# A qualitative study on software application usage and user behaviour at South African Digital Doorway sites.

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## Abstract

Digital Doorways are rugged multi-terminal computer systems for promoting self-directed, unassisted or peer-assisted leaning in low-income communities where computer infrastructure is limited. Users develop the necessary skills through exploration and discovery, with limited or no intervention from a facilitator.

Application usage data is of interest to content providers, developers, funders, community members and other stakeholders and, while quantitative analysis of usage has certain strengths, a mixed-methods research approach provides a more comprehensive picture. Qualitative studies hold utility in complementing quantitative research, by providing data on the site environment, user interactions and perceptions, and stated requirements.

This paper presents the qualitative side of a recent mixed-methods study. This aspect of the study involved site visits to four Digital Doorway installations. Questionnaires, semi-structured interviews and naturalistic observations were undertaken, with the goal of better understanding user activity and software application usage, particularly with respect to age and gender of users, site location, and environmental factors. The qualitative study had both a confirmatory and complementary effect on the quantitative study, affirming certain aspects and highlighting others not identified by log-file analysis alone. User activity and application usage were influenced both by user demographics and by environmental aspects, with site administrators playing a more meaningful role at certain sites than at others.

The paper highlights key findings from the site visits, notes particular areas of concern, and makes recommendations for future ICT for Development projects of a similar nature.

# Introduction and background

This paper presents the qualitative component of a mixed-methods research project to investigate usage patterns of Digital Doorway (DD) computer terminals. The study focuses on findings from site visits to four DD installations in South Africa.

Digital Doorways are rugged multi-terminal computer systems, designed for self-directed, unsupervised, and open-ended use in low-income South African communities. DDs are situated at public locations, with the aim of promoting basic computer literacy and providing access to information in areas where technological infrastructure is limited. In 2002 the Meraka Institute (Information and Communications Technology Unit) of the Council for Scientific and Industrial Research (CSIR) in Pretoria, initiated a project to assess the viability of using these computer terminals for the independent acquisition of basic computer skills – without the intervention of a teacher – through unassisted and peer-assisted learning. Initial sites proved to be successful, and provided evidence of successful computer literacy learning, as users developed the necessary skills through exploration and discovery (Smith, Cambridge and Gush, 2005). The success of the initial installation led to further deployments, and between 2002 and 2010, over 200 DDs were installed throughout South Africa. For more information on the DD project, see Gush, de Villiers, Smith and Cambridge (2011).

During a digital transition (Gurstein, 2010), the process of achieving successful ICT4D interventions requires certain steps such as understanding the problem, access to technology, sustainability of the technology, and social/resource factors (Herselman and Britton, 2002). With an intervention such as the DD, it is not sufficient merely to provide sustainable technology. There needs to be an adequate understanding of the community and its problems, the environment, and social interactions around the technology.

While quantitative analysis of usage has certain strengths, a mixed-methods research approach provides a more comprehensive picture. The site visits were used to obtain data on the site environment, user interactions and perceptions, and stated requirements. They were conducted in order to complement and confirm findings from log-file-based quantitative research on usage patterns of DD users. The entire study was motivated by a need to better understand the usage of information and communication technologies (ICTs) in rural and impoverished areas, particularly in cases where previous exposure to technology had been non-existent (Gush, 2011). A comprehensive understanding of usage patterns and environmental aspects and behaviours affecting usage, is of interest and value to content providers, developers, funders, community members and those involved with similar developments.
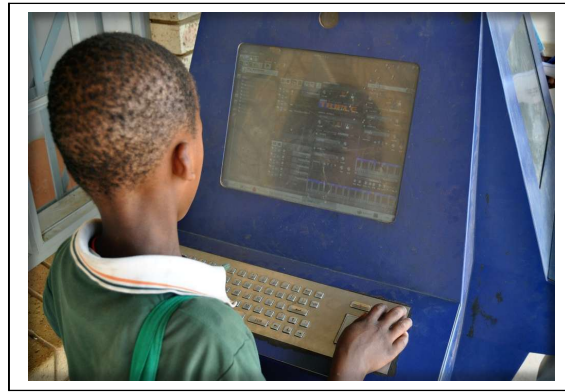
*Figure 1: A Digital Doorway user interacts with the device*

Related projects, in the ICT for development and ICT for Education domains, using kiosks for informal computer literacy training, include:

- India's well-known 'Hole In The Wall' (HITW) initiative (Mitra, 2000) – a precursor to the DD, and;

- the Bingbee facility (Slay, Wentworth & Locke, 2006; Wentworth, 2010).

