

Research Article

The Value of Non-Instrumental Computer Use: A Study of Skills Acquisition and Performance in Brazil

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Abstract

Telecenters, libraries, schools, and other public places where people access computer technology generally must decide which information and communication technologies (ICTs) to make available to the public. These decisions are often made based on a conception of which ICT uses are worthwhile, and often venues end up privileging instrumental uses—when people use the technology as an instrument toward productive goals—over non-instrumental uses, such as gaming or chatting. Users, on the other hand, do not necessarily make these distinctions and they switch seamlessly across multiple types of activities with technology. While public ICT providers must demonstrate good stewardship of public monies, when they privilege activities such as word processing a job application but not gaming or social networking, they constrain how people integrate technology meaningfully into their lives. This article presents the results of a study that investigated assumptions about the benefits of instrumental versus non-instrumental computer uses. Our findings indicate that people who use computers largely for non-instrumental purposes are generally as capable with the computers as those who use them for instrumental purposes, that people who largely use computers for these non-instrumental purposes are gaining skills that translate to instrumental tasks, and that dictating policy across largely software and tool-driven definitions of what constitutes “serious” or “worthwhile” uses of technology (and allocating public money to support access to such technology uses) does not match how individuals see themselves as users of these tools.

1. Introduction

Throughout the Global North and Global South, public money is used to build and sustain facilities (such as libraries, telecenters, and schools) as publically available places where citizens can access information and communication technologies (ICTs). The involvement of public money means these facilities must demonstrate good stewardship of resources, and when there is high demand for the ICTs or they are in an especially public place where others can see how they are being used, these public providers of access must often constrain the uses to which the ICTs are put. Generally, this boils down to sites prioritizing work-based activities rather than apparently leisure activities.

We conducted this in-depth investigation of non-instrumental uses as part of the Global Impact Study (Sey et al., 2013). The Global Impact Study investigates the impact of technology in public access venues, such as libraries and telecenters. This article reports on research conducted in recognition that a significant portion of people’s online time in these public access venues comprises non-instrumental use. We explore the usefulness of “playful” computer activities, such as social networking and gaming, which we refer to as “non-

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instrumental” activities; these activities are contrasted with “instrumental” activities usually found in the workplace. The investigation was originally designed to contribute to conversations in the public policy and philanthropic arenas where there is ongoing debate over whether allocating funds to public technology access facilities should be a priority; a significant impetus for that ongoing conversation is the fact that in many public facilities, users choose to play games, use Facebook or other social networking software, and engage in other online activities that do not appear to have a direct relevance to the types of outcomes articulated by these funding programs. In other words, how does a country or a granting agency justify putting money into a computer center when kids will spend most of their time playing games and chatting with friends?

Our study provides an additional, research-based element to this conversation by investigating the extent to which skill acquisition might happen when people mostly play or engage in other non-instrumental uses of computer technology. In particular, this study recognizes that non-instrumental activity comprises a significant portion of people’s online time in public access venues, and that rather than trying to ban such activity, it might be better to understand the role that such activities play in peoples’ lives. The question of whether gaming or other playful uses of technology are “worthwhile” or have benefits has varying significance across disparate communities, and for many researchers this is often taken as a settled question. However, this remains an active and polarizing debate in many research communities, including public policy and education.

Public venues, when faced with decisions on how to maximize the utility of their resources, often privilege instrumental uses—such as applying for a job or training for future employment. Precise definitions are elusive: Communication via email is a “good” activity, especially if used to send a job application to a potential employer, but communication via chat or Facebook is often scorned as play or banned as disruptive. Overall, gaming is seen as illegitimate because it is considered a waste of time (Hansson & Mozelius, 2010), can be distracting to other patrons (Schweppe & Yi, 2012), or is considered an unfair use of a limited resource (Nicholson, 2009; Pulliam, 2011). Additionally, activities such as blogging and social networking are banned, ostensibly to protect patrons’ privacy (Barnes, 2006) or to protect them from illicit content (Amadeu, 2008).

Yet, users do not make such distinctions. In fact, users are often initially drawn to computers for non-instrumental activities (Kolko & Putnam, 2009). So while most literature in the previous decade emphasized the importance of ICTs for development by focusing on instrumental uses such as education and employment, it turns out that when people gain access to ICTs, they put them to all sorts of uses, intended and unintended, instrumental and non-instrumental (Burrell, 2008). Although the definition of non-instrumental use is continually shifting, our research defines *non-instrumental use* as activities that do not directly result in the production of artifacts for academic or professional contexts. Within this framework, non-instrumental use encompasses gaming, social networking, and other related activities. It is important to note that non-instrumental use is not tied exclusively or even predominantly to specific kinds of software or computer applications. Rather, non-instrumental refers to a user’s articulated purpose in engaging with the technology.

To that end, this study investigates people’s instrumental and non-instrumental uses of technology in order to address the following research questions:

- Do people gain ICT skills (i.e., keyboarding skills, knowledge of operating systems and file structures) through non-instrumental uses of ICTs?
- Are any skills gained through non-instrumental uses transferable to other (instrumental) uses of ICTs?

To answer these questions, we conducted several stages of qualitative research and quantitative computer-based exercises (CBE) study. The findings from the qualitative component informed the design of the CBE study and contextualized our findings; however, this article focuses primarily on the CBE study results.

In the early stages of this study, we conducted field visits and observations in the Brazilian states of Rio de Janeiro and Rio Grande do Sul. We conducted semistructured interviews in Rio de Janeiro and Porto Alegre, and we conducted an ethnographic investigation of two LAN houses in the favelas of Rio de Janeiro. The public access venues we visited were located in rural and urban areas and in neighborhoods with low social indicators, including the district with the lowest human development index in the city of Rio de Janeiro, as well as in neighborhoods considered middle class and upper-middle class. The interviews focused on how people were exposed to technology in general, how and where they have continued to use it, and the role it plays in their

lives. In total, we interviewed 45 participants. The interviews helped us identify public access venues known to have a higher level of non-instrumental use, which guided our sampling strategy for the CBE.

For the CBE, we gathered information about how people learned to use ICTs and how they rated their proficiency at various computer-based tasks. We then administered a series of tasks, grouped into clusters around certain types of software or computer skills (e.g., word processing, Web searching). We also asked users about their computer activities to better understand their performance at these CBEs against a backdrop of their overall computer use.

As a note, we recognize that the terms “instrumental” and “non-instrumental” are coarse distinctions that do not adequately capture the nuances of people’s actual ICT usage. As we discuss in the Results section, rather than applying external labels of instrumentality to study participants, we created emergent categories based how respondents articulated the purpose of their ICT uses.

