Evaluating users' perceptions of the Digital Doorway: a narrative analysis

Abraham van der Vyver

Information Technology Department, Monash University, Private Bag X60, Roodepoort 1725, Johannesburg, South Africa. E-mail: braam.vandervyver@monash.edu

Mario A. Marais

Living Labs and User Methods, CSIR Meraka Institute, P O Box 395, Pretoria 0001, South Africa. E-mail: mmarais@csir.co.za

Abstract

This paper contains a report on the uses, expectations and gratifications experienced by the users of Digital Doorways. The researchers adopted a grounded theory approach in their analysis of 200 narratives collected from the users. The stories and the comments in the narratives were categorized according to the macro domain to which they pertained as well as the uses, expectations, and gratifications of the users. Once the categories had been saturated, the researchers conducted a quantitative analysis of the findings. It showed clearly that the majority of the respondents reported usage that pertains to learning and school work. This need proved to be stronger than the need for game playing. The short term dimension of the required educational support eclipse the more future-oriented/idealistic responses. The study postulates the theory that in access-deprived and information-poor communities the need for short term educational solutions over-rides any other informational need.

Keywords: ICT, education; evaluation; narratives; grounded theory

1. Introduction

The rapid development of Information and Communications Technologies (ICTs) over recent years and their application in a wide range of personal and economic

activities have had a significant impact on society. "New media including telecommunications technology, satellites and computer networks such as the Internet, have led to an explosion in the production, manipulation and distribution of information" (Straubhaar & LaRose, 1997, p. 58). This phenomenon has been dubbed the Information Society. Van Dijk (1999, p. 247) described the Information Society as a "society in which information has become a dominant source of productivity, wealth, employment and power."

The biggest side-effect of the advent of the Information Society is a huge digital divide that separates those who have access to ICTs and those who don't enjoy that privilege. The ICT inequality that forms the basis of this divide contributes to the poor being unemployed and uneducated. Furthermore, the divide is exacerbated by the fact that many of the members of these disadvantaged communities are illiterate and unemployable. Selwyn (2004, p. 343) pointed out that the combating of social exclusion forms the basis of policies in many countries.

Governments, the private sector, and societies are continuously rolling out new initiatives that are aimed at narrowing the digital divide. Tele-centres, libraries, information kiosks, and digital doorways are established to enable disadvantaged communities to share in the benefits of the Information Society (Whyte, 2000, Etta & Parvyn-Wamahiu, 2003; Lesame, 2011). Although a high premium is placed on Internet access, budget limitations often stand in the way of sustainable connectivity. Furthermore, data access in deep rural areas is expensive, slow and unreliable. These challenges call for alternative solutions to the bridging of the digital divide. One such solution, the Digital Doorway initiative, was started in South Africa. The Digital Doorway (DD) is an artefact that was designed to facilitate the development and transfer of computer skills among members of the community. A secondary objective was to make information and educational software available to information impoverished communities, especially primary and secondary school learners. The DD is a robust digital kiosk that offers up to four built-in computer screens, and can be used to access pre-installed information sources and applications.

The first prototypes of the DD were installed in 2002. Since then the network has grown to more than 200 units that are positioned mainly at schools in deep rural disadvantaged communities all over the country (Gush & De Villiers, 2011). The

concept has been continually refined and several configurations exist, including a solar powered version.

Several typologies have been construed to differentiate between the various forms of public access facilities (Colle, 2000; Etta & Parvyn-Wamahiu, 2003; Snyman, 2007). From an educational point of view, three aspects need to be considered namely access, content and supervision (Mitra & Rana, 2001). A number of important distinctions therefore need to be taken into account. A telecentre usually offers unsupervised Internet access to an overwhelming amount of unstructured content. A library usually has Internet access to content that may be structured (books, DVDs) or unstructured (the Internet), accompanied by meaningful supervision by an information specialist (Snyman, 2007). A DD has no Internet access or supervision. However, it offers meaningfully packaged educational and other content (Smith, Cambridge and Gush, 2006).