The DD installations in South Africa have afforded opportunities to verify and create innovations in collaboration with the users, thus providing valuable data and information on users' experiences, as well as developing their own innovative uses. This is an example of the Living Labs concept in action (Eriksson et al. 2005; Pitse-Boshomane et al. 2008).

The next section outlines the research methodology and is followed by a brief overview of the quantitative study. The rest of the paper is devoted to the qualitative component, discussing the sites selected, data collection, and results from each of the four sites.

# Research methodology

The study, which investigated usage patterns and behaviours at DD installations, employed a mixed-methods research approach (Creswell, 2009). This can produce more valuable results than quantitative or qualitative approaches alone. The two are potentially complementary.

A quantitative study is effective in analysing actual numbers and constructing an understanding of what is happening from day to day, unaffected by the research instrument itself. The numbers establish what users are doing "when no-one is watching" and are good for comparing application launches of one application versus another. It allows for easy analysis of data from different time periods, helps identify trends and patterns, and gives a good overall picture of usage. A major drawback, is that the researcher is blind to non-quantifiable factors.

A qualitative study is effective in highlighting the interactions of users within a specific context. It can

provide data on the effect of the environment on usage; attitudes and behaviour around the DD; and interactions of users with each other and with authorities. Some limitations of qualitative research are that site visits can only provide snapshots of activity; are limited to a small sample of the total user base; and may elicit responses that are influenced by the presence of the researcher. In addition, logistics make multiple visits difficult, time consuming and expensive. Furthermore, temporal comparisons are more difficult. Nevertheless, questionnaires, interviews and observations are invaluable in building a holistic picture.

This paper focuses on site visits undertaken as the qualitative component of the overall study, while briefly outlining the quantitative aspect.

## Overview of quantitative study.

Major quantitative studies have been undertaken on usage of the software applications embedded in DDs (Gush, 2011; Gush and de Villiers, 2010). Log file data correlating user demographics with actual application usage, provided a rich source of material for analysing trends and patterns in DD usage. Ten representative sites were selected from over 200, involving 2150 registered users. Key findings from this study are listed below:

- Games usage and video/audio usage was high across all sites (approximately 27% of total usage). Games usage showed a decrease with increasing age of users.

- File navigation (random exploration) and DD Homepage usage was fairly high (approximately 16%).

- Reference material, in particular the open encyclopaedia content, was actively used (16%), especially in the 14 – 17 age group (24%), and at libraries.

- Education and edutainment resources were underutilised (10% and 8% respectively). However, when combined with the reference category, these education-related materials were accessed approximately 34% of the time.

- Edutainment applications that were engaging and had a South African flavour had very high usage compared to the edutainment applications in general.

- Office-related application such as word processor and spreadsheet showed the lowest usage (4%).

- Males used the DDs significantly more than females, with a ratio of approximately 4:1 at some sites. Nevertheless, usage by female teenagers was focused more on educational applications and reference than the usage by their male counterparts.