2. Literature Review

The conceptualization of the “digital divide” has shifted focus in recent years. What was originally conceived of as a largely binary physical gap between having or not having access to information and communication technologies (ICTs) has become a discussion centered on the varying sociotechnical factors that affect access to technology, understanding its relationship to economic development, and developing policies to govern acceptable technology interventions to achieve these development goals. The digital divide is now conceptualized as a complex continuum on which the notion of “access” is situated, where studying patterns of technology diffusion across diverse communities can highlight design, policy, and other issues that are key to integrating technologies effectively into everyday life (Barzilai-Nahon, 2006; Mehra, 2004; Nardi & O’Day, 2000; Selwyn, 2004; Tibben, 2007; Van Dijk & Hacker, 2003; Warschauer, 2002).

Originally, providing physical access to ICTs was expected to change peoples’ lives. National governments focused on improving access to ICTs as a way to empower marginalized communities, both in developed and developing countries. The claim was that ICTs make available information that can result in improved education and job prospects, a greater voice in government, and access to better healthcare information. Development language permeated many of the early efforts to make ICTs available, and it continues to have a significant influence. However, as time passed and technology became more widely diffused, it became increasingly clear that interventions focused on providing access to core technological artifacts were failing or achieving unintended consequences (Gichoya, 2005; Hosman, 2008). These technology access projects were sometimes deployed without ongoing support, or their intended functions were hampered by contexts outside their initial development specifications. Many projects were created with a general user profile of “developing nations” in mind, rather than a particular location (Brewer, Demmer, Du, & Ho, 2005; Heeks, 2010). It also became clear that just having access to an ICT does not result in direct benefit, and that access itself does not cause linear change. This shift in understanding, in addition to ICTs becoming more integrated into many of the domains associated with development (health, government, education), has meant less emphasis on ICTs as a standalone intervention, although targeted efforts to ensure technology remains accessible across communities continue. However, these efforts are often constrained in how they conceptualize what constitutes legitimate or programmatically desirable ICT activity.

2.1 Taking Play Seriously

Among those programmatically questionable ICT activities are gaming and other playful uses. But journals, conferences, and an entire research community focus on the value of non-instrumental computer uses, drawing attention to the value of play. Part of this research concentrates on specially designed learning games; other researchers focus on skills such as collaboration and cooperation that people gain through game playing (Chen, 2005; Squire, 2010). This research has existed largely independent of the digital divide and access literature. In educational research, for example, games are an increasingly central topic, with scholars researching games as part of informal learning (Stevens, Satwicz, & McCarthy, 2007), key skills such as collaboration that people learn while playing multiplayer games (Nardi & Harris, 2006), psychological and reaction-time skills gained from games (Green & Bavelier, 2003), and the creation of actual educational games designed to teach

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complex skills (Dubbels, 2003; Garris, 2002; Gee, 2003; Holland & Jenkins, 2003). A similarly growing literature explores the connections between social networking and learning (Boyd, 2002; Ito et al., 2009) and digital media production and learning, work that builds on the extensive education literature demonstrating the importance of learning communities.

For example, Ito et al. (2009) describe *gaming* as a domain of interest-driven learning that has low barriers to initial entry; the authors describe a path that starts with casual social gaming, then leads to exploration and knowledge seeking, and can eventually result in more intensive forms of knowledge exchange and production. Ito et al. claim that gaming can become an entry point for a wider range of technical and interest-driven practices and literacies, such as hardware hacking, video production, design, and coding.

Kolko and Putnam (2009) found that games constitute a significant portion of the ICT ecology in resource-constrained environments. In longitudinal work in Central Asia, they used ethnographic work to show the breadth of gaming activity, along with survey data to demonstrate that games provide an alternate pathway for users' introduction to ICTs. The authors demonstrate that users with higher levels of education and English language ability are typically introduced to computers through Internet use, but people with lower levels of education and less English ability can still become ICT literate through engagement with computer games. Their work suggests, therefore, that gaming makes ICTs accessible to a wider segment of the population. The authors claim that playful use is an important pathway to people's "first touch" of a computer.

Johnson, King, and Hayes (2008) report on the Tech Savvy Girls project, a program that explores the use of commercial, off-the-shelf video games to help girls to develop IT fluency. The authors observe how participants, through informal "tinkering" activities, develop lifelong meta-skills, or skills that extend beyond the limits of traditional schools' definitions of mastery of software packages. Other studies on children's computer use in public spaces confirm the importance of the social factor; Sandvig (2001) found that computers in libraries are used to play and to communicate with others. He describes how novice users often stood by and observed more skilled users, adopting successful Internet search strategies and noting interesting URLs.

Overall, research on gaming and learning demonstrates, across multiple domains, that non-instrumental ICT use provides a technology entry point and also can lead to informal education and in-depth engagement. Deeper research on the relationship between instrumental and non-instrumental technology uses will increase our understanding of how to build robust technical literacies.

2.2 Public Access Venues in Brazil

Brazil has a two-track model of access: publicly funded venues and privately funded venues, often called LAN houses. Generally speaking, Brazil's government has been successful in making ICTs available to a broad population. For example, in recent years a federal program called "Computers for All" offered credit lines to low-income Brazilian citizens to purchase computers (Schoonmaker, 2009). This helped bring household computer ownership to 54% in 2009 (Brazilian Internet, 2009). Additionally, the Brazilian government established the Association of Telecentre Networks (ATN) in 2006 to help raise the profile of telecenters as public spaces that provide services and skills for community development. In addition to efforts to provide ICT access through public funding, in 2004 the Brazilian government inadvertently assisted in the establishment of a large number of privately owned LAN houses. This was a partial side effect of a Computers for All program. Several people took advantage of the program to obtain multiple computers, placing them in a single location to be used predominately for gaming (Lemos & Martini, 2010). Dubbed the "LAN House Revolution" by Brazilian journalist Paula Góes (2009), these LAN houses became a key factor in the growth of ICT access in Brazil. At one point these LAN houses were responsible for 64% of the Internet access in lower-income communities (Brazilian Internet, 2009).

While these LAN houses provide ICT access, they do not dictate what people do with that access. As a result, there is a significant amount of game playing and social networking in the LAN houses, which is at odds with the goals of the well-meaning development efforts stretching back to early digital divide initiatives. According to the Brazilian Association of Digital Inclusion Centers, about 85% of LAN houses are unlicensed (Brazilian Association, n.d.), and they are under close scrutiny from lawmakers and the court of public opinion because of the heavy use of games and social networking. According to Góes, the main activity for 42% of the

users is playing video games, although patrons of LAN Passos houses are expanding into other uses such as cultural activities, access to websites, and social networking. (2011) confirms that what was previously an exclusive gaming space is now used for communication activities, paper printing, job searching, and other activities, even though gaming still accounts for most of the access in LAN houses. This history and these factors make Brazil a promising site for examining the interplay of instrumental and non-instrumental technology uses in public centers, many of which rely on public funds.