A year-long evaluation project was commissioned by the funder to determine if and how the DD initiative has achieved the broad objective of promoting basic computer literacy. One of the aspects of the evaluation entailed the elicitation and collection of narratives from a sample set of the users. The second author is part of a team from CSIR Meraka Institute that conducted the evaluation. In this research, the narratives were used in an analysis based upon grounded theory approaches in order to gain a deeper understanding of the uses, gratifications and usefulness from the users' perspectives. The three step approach to grounded theory recommended by Strauss and Corbin (1998) were, albeit with a few minor adjustments, implemented during the project.

This paper is structured as follows: the background of the Digital Doorway and the evaluation is outlined, followed by the research questions, the evaluation data collection method, the research methodology, the research findings and finally the conclusion.

2. The Digital Doorway

2.1 Background

The Digital Doorway (DD) was initiated in 2002 as a joint initiative between the South African Department of Science and Technology (DST) and the Meraka Institute of the

Council for Scientific and Industrial Research (CSIR), in partnership with community stakeholders. The aim was to make a fundamental difference to computer literacy and associated skills in low-income communities, especially in rural areas, where access to information via computers is limited. The initiative was initially inspired by the Hole-in-The-Wall project which was developed by Sugata Mitra of the National Institute for Information Technology in India to test if basic computer skills can be acquired via unsupervised experimentation and exploration (Gush, 2004; Mitra, Dangwal, Chatterjee, Jha, 2005; Mitra, 2000, 2003).

The Digital Doorway itself refers to a digital kiosk with up to four screens (terminals) that has been designed to be very rugged and low-maintenance in order to be deployed on the outside wall of buildings for public access (Smith, Cambridge and Gush, 2006).

Figure 1. A three terminal Digital Doorway

The DDs are mostly not connected to the Internet, are Open-Source based and include applications such as educational games, programmes and Open Office. They

also contain a large amount of content (mostly in English), such as a snapshot of Wikipedia and access to project Gutenberg books (Smith, Cambridge & Gush, 2006). Between 2002 and 2010 more than 200 DDs have been installed throughout South Africa. Installation sites were mostly in deep rural areas, mostly schools, but also libraries and community centres (Gush & de Villiers, 2011). There are currently also DDs installed in Lesotho, Ethiopia, Uganda, the Solomon Islands, New York (at UNICEF) and Australia (Cambridge, 2008; Herselman et al., 2011; Stillman et al., 2011). The distribution of the South African sites is shown in Figure 2.
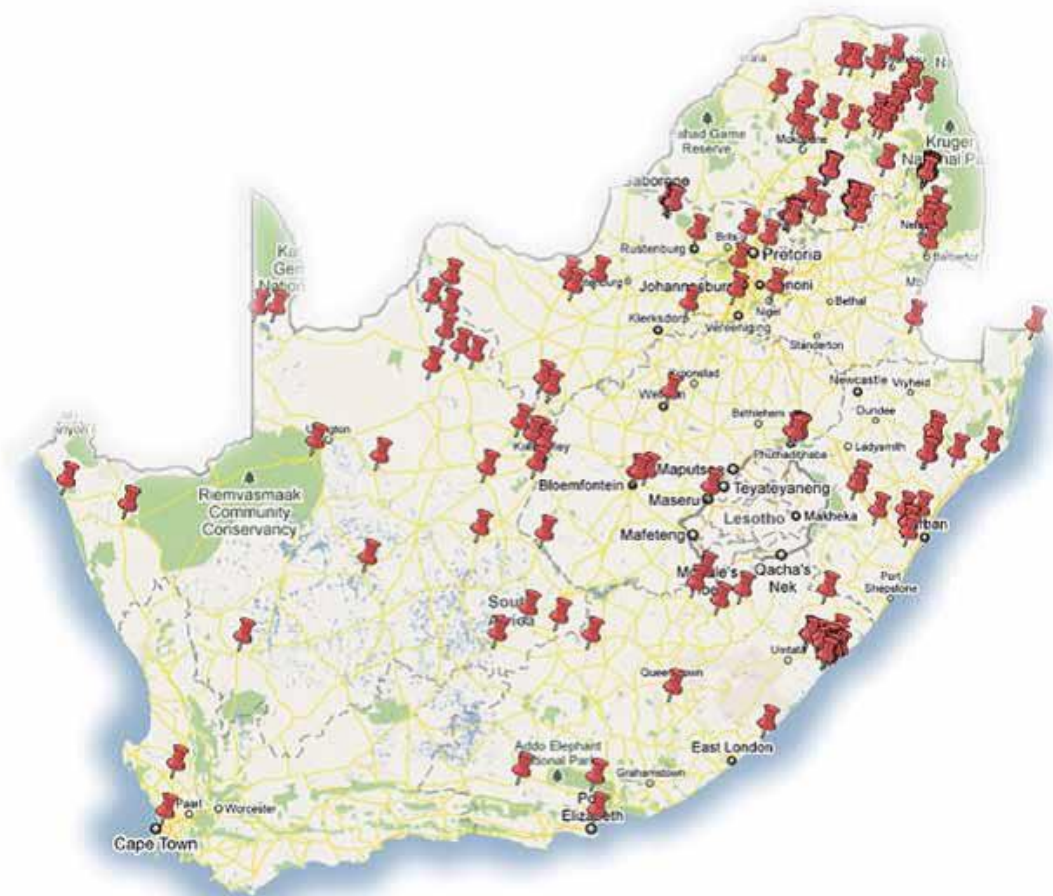