Usage behaviours at DDs situated at different types of locations, displayed different patterns, as illustrated in Figure 2. Similar graphs were plotted for age versus application usage, and gender.
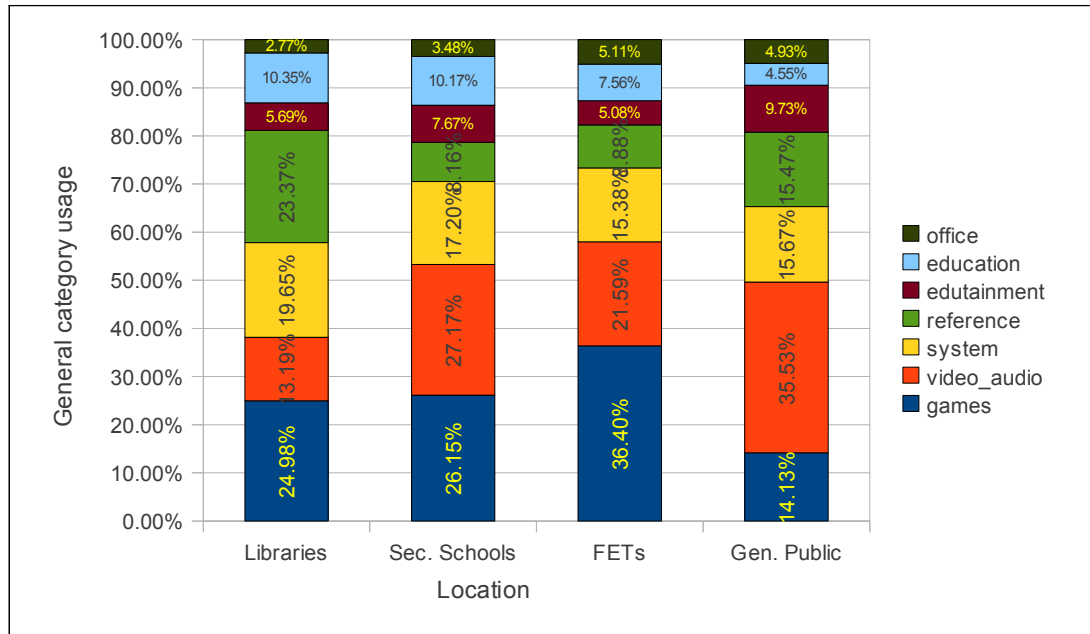
*Figure 2: Quantitative study, general category usage per location*

# Details of qualitative study

## Sites under investigation

As the basis for the qualitative study, four sites, depicted in Figure 3, were chosen for site visits:

- Site 1: A large, noisy, urban high school (1000+ pupils), in the district of Mamelodi, a low-income urban settlement north of Pretoria. The school is located near informal settlements.

- Site 2: An Advanced Manufacturing Technology Strategy (AMTS) Fablab (small public manufacturing facility, laser cutter, and CAD/CAM terminals) situated in a low-income, semi-urban township, north west of Pretoria.

- Site 3: A satellite library in Emjindini township, outside the small town of Barberton, Mpumalanga. The area is semi-urban, with a combination of small state-subsidised houses and more expensive houses.
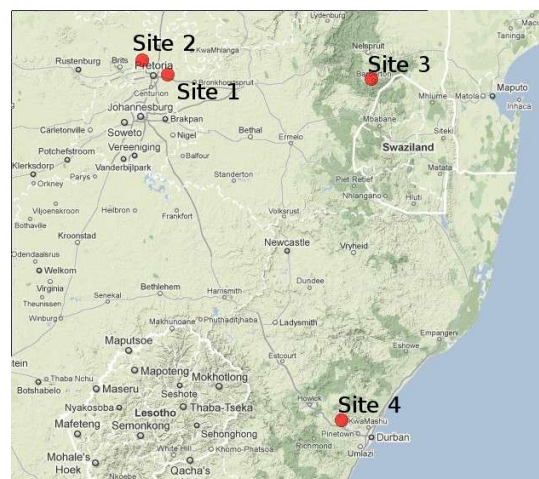


*Figure 3: Sites chosen for qualitative study*

- Site 4: A customer-care centre, surrounded by municipal offices, a post office, and a low-cost library. The complex is located within a sprawling rural development in a hilly area of KwaZulu-Natal.

## *Qualitative data collection*

At each site, a combination of semi-structured interviews, questionnaires, and naturalistic observation, was used to collect data relevant to the user experience at the DD.

Observation involved taking field notes and photographs on site, with particular attention to user activity and environmental factors, such as site position, locality, proximity to schools, time of day, operational conditions, distractions/interferences, etc. These notes and photographs were used to formulate the general site descriptions.

The main intention was to conduct semi-structured interviews with administrators and users of the DDs, based on a set of questions in an interview question template. Where users were able to do so, they were requested to fill in the question template themselves, and the researchers provided assistance where required.

The interviews, transcripts, questionnaire data, and general observational data were used to build up a case study comprising four cases, one for each site. Data was collated into a spreadsheet to facilitate comparison. The descriptions and anecdotes that emerged from the site visits related to particular instances, and thus cannot be generalised, however, they illustrate typical situations that impact on the usage experience.