3. Methodology

3.1 Computer-Based Exercises

The core of this study was a series of computer-based exercises created to accompany a brief interview script. The CBEs borrowed from usability testing methods to measure the level of difficulty a respondent experienced in completing a task and to catalog the most common errors. In addition, the CBE contained a section where respondents self-reported their skill levels and their knowledge of less common ICT terms. The CBE also included a battery of questions that asked respondents about the frequency with which they performed various activities online and whether they performed those activities for work or school or for fun or personal use. These questions allowed us to create data-driven categories of instrumental and non-instrumental users.

The tasks we selected for the CBEs captured a range of computer skills considered typical of instrumental use. These activities were based on a digital literacy study conducted as part of the Programme for International Student Assessment (PISA), an Organisation for Economic Cooperation and Development project (OECD, 2011). That study identified five high-level ICT activities around which we built several of our CBEs. We asked people to complete word processing, spreadsheet, Internet browsing, and email tasks. We chose tasks that required certain computer skills (such as bookmarking a link while browsing the Internet), many of which are relevant across multiple applications (such as opening a file). We did not include exercises based on specific software applications (such as Microsoft Office or Facebook).

During the administration of the CBEs, the researchers recorded qualitative observations as the participant attempted the exercises. The findings of that data are not reported here. All study materials were reviewed by the University of Washington Institutional Review Board.

3.2 Recruitment

In cities in two separate states, Rio de Janeiro and Porto Alegre, 303 subjects were enrolled at 17 public access venues. Participants were recruited and evaluated at public access venues known to have a high level of non-instrumental usage, such as LAN houses. Research assistants visited public access venues and approached potential participants who were already in the venue, or as they arrived. Each session took about one hour. Respondents were free to end the study at any time.

All but one of the respondents were between the ages of 13 and 65 (Figure 1). Nearly one third (33%) were ages 25–34, and 81% were under the age of 34. These age demographics are likely a reflection of the audiences who use public access venues. Participants reported diverse and overlapping employment situations (Figure 2). The most common status was student (32%), followed by full-time employment (28%), and part-time employment (18%). These statuses are not exclusive as participants were allowed to select more than one.

4. Results

4.1 Activities Have Different Degrees of Instrumentality

We presented participants with a list of computer activities and asked (a) if they conducted the activity and, if so, (b) whether they did so for instrumental reasons (work or school), non-instrumental reasons (for fun and leisure), or both. We used this data to construct an index to describe the inherent instrumental character of an activity. We needed this instrumentality index to show that activities have both instrumental and non-instrumental value, and to validate our approach of looking at the intent behind activities, rather than using specific activities themselves (e.g., using spreadsheets) to categorize our users.

The instrumentality index is a ratio comparing the number of respondents who perform an activity for

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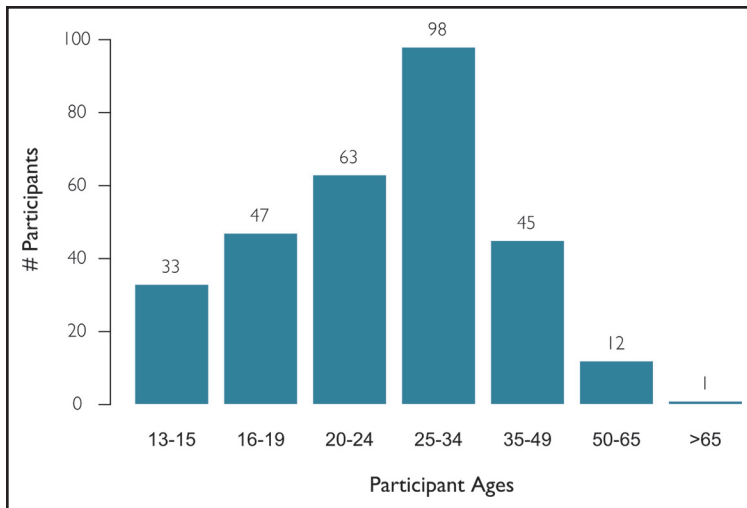


Figure 1. Age distribution of computer-based exercise participants ($n = 298$).

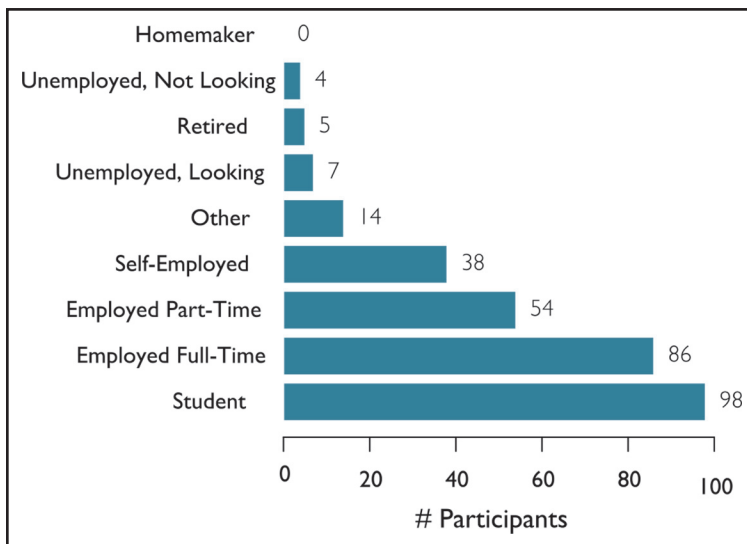


Figure 2. Occupation status for CBE participants ($n = 303$). Participants could select more than one category.

work or school to the number of respondents who perform an activity for personal use or fun. Scores of greater than 1 indicate activities that were done more for instrumental purposes than non-instrumental purposes. Scores of less than 1 indicate activities that were done more for non-instrumental purposes than instrumental purposes. Finally, scores equal to 1 indicate activities that, for those who did them, satisfied instrumental reasons as often as non-instrumental reasons. The instrumentality index scores for each activity are presented in Table 1.

Activities such as creating computer presentations, using spreadsheets, and creating documents ranked as being used primarily for instrumental purposes. This validated our choice that using spreadsheets and doing word processing activities would be central to the computer-based exercises because of their primarily instrumental nature. However, none of the activities were either strictly instrumental or non-instrumental. Even activities that ranked low on the instrumentality index, such as playing computer games, still had some respondents saying they performed those activities for work or school purposes. Table 1 lists the rates at which specific activities were performed for both instrumental and non-instrumental purposes.