Figure 2. Digital Doorway sites in South Africa

The design of the DD and the thinking about the role of the DD evolved in response to user feedback and research. The concepts of "minimally invasive" education (Mitra, 2000, 2003) and "unassisted learning" was initially used to reflect the non-supervised use of the DD. This changed to "peer-assisted learning" as the

interactions between children at the three terminal DD kiosks were observed (Smith, Cambridge, & Gush, 2006; Cambridge, Smith & Gush, 2008).

2.2 Major evaluation

Ten years after the DD initiative was implemented, DST commissioned an evaluation in order to determine whether the DD initiative has achieved the broad objective of promoting basic computer literacy through "minimally invasive education", how it has done so and whether the DD initiative has evolved since its initial inception (Marais et al., 2012). The goal was an outcome evaluation for the Digital Doorway project through the development, testing and implementation of an evaluation methodology that focused not only on the direct beneficiaries, but also on the key role players, and especially on the learning that has taken place among these key role players. A combination of approaches was used, namely Outcome Mapping (OM) (Earl, Carden, Smutylo, 2001) and narrative enquiry. An evaluation framework that combines OM and narrative enquiry was developed and the evaluation was based on the evidence produced by the two methodologies, with OM as the backbone of the evaluation methodology (Marais et al., 2012). The focus in OM is on outcomes as behavioural change and on an understanding of the contribution made, rather than seeking to attribute outcomes to the intervention (Earl et al., 2001).

In this research, only the narratives or anecdotes that were created by the interviewees during the narrative enquiry component of the evaluation was used and hence only the narrative enquiry evaluation will be described in a later section. Before the research process is described, the research questions will be addressed.

3. The research questions

An in-depth examination of the narratives was conducted from a purely research perspective, in order to shed light on the following questions:

- is there still a need for public access facilities in rural areas;
- which user needs are met by the existing DD contents;
- which programmes and functions are used by the users; and,
- which kinds of user problems and issues are unmet.

In the following two sections the data collection methodology and the data analysis methodology will be described.

4. Data collection method

4.1 The narrative enquiry

The data collection method took the form of a narrative enquiry. This narrative enquiry based evaluation, henceforth referred to as the narrative evaluation, was conducted by a private concern, The Narrative Lab (TNL). TNL specialises in the use of narrative to surface the mindsets, perceptions and belief systems that govern patterns of behaviour (TNL, 2011). SenseMaker®, a software tool developed by Cognitive Edge, was used to act as a narrative database and analytical tool for monitoring the social patterns associated with the Digital Doorway (Marais et al., 2012). This tool was designed to gather large amounts of narrative material, and serves to bridge the gap between qualitative and quantitative research and assessment methods by combining the richness of narrative (qualitative) with the scalability of numbers (quantitative) (TNL, 2011; Marais et al., 2012).

The data collection process was designed to gather narrative material from interviewees, who were then asked to signify (index) their stories using a set of questions that form an interpretative framework for assessment. The interviewer also asked each interviewee to give each story a title. The self-signification assigns meta-data to each story in the form of quantitative values. These are then visualised through the software to allow for trend and pattern analysis by the analyst.