## *Questionnaire / interview template design*

The questions were designed to obtain basic user-profile information (e.g. age, gender) as well as elicit responses of a more complex nature (e.g. environment, and application usage). A few example questions are listed below.

- What is your favourite Digital Doorway program (other than games)?

- Why is it your favourite?

- What other information would you like on the Digital Doorway?

- How long have you been using the DD?

- How many times a week do you normally come here?

- Who uses the Digital Doorway the most: boys, girls, or don't know?

- Has the DD helped you learn how to use a computer: yes or no?

Interviews and questionnaires were conducted as follows:

Site 1: 28 user-questionnaires;

Site 2: 12 user-questionnaires, 1 interview with an administrator;

Site 3: 18 user-questionnaires;

Site 4: 2 interviews with administrators.

# Results

The following highlights from Gush (2011), describe the findings from the four site visits. Tables 1 and 2 compare data elicited from the questionnaires and interviews at Sites 1, 2 and 3. Table 1 tabulates participant demographics and usage patterns, while Table 2 highlights gender perceptions and usage preferences. Some participants did not answer every question, e.g., where a question was irrelevant to that participant. A descriptive summary of each case, including Site 4, is included after the tables.

*Table 1: Site comparisons 1: demographics and usage patterns (Gush, 2011)*

| | Site 1 | % | Site 2 | % | Site 3 | % |
|---|---|---|---|---|---|---|
| **Participants** | 28 | | 12 | | 18 | |
| **Ages** | 13–19 | | 9–35 | | 10–39 | |
| **Males** | 19 | 68% | 9 | 75% | 7 | 39% |
| **Females** | 9 | 32% | 3 | 25% | 11 | 61% |
| **Home Language** | Ndebele: 2<br>isiZulu: 7<br>N. Sotho: 1<br>Swazi: 1<br>Tswana: 1<br>Xhosa: 1<br>Tsonga: 1<br>Sepedi: 14 | | isiZulu: 2<br>S. Sotho: 1<br>Tswana: 3<br>Tsonga: 4<br>Sepedi: 2 | | English: 3<br>Siswati: 15 | |
| **Preferred Language** | English: 28 | | English: 9<br>Zulu: 1<br>Sepedi: 1 | | English: 18 | |
| **Access to a PC** | at home: 7<br>at friend: 10<br>MPCC: 3<br>school lab: 17 | | at home: 8<br>at friend: 3<br>MPCC: 1<br>school lab: 1 | | at home: 9<br>at friend: 6<br>MPCC: 4<br>school lab: 1 | |
| **Used DD for > 1 yr** | 21 | 75% | 8 | 67% | 11 | 61% |
| **Use DD mornings** | 6 | 21% | 2 | 17% | 0 | 0% |
| **Use DD afternoons** | 14 | 50% | 7 | 58% | 15 | 83% |
| **Use DD anytime** | 8 | 29% | 2 | 17% | 1 | 6% |
| **Use 0-2 times a wk** | 3 | | 6 | | 8 | |

| | Site 1 | | Site 2 | | Site 3 | |
|---|---|---|---|---|---|---|
| Use 3-4 times a wk | 19 | | 4 | | 5 | |
| Use 5+ times a wk | 4 | | 2 | | 5 | |
| Spend < 1 hour | 7 | | 2 | | 5 | |
| Spend 1-2 hours | 14 | | 6 | | 10 | |
| Spend 3+ hours | 5 | | 1 | | 1 | |

*Table 2: Site comparisons 2: gender perceptions and usage preferences (Gush, 2011)*