4.2 Categorizing “Instrumental” and “Non-Instrumental” Users

Since the results of the instrumentality index described above demonstrate that any given activity was situated on a continuum of instrumentality, we could not place people in categories based on the kind of technology use they reported. For example, most people who use email use it for both instrumental (messages related to work or school) and non-instrumental (communicating with friends or family) purposes. Similarly, people use Web searches for tasks related to their work or school as well as for personal interests. Even an activity such as gaming, which is arguably the quintessential non-instrumental activity, was used for instrumental purposes by some participants.

We needed to find a way to categorize different kinds of online activities because we wanted to assess

Table 1. Overview of Instrumental and Non-Instrumental Uses for Activities.

	N	Of those who do the activity:		
		# (%) for Instrumental Reasons	# (%) for Non-Instrumental Reasons	Instrumentality Index
Create computer presentations	207	192 (93%)	46 (22%)	4.17
Create or use spreadsheets	189	171 (90%)	58 (31%)	2.94
Create documents with a word processor	229	198 (86%)	104 (45%)	1.90
Search for information online	291	219 (75%)	245 (84%)	0.89
Create content for the Web, such as a blog, wiki, or website	80	41 (51%)	55 (69%)	0.75
Use email	293	194 (66%)	268 (91%)	0.72
Create multimedia files	116	52 (45%)	81 (70%)	0.64
Participate in online discussions	117	45 (38%)	93 (79%)	0.48
Chat online	203	64 (32%)	193 (95%)	0.33
Watch videos online	268	65 (24%)	259 (97%)	0.25
Buy merchandise online	148	26 (18%)	142 (96%)	0.18
Use social network sites	269	32 (12%)	259 (96%)	0.12
Listen to music on the computer	264	25 (9%)	260 (98%)	0.10
Play computer games	165	10 (6%)	161 (98%)	0.06

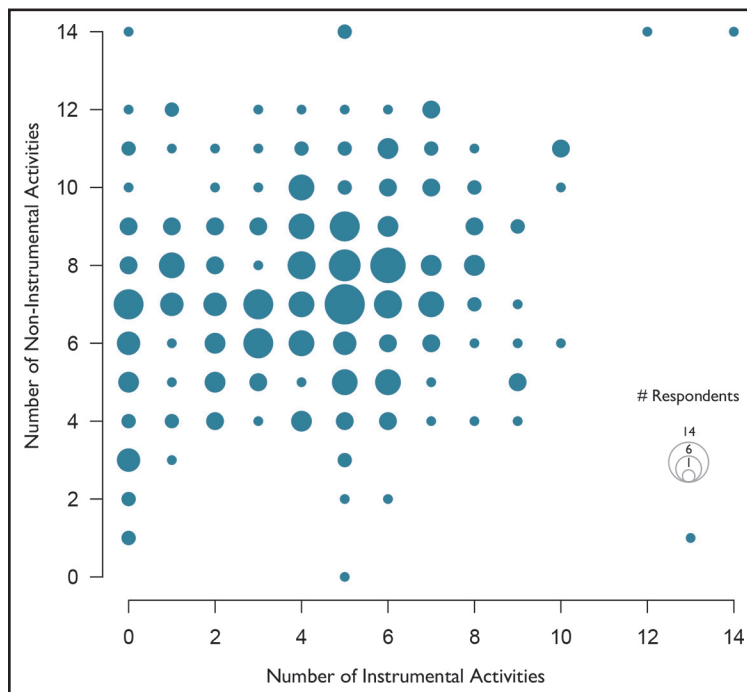


Figure 3. Scatterplot of number of instrumental activities compared to number of non-instrumental activities (n = 303).

respondents' performance on the CBE against how instrumental a user they were. Rather than struggling to impose deterministic categories for whether a respondent was an instrumental or a non-instrumental user based on specific activities, we started by plotting the total number of non-instrumental activities a participant performed against the total number of instrumental activities they performed (Figure 3). The size of the circles in Figure 3 represents how many respondents reported these numbers; the larger the circle, the greater the number of respondents who had the same counts. As part of Figure 3, the key in the lower right corner indicates the scale of number of people and size of circle.

From this scatterplot, we formed categories based on clusters. To gauge the distribution of

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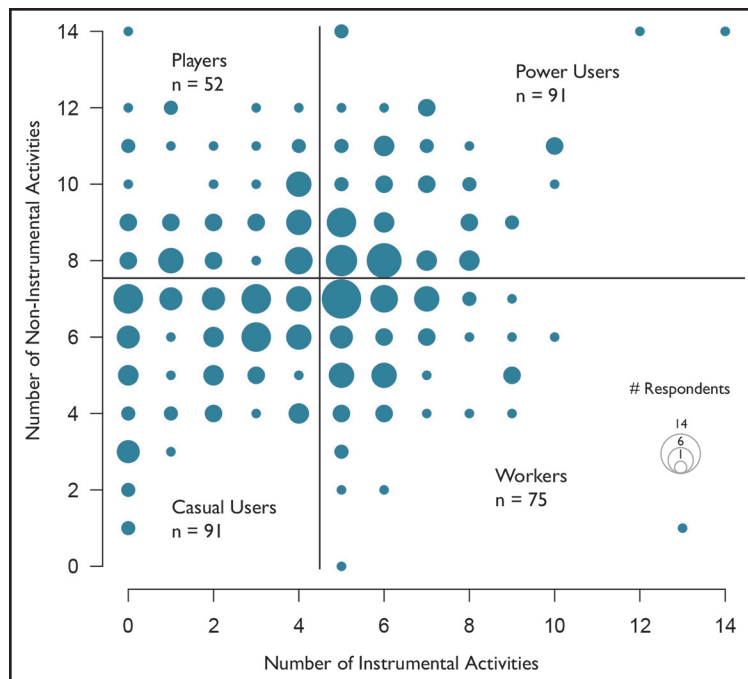


Figure 4. Respondent categories for identifying relative computer skill levels.

the mean for instrumental use. *Workers* reversed that pattern and reported above the mean for instrumental use and below the mean for non-instrumental use. *Power users* reported above the mean levels of both non-instrumental and instrumental use; we classified them as people who engaged with computers often, and we predicted that they would have the best performance measures on the skills test.