4.2 The sampling method

A purposive sampling method, specifically heterogeneity sampling, was used to select specific Digital Doorway sites for collection of Outcome Mapping and Narrative information (Marais et al., 2012). This method of site selection was chosen to ensure that as much as possible of the diversity of the DD deployment contexts are represented, namely: the geographical location, the type of community, the configuration of the installed DD and type of installation (e.g. at a school), the targeted users and the relevant social or cultural factors. Two aspects regarding geographical location were considered: location in geographical clusters of close proximity of DD sites, and the

type of geographical settlement. A typology of South African settlement and land-use patterns, developed by the CSIR, was used to describe the settlement type in which the selected DD sites are located. Sites were selected in such a way that they do not all belong to the same settlement type (e.g. service towns or dispersed rural settlements). A total of 28 DD sites were selected as preliminary sites, of which 14 were used for Outcome Mapping interviews. From these sites, a subset of seven sites was selected for the narrative enquiry visits. Seven of the nine provinces of South Africa were represented (Gauteng, Limpopo, Mpumalanga, Kwa-Zulu Natal, Free State, North West and the Northern Cape). The DDs at the selected sites were mostly located at primary or secondary schools, with one at a library and one at a community centre. The Narrative Lab (TNL) research team visited four of these DD sites, while the remaining three sites were visited by CSIR Meraka Institute.

The narrative survey instrument included three sections:

- Basic information about the respondent and his/her interactions with the DD
  Questions included: gender, age group, home language, schooling, as well as questions pertaining to perceptions such as who the respondents believe owns the DD and who causes the most problems at the DD.

- Elicitation question(s)
  Five elicitation questions, one of which was compulsory, were designed to elicit stories or experiences from respondents. These were open-ended questions and were phrased so that the respondents were invited to share stories that are either positive or negative (e.g. the compulsory question: "what is the most important story you can share about the DD").

- Signifiers
  Signifiers are questions about the story itself. They were intended to provide an additional layer of data for analysis over and above the narrative that the participants shared. Signifiers were completed for each story shared, and were used to search for patterns across stories.

Data collection took between two to seven days per site. Paper-based survey instruments were used and the stories that were elicited by the relevant questions were recorded (with permission) using a voice recorder.

The stories were shared in local languages, or in a combination of English and the local language. Locally recruited people proficient in English assisted the researchers. Before all the recorded stories could be transcribed, they had to be translated from local languages into English. This was done by a separate team of translators and transcribers. Finally, the data from the survey instruments and the narrative transcriptions were uploaded into the SenseMaker® database for classification and analysis by the TNL team.

A total of 1327 stories were collected, with the vast majority being elicited by the compulsory question. Interviews were held with a range of users of the DD. The following age groups were represented in the interviews: 6-12, 13-18, 19-25, 26-40 and the 41 to 60 age group. The required ethical protocols were followed.

The raw data included in the sampling frame for this article consisted of these 1327 stories, and included the story titles as given by the interviewee. The first author was not involved in the evaluation project at all, and his first contact with the data was when he was presented with the data in the format as illustrated in Table 1 below.

TITLE	NARRATIVE/STORY/COMMENTS
The computer is important	DD helps us with our school work that we don't understand and we can do research on the DD
DD the Amazer	Yes, I once saw my friend watching a movie and wondered because I didn't expect a computer to play a movie. I asked the principal about that and he told me that I can do whatever I want with the DD.
DD has important things other than games	When I opened the door I was surprised to see information on maths, Sesotho. Yes, but it didn't expect that the DD would help me on my school work. One day when I went to the DD to play games I found someone using (sic) reading useful information and I then realised that how helpful it can be.

Table 1. Examples of stories with their titles

As can be seen, the respondents' contributions took the form of narratives and comments regarding their experiences of the DDs.

5. Research methodology

The researchers implemented the grounded theory approach during the content analysis process of the stories and titles.

According to Strauss and Corbin (1998, p.12), grounded theory implies "theory that was derived from data, systematically gathered and analysed through the research

process". They added that "a researcher does not begin a project with a preconceived theory in mind" (Strauss & Corbin, 1998, p. 12).