| | | Site 1 | % | Site 2 | % | Site 3 | % |
|---|---|---|---|---|---|---|---|
| **Mostly used by** | **Boys** | 24 | 86% | 9 | 75% | 4 | 22% |
| | **Girls** | 3 | 17% | 2 | 17% | 7 | 39% |
| | **Both** | 0 | 0% | 0 | 0% | 4 | 22% |
| **Enough apps for girls?** | **Yes** | 19 | 68% | 6 | 50% | 12 | 67% |
| | **No** | 9 | 32% | 1 | 8% | 3 | 17% |
| **Use DD** | **on own** | 9 | 32% | 6 | 50% | 6 | 33% |
| | **with friends** | 11 | 39% | 5 | 42% | 7 | 39% |
| | **Both** | 8 | 29% | 0 | 0% | 8 | 44% |
| **Use DD for homework** | | 19 | 68% | 5 | 42% | 10 | 56% |
| **Not for homework** | | 7 | 25% | 3 | 25% | 3 | 17% |
| **Prefer learning on own** | | 16 | 57% | 8 | 67% | 11 | 61% |
| **Prefer with friends** | | 9 | 32% | 3 | 25% | 6 | 33% |
| **School computer classes?** | **Yes** | 8 | 29% | 1 | 8% | 7 | 39% |
| | **No** | 19 | 68% | 3 | 25% | 6 | 33% |
| **Has DD helped you learn computers?** | **Yes** | 26 | 93% | 10 | 83% | 16 | 89% |
| | **No** | 1 | 4% | 2 | 17% | 1 | 6% |
| **DD is useful** | | 28 | 100% | 12 | 100% | 16 | 89% |
| **DD is not useful** | | 0 | | 0 | | 0 | |

## *Site 1 – High school*

### *Environmental aspects*

The Digital Doorway was located on the school verandah, and displayed signs of use, and wear and tear. Only one of the three terminals (Terminal 2) was functional, Terminal 1 had a black screen and Terminal 3's keyboard was malfunctioning. Visibility at the functioning terminal was poor, due to light reflecting off the screen. The DD was not being used on arrival, and usage only commenced after the questionnaire process began. Human activity around the DD ranged from bustling activity during break periods, to no activity during class time.

All 28 participants indicated that the DD was useful, with 80% of them having used it for at least one year, mostly during break times and after school. Usage was typically three to five times a week for periods of 15 minutes to three hours. Twenty-six participants (93%) stated that the DD had helped them learn to use a computer.

Many younger users indicated that they enjoyed playing the 'gnibbles' snake game, while several older users identified a preference for card games, calculator, and maths or science applications. While the quantitative data shows a strong tendency for users to locate and play games (see Figure 2), the questionnaires and interviews also revealed a desire to access a wide variety of other resources for personal use and study.

According to the majority of responses, the DD was mostly used by boys. All 19 boys indicated this. Five of the nine girls indicated the same, while three of the nine stated that it was mostly used by girls. Responses concerning gender-related differences to usage behaviour varied considerably, from *'Boys like to play games'* and *'Girls are shy'* to *'Because boys know too much and they like touching and pressing things'*. Two males and one female agreed that games were a definite draw-card for males; while one male and one female believed that males were more knowledgeable when it came to the DD. Many of the female users indicated a preference for card games on the DD, while the boys were more likely to specify action and science games.

Some users were observed to be playing a game not accessible from the menu system. They explained how they had found it by navigating the Linux file structure using the file navigation application, and locating the game in a games sub-directory. This indicated successful mastery of the file-manager, confirming self-directed learning had occurred.

Requests for additional information on the DD fell into a wide variety of topics, ranging from information on World Wars 1 and 2, and geographical information, through to biology and health. These requests confirmed that users viewed the DD as more than just a plaything or learning station, but also an information repository.

## Site 2 - FabLab

*Environmental aspects*

On arrival, the researchers noted various people (mostly young adults and adults) milling around the complex, however, no-one was using the DD at the time. Of the two DDs located at the premises, only one was functional. The functional DD was located on a verandah, outside the entrance to the FabLab, and had been installed approximately three years previously. The non-functional DD was located about 20m away, and was down due to a recent electricity supply cut at the premises.

The functional Digital Doorway was dusty, and worn from extensive use. Visibility of the screen of Terminal 2 was extremely poor (see Figure 4) due to the scratching and scuffing of the protective plexi-glass sheet covering the LCD screen. The touch-pad and certain keys had been worn down to the layer below the

metallic coating (Figure 5). This was particular evident on Terminal 3. Terminal 1 had been used to the second-greatest extent (based on the evidence of worn keys) and Terminal 2 the least, possibly due to the difficulty of seeing the screen properly during periods of bright sunlight.
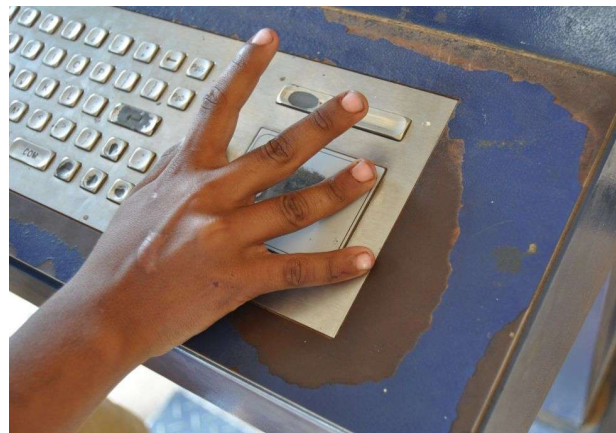