4.3 User Groups Characterized by Different Demographics

Figure 5 summarizes some key demographics for the four user groups. In the *power users* quadrant, we find many of the highly educated participants (vocational school, university, or higher). Female participants tended toward the middle, straddling the *casual users* and *workers* groups, indicating that they tend to do fewer non-instrumental activities. The youngest participants (ages 13–19) constituted most of the *players* group, indicating a higher degree of non-instrumental activity and a lower degree of instrumental activity. Finally, the users who lacked home access to the Internet or a computer constituted a narrow subset of the *casual user* group who engaged *only* in non-instrumental activity.

More than half (60%) of *casual users* and *players* were under 25 years old, compared to 35% of *workers* and 42% of *power users*. A Pearson chi-square test shows the age group differences are significant ($X^2(18, N = 299) = 46.689, p < .001$).

The largest number of participants had attained a high school education (39%), followed by college or university (35%), grade school (18%), vocational/trade school (7%), and no formal schooling (2%). A Pearson chi-square test shows that the education differences among all groups are significant ($X^2(15, N = 296) = 73.280, p < .001$). One notable difference is between the *players* and *workers* groups. In the *players* group, 57.7% of participants had, at most, attained a high school education, while in the *workers* group, 50.7% of respondents had, at most, attained a college or university education.

Of all the participants, 63% were male and 37% were female. A Pearson chi-square test shows that the gender differences are not significant ($X^2(3, N = 299) = 3.415, p = .332$). In other words, the user groups are roughly similar in gender composition.

We also asked the average years of computer experience for each group. *Casual users* had less experience (6.6 years) than *players* (8.4 years), *workers* (10.8 years), and *power users* (11.8 years).

our instrumental and non-instrumental users, we calculated the mean and median counts of activities. For non-instrumental activities, the mean was 7.3 and the median was 7.0. For instrumental activities, the mean was 4.4 and the median was 5.0. The split-points for both the mean and median had no functional difference in our later statistical calculations, so we used the mean.

In Figure 4, you see our labeled scatterplot with the four categories of users we derived from the data: 1) *casual users*, 2) *players*, 3) *workers*, and 4) *power users*. *Casual users* were those who did not perform many activities on the computer; they were below the mean for both instrumental and non-instrumental activities. *Players* reported above the mean level of non-instrumental use and below

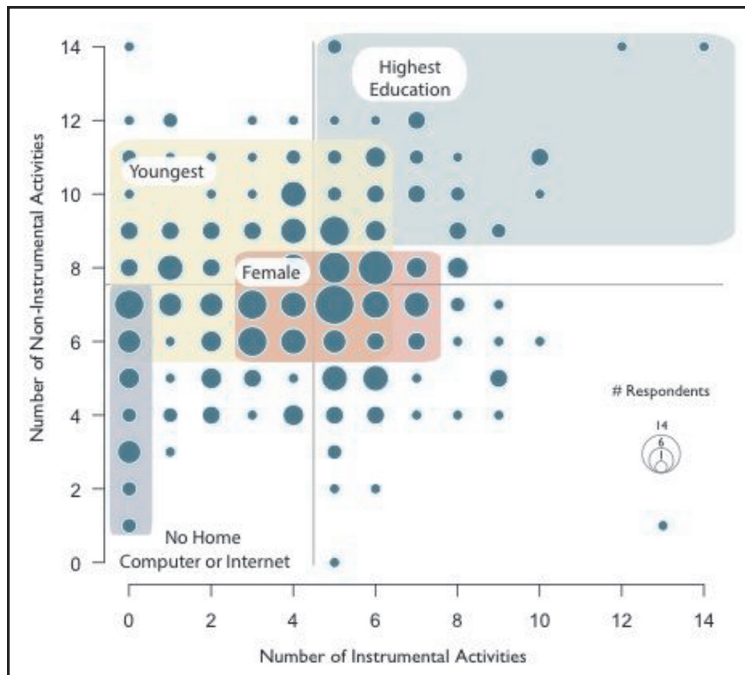


Figure 5. Demographic trends across user activities scatterplot.

We asked if participants received formal, informal, or self-training for any of their activities. The most prevalent type of computer training participants had received was informal training from friends and family. *Workers* (48.1%) were the most likely to receive formal training, followed by *power users* (38.5%), *players* (26.9%), and *casual users* (11.0%). *Players* (65.4%) were the most likely to receive informal training, followed by *casual users* (51.6%), *power users* (40.0%), and *workers* (36.0%). Finally, *players* (80.1%) were the most likely to self-train, followed by *power users* (74.1%), *workers* (72.0%), and *casual users* (70.3%). Participants were more likely to receive formal training in certain skills, such as using a spreadsheet (33%), creating documents (34%), or preparing presentations (31%) and were more

likely to be informally trained in other skills, such as watching videos (77%), listening to music (76%), using email (75%), or using social network sites (75%). Email and typing, skills important for a number of instrumental activities, were also primarily learned through informal training.

4.4 Evaluating Task Performance

After defining different types of users based on their instrumental and non-instrumental activities, we investigated what bearing these distinctions had with regard to their task performance on the CBE.

4.4.1 Overall Completion Results

Each task that participants attempted was scored as being Completed, Completed with Effort, or Not Completed. For the following analyses, tasks rated as Completed and Completed with Effort were combined because there were only a small number of tasks marked as Completed with Effort. Table 2 illustrates what percentage of those who attempted a task was able to complete it.

Overall task completion rates ranged from 27–93%. Across all tasks, *power users* had the highest completion rate. In most tasks, the *workers* group had the second next highest completion rate, except for bookmarking a webpage and finding a picture online. For these tasks, the *players* had the second highest completion rate. While *power users* generally performed better, there were some surprises in the completion rates. For example, when cutting text in a word processor, which may seem like a relatively basic word processing task, 25% of the *power users* failed to complete that task. The *power users* also had difficulty changing text format in a spreadsheet, with a completion rate of only 41%, even though they could do other basic tasks with spreadsheets such as searching and saving changes. The *players* closely mirrored the *workers* task performance for things like minimizing a window, bookmarking, and copying text. Overall, the *casual users* kept pace with the other groups in completion rates, except for tasks that required interaction with email in some fashion. Like the other three groups, they struggled with some of the spreadsheet-related tasks.

We ran contingency table analyses across the 16 tasks in the CBE, doing two versions of the comparisons. The first comparison involved the four levels (*casual users*, *players*, *workers*, and *power users*) versus the completion status of the task (*completed* versus *failed*). The second comparison looks only at the *workers* and

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Table 2. Task Completion Rate Overall and by User Group.