The researchers opted for the coding method advocated by Strauss and Corbin (1998). This method differs from the two-step method preferred by Glaser (1978) in that it makes provision for three steps, i.e. open coding, axial coding and selective coding (Heath & Cowley 2004, p. 146). Open coding is defined by Strauss and Corbin (1998, p. 101) as "(t)he analytic process through which concepts are identified and their properties and dimensions are discovered in data", It is in this initial stage that the categories of information is formed (Creswell (1998, p. 150). Axial coding relates to the linking of data categories to subcategories (Strauss and Corbin,(1998, p.121), and selective coding refers to the integrating and refining of theory (1998, p.143).

The researchers started with a line-by-line examination of the data. The words, sentences and phrases embedded in the comments and stories were examined. The first iteration of open coding was done by the researcher who was not involved in the data collection. In this iteration, 50 stories were selected at random from the narrative database.

This researcher detected at an early stage that the responses of the interviewees could be categorized into domains. A domain is defined by an influential online dictionary as a "field of action, thought, influence" (Dictionary.reference.com, n.d.). The educational, technological, entertainment and economic domains stood out during the first iteration. He also discovered that one story/response could pertain to more than one domain. This was recorded as such. During the second iteration, conducted by both researchers, the communication, community and psychological domains were added as another 150 stories were selected (two of which were subsequently discarded, leading to a total set of 198 stories).

During the third iteration, the first researcher started to form categories of activities. An activity is defined as "a specified pursuit in which a person partakes" (The Free Dictionary, n.d). The specific uses of the DD stood out as a central variable for categorization. Activity categories like learning, research, games, music, computing and getting information was formed.

During the next iteration in which both researchers participated, these activity categories were refined. It was for instance determined that learning would be restricted to school work and that the learning of computer skills would fall under computing.

New activity categories were also added. Once the activity categories had been provisionally saturated, the researchers documented other relevant snippets of information.

The focus was shifted to specifics, i.e. if the DD was used for musical purposes a distinction was drawn between listening to music and playing keyboard. Both these activities can be achieved on the DD. The subjects/topics pertaining to school work that was referred to by the respondents were also listed.

In the last iteration the researchers focused on any expectations that the respondents reported regarding the DD, as well as on the role of word of mouth communication. After the completion of the open coding process, the researchers engaged in axial coding. Axial coding is described by Strauss and Corbin (1998, p.125) as "the act of relating categories to subcategories along the lines of their properties and dimensions. It looks at how categories crosscut and link."

During this stage the researchers investigated the linkages between categories. Some of these linkages were obvious, such as the one between learning, school work, homework and training. The first researcher did another line-by-line inspection of the content, since some of the abovementioned concepts featured in the same comment/story.

The nature of the linkages pointed the researchers in the direction of the uses and gratifications theory as an investigative platform. This approach that was named and formalized during the early seventies is described by Katz (1974) (cited in McQuail 1994, p. 319) as being concerned with:

> (1)The social and psychological origins of (2) needs, which generate (3) expectations of (4) the mass media or other sources to (5) differential patterns of media exposure (or engagement in other activities), resulting in (6) need gratifications and (7) other consequences, perhaps mostly unintended ones.

Since the grounded theory approach is not aimed at identifying theory but at discovering theory (Heath & Cowley 2004, p. 149), the researchers did not implement the uses and gratifications theory, but only borrowed the core concepts from it. This practice is in line with the guidelines given by Strauss (1987) who indicated that "both specific understanding from past experience and literature may be used to stimulate theoretical sensitivity and generate hypotheses" (Heath & Cowley 2004, p. 143). The

axial coding process led the researchers to include usage, gratifications and expectations as core concepts in the final process of data analysis. These concepts make up the framework that the researchers used to build the theory.

Once the researchers had completed the refining and saturation of the various domains and categories in the set of 198 stories, they engaged in the construction of a matrix. The use of a matrix is to "enable the researcher[s] to organize materials and present a more complete and persuasive explanatory account of the phenomenon under construction" (Strauss & Corbin 1998, p. 191). In this case the researchers did not opt for the circular structure that Strauss and Corbin (1998, p. 191) proposed, but decided on a table structure that more purposefully served their analysis. The domains, uses, gratifications and expectations were embedded in the structure. An overview is given in Table 2.