*Figure 4: Poor visibility*

*Figure 5: Wear and tear indicates extensive use of keyboard and touch pad*

After school closed, a number of primary school children arrived and proceeded to enthusiastically engage with the DD, talking to each other and periodically moving to a different terminal to observe what another user was doing before returning to the original terminal. Users often tended to perform the same activity as the one just observed, highlighting the impact of peer-assisted learning. Children were seen to use the touch-pad in an unconventional way, keeping their fingers on the touch-pad buttons and using their thumb to work the pad.

### *Usage findings*

*Interview*

According to the site administrator, users were mostly aged between 7 and 19, with the most consistent users being those in grades 10, 11 and 12. The most popular time to use the DD was between 2pm and 5pm on weekdays, after which the complex was locked. The complex was also open every Saturday between 7am and 5pm.

Both males and females used the terminals. The respondent believed that there were enough programs for girls, particularly in the light of all the educational resources available. However, he maintained there was always a need for further educational material.

Suggestions for additional content on the DD included employment resources, typing-skills development, and computer literacy courses. A further request involved linking the DD to PCs within the neighbouring computer school and providing other PCs on the premises (inside the Fablab), with access to the content on the DD. The administrator stressed the need for an external USB port, particularly for school learners to save information from the DD to personal flash drives.

When asked if he thought the DD helped learners acquire basic computer skills, he responded in the affirmative, adding that there was value in acquiring 'science and technology knowledge' and 'promoting debate amongst learners'; referring to the collaborative nature of learning at the terminals.

*Questionnaires*

Participants were aged between 9 and 35, nine males and three females, speaking a variety of home languages. While all were familiar with the DD, and had spent time using it, not all of them interacted with it during the course of the afternoon. Nine of the twelve participants indicated a preference to interact with a computer in English. For most users in this case study, the DD was not the only PC they had access to, with eight having access to a home PC as well. Despite this, all twelve found the DD to be useful.

Participants indicated that they used the DD both alone and in groups of friends. Ten of the twelve explained that the DD had helped them learn how to use a computer.

Games were a popular choice, and a variety of favourites emerged, from card games to action games and maths and science games. Some older users stated that they did not play games, rather using the DD it for searching for information. A number of users showed a preference for using the encyclopaedia (Wikipedia) to find information.

Participants indicated that the DD was mostly used by boys. A reason for this appeared to be that boys dominated the use of the machine and did not allow space for girls, as highlighted by a comment by a 21 year-old male: *'Girls don't have time to use the DD as it is always being occupied by boys'*. Six users felt that there were enough applications for girls. Five did not specify or indicated that they didn't know. Another user, a 19 year-old female, stated: *'Girls like fun and interesting games. The latest ones'*.

Those users who, in general, were older than the scholars (Site 1) had a broader knowledge of software and websites. Their requests included Internet, email, social media, graphics applications, audio facilities and more games. The requirements for business information, geography information, and local content (councillor-ships and youth organisations in the area) came from more mature users.

# Site 3 - Library

### Environmental aspects

This site had been the venue for a major official Digital Doorway launch some years before. The library was neat, orderly and air-conditioned. The DD, located in a corner, was switched off. The librarian turned it on and explained that one of the screens (on the server side) went black after a few minutes. Both client terminals worked as expected. After approximately ten minutes, the server screen did indeed go off, and was clearly in need of repair.

The majority of library users were under the age of twenty. Older users did enter the library, but were not seen to use the DD, many indicating that they were unaware of the benefits of a computer.

### *Usage findings*

Sixteen of the eighteen participants felt that the DD was useful. Eleven had been using it for over a year. It was predominantly used in the afternoon (fifteen participants), with eight using it less than twice a week; five using it three to four times a week; and a further five interacting five or more times a week. Ten indicated that they spent between one and two hours per session on the DD.