	N	Overall Completion Rate	Casual Users	Players	Workers	Power Users
Open word processor	290	85%	68%	84%	92%	96%
Open file in word processor	288	87%	74%	88%	92%	94%
Copy text in word processor	271	93%	84%	92%	96%	99%
Cut text in word processor	264	52%	36%	35%	52%	75%
Change font size in word processor	270	86%	70%	83%	90%	99%
Run spellchecking in word processor	266	77%	62%	65%	84%	93%
Save file in word processor	264	83%	66%	78%	90%	96%
Minimize word processor window	266	93%	83%	96%	97%	98%
Find picture on the Web	273	90%	79%	94%	93%	96%
Bookmark a Web page	213	75%	47%	82%	80%	94%
Replace a picture in word processor	269	79%	51%	83%	87%	94%
Send email for picture permission	273	75%	47%	71%	88%	92%
Find a room entry in spreadsheet	279	54%	43%	40%	62%	65%
Change format in spreadsheet	223	27%	15%	16%	31%	41%
Save changes in spreadsheet	273	83%	67%	81%	91%	93%
Email with an attached flyer	273	75%	47%	71%	88%	92%

players versus the completion status. We chose to look at these two groups because we were interested in seeing how the performance of those with a high count of non-instrumental activities might compare to the performance of those with a high count of instrumental activities.

For the contingency table analyses, we used either a Pearson chi-squared test (comparing all four user types) or a Fisher exact test (*workers* versus *players*). This gives a standard *p*-value for analysis. Additionally, a Cramer's V test of association was performed for all tests. The Cramer's V test is a nominal measure of the degree of association between task completion and the user groups. For example, if all *workers* completed a task and all the *players* failed, this would be a Cramer's V of 1, a perfect association. The V values also come with a *p*-value for determining significance. Table 3 summarizes the results of this analysis.

Analyses for all groups and all tasks showed measures of association at least 0.22 and significant, suggesting a low-to-moderate association of user group with performance. This suggests that how a participant performed is related to their user category. Analyses of the residuals for each group suggest that the significance of these results is driven primarily by two trends. First, the *casual users* show a large positive residual with regard to failure, while the *power users* have a large negative residual for failure. This means that the *casual users* showed a stronger-than-expected tendency to fail the task, while the *power users* showed a stronger-than-expected tendency not to fail at it. Given that these two groups had widely divergent performance results, we repeated the analyses with only the *players* and the *workers*.

4.4.1.1 **Players** Perform Comparable to **Workers**

When looking at only the *players* and *workers*, the two groups were found to perform equivalently on most of the tasks (i.e., no significant result as determined using the Fisher's exact test), as shown in Table 4. However, there were significant or trending differences on five of the 16 tasks: cut text ($p < .10$), use spellcheck ($p < .05$), find an item on a spreadsheet ($p < .05$), change spreadsheet formatting ($p < .10$), and email an attachment ($p < .05$). In these instances, *workers* were more successful than *players*. However, it still stands that *players* and *workers* showed no significant differences in completion of most of the tasks.

Table 3. Significance Testing Results for Task Success Comparing All Groups.

	<i>N</i>	$\chi^2(3)$	<i>p</i>	Cramer's <i>V</i>	<i>p</i>
Open word processor	290	29.482	0.000	0.319	<.001
Open file in word processor	288	16.886	0.001	0.242	<.01
Copy text in word processor	271	13.325	0.004	0.222	<.01
Cut text in word processor	264	29.113	0.000	0.332	<.001
Change font size in word processor	270	26.946	0.000	0.316	<.001
Run spellchecking in word processor	266	25.69	0.000	0.311	<.001
Save file in word processor	264	28.031	0.000	0.326	<.001
Minimize word processor window	266	16.368	0.001	0.248	<.01
Find picture on the Web	273	15.066	0.002	0.235	<.01
Bookmark a Web page	213	38.335	0.000	0.424	<.001
Replace a picture in word processor	269	46.52	0.000	0.416	<.001
Send email for picture permission	266	26.625	0.000	0.316	<.001
Find a room entry in spreadsheet	279	13.934	0.003	0.223	<.01
Change format in spreadsheet	223	14.589	0.002	0.256	<.01
Save changes in spreadsheet	273	22.571	0.000	0.288	<.001
Email with an attached flyer	273	50.317	0.000	0.429	<.001

4.4.1.2 Light Players Perform as Poorly or Worse than Casual Users

In addition to the four groups initially identified by the data, we decided to look at the performance of participants who reported doing only non-instrumental activities, i.e., those sitting along the *y*-axis. Because they had fewer than four instrumental activities, these participants were originally members of the *casual users* and *players* groups. Those solely non-instrumental users who were part of the *casual users* group were placed into a new group—*light players*. Those solely non-instrumental users who were part of the *players* group were placed into a new group—*active players*.

Light players ($n = 21$) were compared to the remaining members of the *casual users* group ($n = 61$) to see if there were any performance differences. Overall, the two groups performed equally (i.e., no significant result as determined using the Fisher's exact test) in most of the tasks. However, three tasks showed either significant ($p < .05$) or trending ($p < .10$) differences in which the *light players* group performed worse than the *casual users* group. These tasks were open a file in a word processor ($p < .01$), minimize the word processor window ($p < .10$), and send an email with an attached flyer ($p < .05$).

These results seemed to indicate that the fewer activities one performs on computers, the more limited are one's computer skills. Since the *light players* group has some of the most limited engagement with computers, it is unsurprising that they performed at an equal or lesser level when compared to the *casual users* group.

4.4.1.3 Active Players Perform Comparable to Workers

We compared *active players* ($n = 6$) to *workers* ($n = 74$) to see if the findings would be similar to the comparison of *players* to *workers*. Overall, there were no significant ($p < .05$) or trending ($p < .10$) differences between *active players* and *workers* on any of the tasks. This finding differs from the comparison of *players* to *workers*, where significant differences were found for six tasks. This suggests that users who engage *exclusively* in non-instrumental activities at a high level can develop performance skills at least as good as those who have a high level of instrumental engagement. In other words, non-instrumental uses are associated with improved computer skills in a way that is similar to instrumental uses. However, these differences may be the result of the relatively small sample size of the *active players* group, so the resultant findings should be considered preliminary.

