, previous experience with computers; level of education; motivation; peer pressure; marginalisation of girls, risk of embarrassment, and confidence levels.

The quantitative and qualitative studies thus played both confirming and complementary roles – confirmatory when similar findings emerged and complementary when the qualitative methods obtained data not possible with quantitative techniques.

Conclusion and recommendations

This study established that user demographics, DD location and application usage are correlated. The findings motivate the customisation of content on a demographic-specific and location-specific basis, taking cognisance of users' age and gender.

Usage by youth could be enhanced by improving under-used software and by incorporating or developing new applications, with a view to integrating educational aspects into games or audio/video formats. The high use of games should be optimised by incorporating educational games in learning situations, particularly local-content games customised to the African context.

Further concerns relate to low use of the DD by certain groups, for example, adults aged over 26 and females/girls. Strategies can be employed to address these issues, but are outside the scope of this article.

Since much of the educational material and information resources is underutilised, increased usage of educational resources should be encouraged through supportive signposting and clear visual guides introducing the available content (Gush and de Villiers 2010). Notwithstanding the ethos of unsupervised learning, facilitators should be trained in practical ways of enhancing usage of DDs. Such training could emphasise

the worth of educational resources and interaction by females. Users should be encouraged to explore and engage with the full spectrum of available content.

The DD has the potential to meet users on multiple levels. It provides information, but also meets needs for escapism and challenge, as evidenced by playing games and watching videos. It can supplement library services and enrich entire communities, but particularly its greatest user group, namely youth. It can serve a valuable role in providing information for school projects and life-skills training. In communities without libraries, it provides alternative, low-cost information resources. It can meet both the computer training needs and information-access requirements of youth in disadvantaged communities and developing regions. Improved content sourcing and new software development can further enhance the utility of Digital Doorway as a vital community resource.

Notes

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- 2 Ruth de Villiers, School of Computing. Email: dvillmr@unisa.ac.za

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