Table 2. Relational matrix

DOMAIN	USE	GRATIFICATION	EXPECTATIONS
Educational	Schoolwork/homework/ learning/training	Pass (exams)	Met
Entertainment	Games	Good marks/ Improve marks	Not met
Technological	Movies	Watch old movies, video's, cartoons	Exceeded
Communications	Information	Jobs (info)	Neutral
Economic	Music	Play keyboard	
Community	Read	Future (hope)	SPECIFICS
Informational	Photography	Info not in textbooks/books	Maths, science
		Learn from each other/other learners/ taught	Astronomy, planets
		Keep children off the street/ Fight boredom	Zoology, animals, mammals, reptiles, birds
		Improve skills	View pictures, virtual tourism
		Don't have to pay/free	Fight boredom
		Understand	Keep children off the street

		Access = to computers/information	
		Relaxation/fun/enjoy	
		Photography/taking/saving Photos	
		Quality of life/ makes lives/life good/improve	
		To help community/community	
		Write (creatively)	
		View pictures/virtual tourism	

In column 1 of the table, the macro domains to which the narratives, stories and comments relate are listed. The second column hosts the uses (of the DD) that the respondents declared when asked about it. The gratifications that the users experienced when they made use of the DDs are embedded in column 3. The top part of table 2 accommodates the possible outcomes that the user experienced regarding the expectations s/he harboured about the DD. The bottom half is used to list specific topics/subject matter that featured in the responses. The segments of the table should be viewed as separate entities. The rows should therefore not be interpreted as meaningful atomic entities. The table with its various segments is a depiction of the inter-relationships on which the interpretation of the data was based. It depicts the conditional/consequential matrix that Strauss and Corbin (1998, p. 181) defined as "an analytic device to stimulate analysts' thinking about the relationships between macro and micro conditions/consequences both to each other and to process."

6. Findings

The data set of 198 stories contained responses from users between the ages of six and forty. The researchers started with an analysis of the domains to which the responses referred. This collection of domains describes the realm of activities to which the respective uses, needs and expectations that the respondents referred to in the interviews, relate. In some cases a single response related to more than one domain.

Table 3. Domain analysis

DOMAIN	%
Education	59.1
Entertainment	30.3
Technological	28.3
Informational	28.3
Economic	8.1
Communications	3.0
Community	2.5

As can be seen in Table 3, 59.1% of the 198 responses pertained to the educational domain. The entertainment domain contained 30.3% of the responses, while the technological and informational domains each rendered 28.3% of the responses. The economic domain featured in 8.1% of the responses and the communications domain in 3.0% of the comment sets. A mere 2.5% of the comments related to the community domain.

After the completion of the domain analysis, the researchers moved on to a verbatim analysis of the responses. Their findings are reported in Table 4 below.

Table 4. Activities

ACTIVITY	%
Games	26.8
Learning	26.3
Information	25.3
Research	23.7
Internet	6.1
Music	4.0
Movies	1.5
Photography	1.0
Training	1.0
School work	1.0
Read	0.5

The activities that featured most frequently in the response-analysis are: playing games (26.8%), learning, (26.3%), gathering of information (25.3%), research (23.7%) and computing (11.1%). Six percent of the respondents reported that they used the DD to access the Internet. Although the screens and the searching methods that the DD offers create a virtual environment that is very similar to the Internet, the DDs that featured in this study did not offer Internet access.

Another important dimension that was detected by the researchers pertained to users' expectations. Twenty two percent of the respondents declared that they formed expectations when they first learnt of the existence of the DD. It needs to be emphasized that no initial prompt was included or telegraphed in the questionnaire in this regard. The outcomes of these expectations are reported in the table below.

Table 5. Expectations expressed

EXPECTATIONS	%
Expectations exceeded	53
Expectations met	24
Expectations neutral	2
Expectations not met	16

Of those harbouring expectations, 53% declared that their expectations were exceeded while 24% noted that their expectations were met. 16% indicated that their expectations were not met. The majority of the respondents (65%) did not allude to any expectations but reported on the benefits that they experienced from using the DD. A mere 1.5% commented on the disadvantages of the DD.