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Table 4. Significance Testing Results for Task Success Comparing Players to Workers.

	n	Fisher's exact	Cramer's V	p
Open word processor	124	0.25	0.11	n.s.
Open file in word processor	123	0.55	0.06	n.s.
Copy text in word processor	119	0.44	0.09	n.s.
OCut text in word processor†	115	0.09	0.17	<.10
Change font size in word processor	118	0.40	0.10	n.s.
Run spellchecking in word processor*	117	0.03	0.23	<.05
Save file in word processor	115	0.11	0.16	<.10
Minimize word processor window	114	1.00	0.03	n.s.
oFind picture on the Web	119	1.00	0.02	n.s.
Bookmark a Web page	92	1.00	0.02	n.s.
Replace a picture in word processor	117	0.60	0.05	n.s.
Send email for picture permission	116	0.41	0.09	n.s.
Find a room entry in spreadsheet*	119	0.03	0.22	<.05
Change format in spreadsheet†	95	0.10	0.18	<.10
Save changes in spreadsheet	116	0.16	0.15	n.s.
Email with an attached flyer*	120	0.02	0.22	<.05

†p < .10, *p < .05

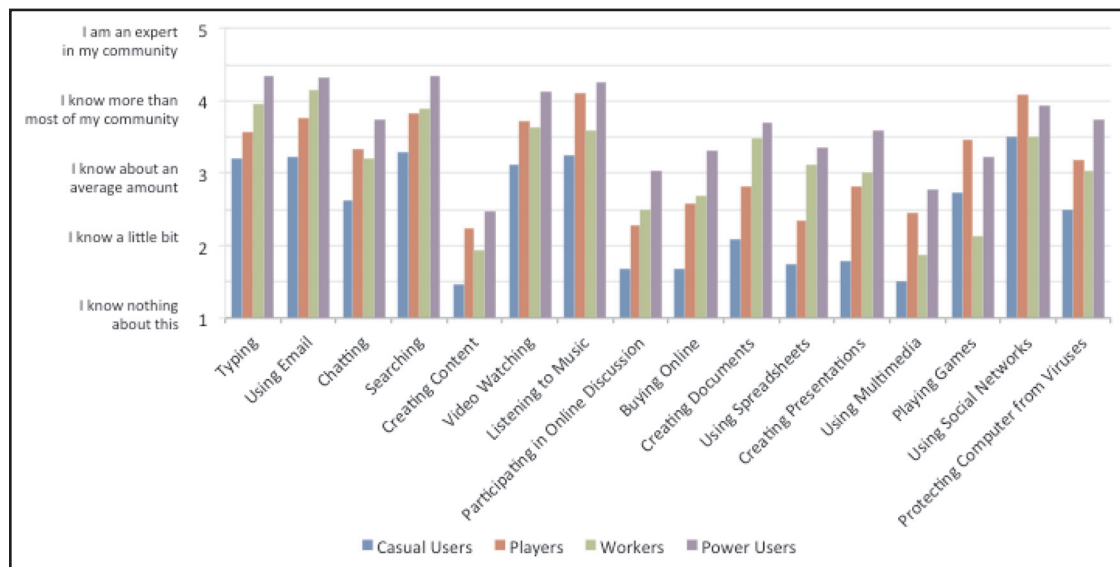


Figure 6. Self-reported skill levels of the four user groups.

4.4.1.4 Self-Efficacy and Skill Level

A secondary goal of this study was to examine the issue of self-efficacy with respect to demonstrated skill level. We asked respondents to self-rate their ability to complete a task in addition to having them perform tasks.

As Figure 6 shows, users' self-rating is consistent with previous findings on the reliability of self-rating (Hargittai, 2005); participants' self-assessment of their knowledge, with a few exceptions, were generally predictive of how they performed on the CBEs. Participants were asked to rate their knowledge on a scale from 1 (I know nothing about this) to 5 (I am an expert in my community) in the following skills: typing, using email,

Table 5. Completion Rates for Word Processing Tasks by Word Processing Proficiency Self-Assessment Score.

	Open Word Processor	Open File	Copy Text	Cut Text	Format Text	Use Spellcheck	Save File	Minimize Word Processor Window
1 (I know nothing about this)	65.6%	71.4%	81.1%	32.1%	68.5%	60.4%	62.3%	81.1%
2 (I know a little bit)	71.1%	78.4%	82.4%	23.5%	73.5%	63.6%	68.8%	90.6%
3 (I know about an average amount)	92.5%	91.0%	95.5%	55.6%	90.8%	80.3%	86.2%	93.9%
4 (I know more than most of my community)	96.9%	96.9%	100.0%	72.1%	95.2%	88.3%	94.8%	100.0%
5 (I am an expert in my community)	94.7%	93.0%	100.0%	64.2%	96.4%	88.9%	98.2%	98.2%
<i>n</i>	291	289	271	265	270	267	264	267
$\chi^2(4)$	39.31	23.92	26.67	32.84	29.05	21.01	37.07	19.19
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.01

Table 6. Completion Rates for Spreadsheet Tasks by Spreadsheet Knowledge Self-Assessment Score.

	Find Room	Change Format	Save File
1 (I know nothing about this)	41.5%	9.1%	64.9%
2 (I know a little bit)	58.8%	19.1%	84.0%
3 (I know about an average amount)	54.0%	30.0%	89.2%
4 (I know more than most of my community)	59.6%	52.6%	95.6%
5 (I am an expert in my community)	66.7%	45.5%	94.4%
<i>n</i>	279	223	273
$\chi^2(4)$	8.57	28.97	28.20
<i>p</i>	<.10	<.001	<.001

chatting online, searching for information, creating Web content, watching videos, listening to music, participating in online discussions, buying merchandise online, creating documents with a word processor, using spreadsheets, creating presentations, creating multimedia files, playing computer games, using social networking sites, protecting a computer from viruses.

For this study, we compared how participants assessed themselves in their ability to create documents in a word processor versus how they performed on word processing tasks. We also compared how participants assessed themselves in their ability to use spreadsheets versus how they performed on spreadsheet tasks.

What we saw across each task was a general pattern suggesting that those with higher self-rated proficiency scores performed better than those with lower self-rated proficiency, validating self-report (see Table 5). For example, 89% of those who rated themselves as word processing experts were able to use spellcheck, while only 60% those who rated themselves knowing nothing about word processing were able to use spellcheck.

Table 6 shows how participants rated their proficiency at spreadsheets and the completion rate for the

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Table 7. Word Processing Task Success vs. Instrumental and Non-Instrumental Use.

	Open Word Processor	Open File	Copy Text	Cut Text	Format Text	Use Spellcheck	Save File	Minimize Word Processor Window
Had not done activity	58.2%	66.7%	76.8%	28.6%	59.6%	50.0%	52.7%	76.4%
Had done activity only for non-instrumental reasons	93.1%	86.2%	92.3%	45.5%	84.0%	73.1%	84.0%	96.2%
Had done activity only for instrumental reasons	91.1%	91.8%	97.5%	54.7%	92.4%	86.1%	93.2%	98.3%
Had done activity for both instrumental and non-instrumental reasons	97.2%	97.2%	98.6%	68.6%	98.6%	87.1%	91.0%	97.1%
<i>n</i>	291	289	271	265	271	267	265	267

Table 8. Spreadsheet Task Success vs. Instrumental and Non-Instrumental Use.