In contrast to the other sites, indications were that library DD was used more by girls than boys. Seven respondents noted that the DD was used more by girls, while only four believed it was used more by boys. Log files revealed that, on average over a 28-month period, twice as many males than females registered user accounts, but a 1:2 female:male ratio shows notably higher usage by females than elsewhere.

Ten users mentioned that they used the DD for homework. This corresponded with a high percentage of users who indicated use of the reference resources and encyclopaedia for finding information.

Users at this site evidenced a preference for using the open encyclopaedia application, Wikipedia, DD resources and the Celestia space simulation application, as well as playing games. The most common response to 'Why is that your favourite application?' was 'It helps me with my homework'. Other user activities included watching movies.

An important issue was addressed with regard to Wikipedia: the researchers determined that it was extensively used, due to users being encouraged to search for information on the DD for school projects, both by the librarians and (according to the librarian) by schools in the area.

Some users were unaware that the information they required was available on the DD, and had to be shown how to access the encyclopaedia and search for a particular topic.

Mention was made of the DD being noisy when many school children occupied it, disturbing other visitors to the library.

Many requests were made for facilities to print documents from the DD.

The overall impression of the site was one of a well-managed library environment, where visitors were enthusiastic about learning, and willing to embrace whatever technology was available. While the librarians indicated that they required advanced instruction on the use of the DD, so that they could further instruct users, they were enthusiastic about encouraging visitors to use the DD to find information independently.

## Site 4 – Community Centre

### Environmental aspects

The DD was situated on the verandah of a customer-care centre building, surrounded by municipal offices, a post office, and a library inside a recycled shipping container.

On arrival at the site, it was noted that the DD was switched off, hence there was no user activity. According to the staff workers, the reason was that, up until a few weeks earlier, the library, which assumed responsibility for the machine, had not contributed to the monthly electricity cost of the complex. The machine was perceived to be wasting electricity and had been switched off. The library had since begun to contribute to the electricity costs and the DD could thus be permanently switched on.

Once switched on, the DD itself was seen to be in working order, except for the external USB port. This was one of the few DDs with an external USB port, however, the slot had been damaged and was unusable. Damage to external ports and drives was the reason they were not included in the original design, and the system in question illustrates one of the potential problems with the provision of additional functionality.

While the researcher was interviewing two staff members who had agreed to partake in the study, two boys aged 8 and 12, arrived to use the computer. They were pleased to find that it was operating again. Neither boy could speak English, so the researcher did not interview them, but observed their behaviour and demonstrated some activities on the DD. The boys conversed with each other, while interacting at separate terminals of the DD.

### Findings

The following points emerged from the interviews:

- There were approximately fifteen schools in the area. Many scholars were aware of the DD and made use of it.

- The complex was open between 7:00 and 4:30 on week days and closed on weekends.

- Usage at that time of year (11 November) was low, since students were writing exams and were studying.

- Most users were between 14 and 21 years old, and would converge on the site in the afternoons after school.

- Both boys and girls used the DD.

- The gender balance was most even for users in Grade 12. Among younger users, the DD was used more by boys than girls.

- The two interview participants did not know how to use the DD, and thus were *"unable to show others"*. The librarian requested basic training, in order to be able to teach children how to use the DD effectively.

- Neither respondent had a computer at home or at a friend's home. They had access to a workplace computer in the library that was Internet-enabled, but did not indicate how proficient they were at using it. Users of the library computer had to pay for Internet use.

- The respondents were unfamiliar with the content on the DD, and thus could not comment on its appropriateness. However, they commented that users mostly used the DD to play games, with some doing research for school purposes.

- If the USB port had been operational, the printer in the library could have been used for print-outs, at a charge of R3 (approximately 40 US cents per page).

- When asked what content they thought should be on the DD, the following were suggested: school-related content, in particular maths and science material; and for older users: email and resources related to agriculture.

- They both indicated a desire that schools in the area be contacted, promoting the benefits of the DD. It is interesting to contrast this with the library DD (Site 3), which had held a formal launch and was well known in its community.

- Notably, a request was made for a poster or chart to be placed on a nearby wall, explaining the DD and giving basic usage instructions to help new users. A similar request was made by a user at Site 2.