During the second phase of the research, the researchers engaged in axial coding. Each of the activity categories was inspected. In some cases sub-categories of activities were created and in others activities were merged. By merging the activity categories for learning, research, training and school work, the new combined learning-research category showed that 52% of the respondents engaged in educational activities during their use of the DD.

Table 6. Merged educational activities

ACTIVITIES	%
Learning	26.3
Research	23.7
Training	1.0
School work	1.0
Total	52.0

This revised activity category now clearly comprised the most dominant usage pattern followed by, as reported in Table 4, game playing (26.8%) and the general gathering of information (25.3%).

Table 7. Merged entertainment activities

ACTIVITIES	%
Music	4.0
Movies	1.5
Photography	1.0
Total	7.0

A combined activity category embedding music, movies, photography and reading made up 7% of the responses. Four percent of these responses pertained to the listening of music and/or the playing of musical instruments.

In terms of the specific content accessed, the researchers found that 6.1% of the respondents mentioned mathematics and 5.6% science (as referred to in Table 8).

Table 8. Specific content

SUBJECTS	%
Mathematics	6.1
Science	5.6
Astronomy	3.5
Zoology	1.5
Botany	0.5
Total	52.0

Astronomy featured in 3.5% of the responses while zoology and botany generated two percent reported accesses. This finding is in line with the course content that is offered on the DD. The content mix displays a strong bias towards mathematics and science. In terms of other subject areas, the researchers noted that only one mention was made of life skills and no mention was made of other subject areas such as economics and business economics in this particular sample.

The researchers finally compared the results against the *raison d'etre* of the concept of a DD. The role of self-directed and participatory learning, piloted by Mitra

(2000, 2003) in the form of the hole-in-the-wall concept and often referred to as the new pedagogy, did not feature prominently in the narratives. Only three percent of the respondents declared that they were taught by friends and only one respondent reported that s/he taught himself/herself. Having said this, only one respondent mentioned that s/he was taught by a teacher. Another 5.5% got interested when they saw friends using it, while one individual responded to an invitation from friends to get involved.

In order to generate grounded theory, the researchers perused the whole landscape of information that was generated by the field work. The core theme that was distilled from the respondents' feedback is the dominant short term need for educational support. The majority of the respondents reported usage that pertains to learning and school work. This need proved to be stronger than the needs for game playing. It should be underscored that the games on offer on the DD is of an educational nature, which means that they can be classified as a form of sugar-coated education. Even with that in mind, the reported responses displayed a strong bias favouring school-related research and studying. The short term dimension of the required educational support becomes clear when it is compared with the frequencies found in the more futuristic responses. Mention was made of self-improvement, learning skills and making life better in only 10% of the responses.

7. Conclusion

The primary goal of the Digital Doorway initiative was to make a difference to computer literacy and associated skills in low-income communities, especially in rural areas, where access to information via computers is limited. The solution had to be freely accessible to the major users, namely primary and secondary school learners, in order to support the principles of "minimally invasive" education, "unassisted learning", "self-directed learning" and "peer-assisted learning". In the resource-poor environments, the DD was also available as a large information resource that could be accessed when required.

The biggest limitation that the researchers faced was that all the DDs do not contain exactly the same content. Although the ratio between the various content types is to a large extent the same, the specific content included in the mix may differ.

As discussed in the findings, respondents did not refer in a great degree to the way in which they were learning. The analysis showed a strong bias towards the use of

the DD for short term educational support in the form of school-related research. Entertainment also featured strongly in the usage reports. Bearing in mind that many of the games on the DD are of an educational nature, it is clear that the usefulness of the DD as an educational support tool is supported by this research. This finding answered the first two questions that the researchers posed: is there still a need for public access facilities in rural areas and which user needs are met by the existing DD contents.

The findings embedded in the tables contain the answer to the third question of the researchers, namely, which programmes and functions are used by the users. The relational matrix in Table 2 provides an integrated view of the 5 variables that surfaced during the study, i.e. domains, uses, gratifications, expectations and specific content. It paints a picture of multi-purpose usage as well as active community involvement.

In terms of future research, a number of gap analysis studies are in progress. These studies compare the present content that is available on a DD to the declared needs of the users.

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