	Find Room	Change Format	Save File
Had not done activity	41.0%	11.4%	68.4%
Had done activity only for non-instrumental reasons	52.9%	23.1%	86.7%
Had done activity only for instrumental reasons	62.6%	35.9%	91.1%
Had done activity for both instrumental and non-instrumental reasons	57.5%	37.9%	94.7%
<i>n</i>	280	224	274

spreadsheet tasks. We see a pattern similar to word processing; those who rated themselves most proficient at using spreadsheets generally performed better than those who rated themselves as less proficient.

While there is a relationship between self-proficiency rating and performance, the data also show that some of those who rated themselves as “I know nothing about this” or “I know a little bit” regarding a skill were, in fact, able to complete some tasks related to that skill. This could be due to the fact that some tasks, such as opening a file or copying text, transfer across multiple computer skillsets.

4.4.1.5 The Impact of Instrumental and Non-Instrumental Use on Task Completion Success

We evaluated whether a user reported doing an activity for instrumental or non-instrumental reasons had any relationship with task success. For all the word processing tasks (Table 7), those who had done the activity for only non-instrumental reasons performed better than those who had not done the activity. Those who had done the activity only for instrumental reasons performed better than both those who had not done the activity and those who had done the activity only for non-instrumental reasons. Those who had done the activity for both instrumental and non-instrumental reasons did better than all the other groups in all tasks, except saving a file and minimizing the window, where they performed slightly poorer than those who had done the activity only for instrumental reasons.

For the spreadsheet tasks (Table 8), the results were similar to the word processing tasks, as those who had done the activity only for non-instrumental reasons performed better than those who had not done the activity, those who had done the activity only for instrumental reasons performed better than both those who had not done the activity and those who had done the activity only for non-instrumental reasons, and those who had done the activity for both instrumental and non-instrumental reasons performed better than all the other groups in all tasks except “find room.”

5. Discussion

Study results suggest that people who spend most of their computer time in playful or leisure activities still find themselves with skillsets that can help them accomplish instrumental tasks.

5.1 *The Boundary Between Technology Use for Work and Play Is Blurred*

Our instrumentality index shows that common conceptions of work-focused or playful activities often fail to capture the richness and complexity of people's self-conception of their technology use. Each activity we identified had some level of instrumental value for our participants, underscoring that the boundary between using technology for work or play is blurred. This supports our approach to addressing instrumentality as reason-for-use, rather than delineating activities as being strictly instrumental or non-instrumental.

As mentioned previously, our participants had been introduced to technology in a variety of ways and they continued to use technology in a variety of ways: 62% of participants indicated they use the Internet for more than games. Although participants started using technology for certain reasons, many expanded their skills for new purposes. One participant explained that "schoolwork ended up demanding [that I use computers], and I began to learn more games." Inversely, another participant was first interested in technology "for gaming, but today it's more for studies." Another participant blurred the lines between instrumental and non-instrumental uses, explaining that she simultaneously "learned to install games, get on the Internet, and type." The diversity of experiences and different means of progressing to different uses indicate that users in Brazilian LAN houses have an expanding relationship with technology; they are initially exposed to it for certain reasons, then they gradually expand their knowledge to engage in many different uses. This is also suggested in the quantitative data: The groups with either more activities or the most years of experience (*players*, *workers*, and *power users*) were generally older than the group with the fewest activities and fewest years of experience (*casual users*).

5.2 *Non-Instrumental Use Transfers into Broader Computer Skill Development*

The CBE results suggest that people who largely use computers for gaming and social networking are generally as capable with computers as those who use them for instrumental purposes. Our findings also illustrate that people who largely use computers for non-instrumental purposes have gained skills that translate to common instrumental tasks. Although for some tasks, there was a discrepancy between the *workers* and *players*, the groups performed equally well on the majority of tasks, with the *power users*—those who engage in heavy computer use for both instrumental and non-instrumental purposes—predictably performing best on all tasks. The finding that *players* perform similar to *workers* suggests that engaging in non-instrumental activities is associated with the ability to perform instrumental activities. However, the results also suggest that more non-instrumental experience is needed to equal instrumental experience. Finally, the superior results of the *power users* in the CBE also suggest there may be an augmenting effect of engaging in non-instrumental activity in addition to instrumental activity, strengthening the relationship between non-instrumental use and skill development.

In the word processing and spreadsheet examples analyzed above, those who had performed an activity for non-instrumental reasons did better than those who had never performed the activity. Further, those who had done an activity for both non-instrumental and instrumental reasons performed better than those who had done an activity for only instrumental reasons. In these two cases, we see that adding non-instrumental use (or play) translated into greater skills. These results suggest that banning gaming or social networking in libraries or schools may cut off a pathway for gaining computer proficiency.

In other words, allowing community members to engage *frequently* with computers, irrespective of the *nature* of their online activity, is most likely to provide people the opportunity to gain skills commonly associated with employability. Policies that restrict certain activities, such as gaming or social networking are, in fact, interfering with skill acquisition that might translate into instrumental use.

5.3 *Self-Reported Abilities Accurately Reflect Performance*

Participants' self-reported abilities to complete tasks corresponded closely with their individual performance on those tasks. Each user group's collective self-reported ratings also mapped to the relative actual performance

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of each group. Finally, we see distinctions among the groups consistent with the types of activities that each group is likely to perform. For example, *players* had higher self-reported ability than *workers* in playful activities such as listening to music, watching videos, playing games, and using social networks. Together, these findings validate the reliability of using self-reported skill measures as a suitable proxy for observation-based skill evaluations in diverse contexts and suggest that researchers can use these measures to predict individual performance and describe differences among user groups.

6. Conclusion

Knowing how and where citizens first experience technology allows us to be thoughtful in policies and pathways that build on existing patterns of community life. This research focused on patterns of ICT use in public access facilities in Brazil, but the findings have implications for technology access programs elsewhere. Citizens access technology at increasingly diverse points, gaining and sharing technical knowledge along the way. Given the evidence that social networking or gaming activities are associated with skills that transfer into core computer use tasks, it seems useful to rethink definitions of what constitutes a valuable use of publicly funded resources, or even how to conceptualize pathways to gaining digital literacy.

Our study recognizes the value of playful and non-instrumental uses of technology in building a broader set of computer literacies, and the findings suggest that exposure to a variety of activities is important in computer skill acquisition. This means that policies banning certain activities could limit skill development. Ultimately, it is possible that users, as they fail to make distinctions about whether their ICT activity is instrumental or non-instrumental, may be providing schools, libraries, and other public venues a more authentic way to think about technology engagement and how to serve the public effectively. ■

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