The young boys who arrived at the DD were observed to be playing games, as well as using the Tuxpaint program for drawing. The researcher observed the actions of one young user, noting how he logged on, after arrival at the DD. The researcher suggested he log on with guest user 'DD1', however, he mentioned the word 'five' and proceeded to log in with guest user 'DD5'. Apart from a few English words, he could not speak that language, but had obviously learned how to log in using DD5 from other users, rather than with his own user account. This indicated that he had acquired enough knowledge to log into the system, yet without fully grasping the concept of user logins.

# Discussion

The research highlighted the important effect of context and environmental aspects on application usage at DD sites. Fundamental aspects such as uptime of the DD, stable electricity supply, functioning terminals, and screen visibility have a major impact on the effectiveness of a site.

The prior quantitative analysis contributed proportionally more to the overall study than the qualitative (approximately 70:30). However, the qualitative study enriched the results and helped explain various issues

raised in the quantitative analysis. Moreover, difficulties not observable in the raw data analysis (such as users battling to register an account) were discovered during the site visits. The quantitative and qualitative studies thus played both confirming and complementary roles. They served a confirmatory role when similar findings emerged, and a complementary role when the particular features of one method elicited data not possible with the other method.

Aspects confirmed by the site visits:

- Proportionally more males than females use the DDs, with proportions varying, depending on location and site administrator involvement. This issue demands attention. ( A high male:female ratio was also observed at the Indian HITW sites (Mitra, 2003)).

- Usage was predominantly by users under the age of 21.

- Usage of games and multimedia content was most popular, followed by reference material.

- The use of the office applications and certain educational content was low.

- Despite users having various home languages, the majority indicated a preference for interacting with a computer in English.

Complementary findings from the site visits included:

- Users from numerous cultural groups used DDs (Table 1).

- Of the 58 users, 40 of the 58 had been using DDs for over a year and 24 had a computer at home. Efforts should therefore be focussed on recruiting new users and users with no access to computing.

- Site administrators who were involved, played an important role in shaping usage and in influencing gender balance. The high use of reference material at Site 3, evident from the log-file data, could be attributed to the involvement of the librarians on site. Despite the DD ethos of 'unassisted use', low-level facilitation should be encouraged and supported practically.

- Games content proved to be an incentive for file exploration as users discovered new games not available from the menu. This concept of using games as motivation for exploration and discovery could be further exploited in future DDs.

- Despite games being the most-used applications, over 60 % of school-aged users indicated using the DD to help them with homework (Table 2).

- Site politics (e.g. tenants no longer having access to electricity) and degree of administrator involvement, effect usage at the site.

- There is a great need for printers, or access to printing facilities at the sites, especially for school learners to save encyclopaedia information for later reference.

- Requests for Internet access were frequent. The provision of Internet access was purposely excluded from the original design for reasons of cost and aim of the DD (basic computer awareness, rather than "free Internet café"). However, provided a cost-effective and sustainable Internet service model can be found, the Internet could be used in a variety of ways to enhance users' experience at the DD.

- More could be done to raise awareness of the variety of DD content available to users.

- The DD has the potential to benefit older users, but content needs to be appropriate, and the older generation made aware of the resources available to them.

- The requests for additional content and information were numerous and varied. A more efficient way of servicing those requests and making the relevant content available, needs to be incorporated into future sites.

# Conclusions

The qualitative research undertaken in this study constitutes a valuable contribution to the analysis of software application usage at selected DD sites in South Africa, raising certain concerns, and providing a complementary and confirmatory addition to the quantitative research component.

In a paper entitled "Hope-in-the-Wall? A Digital Promise for Free Learning", Arora sought to understand the reasons behind the failure of certain HITW sites in India after a number of years in operation. Vandalism, electricity payments, politics, and unmet expectations of the technology providers, all played roles in the demise of those sites (Arora, 2010). The site visits to DD installations discussed in this paper provide reasons for optimism in such projects, while at the same time raising certain warning flags. Less than 4% of the 210+ DDs have experienced vandalism of any kind, however, the aspects of site administration, adequate electricity provision, updated content and community awareness of the project should all be assessed and possibly revisited at each site, on a regular basis, in order to ensure maximum benefit is derived from these free open-learning and information hubs.

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