Integrating mobile technologies to achieve community development goals: the case of telecenters in Brazil

Full paper

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ABSTRACT

Telecenters and mobile technologies are two of the main interventions for reducing the digital divide and are primary tools for information access. The rapid and pervasive adoption of mobile technologies had called into question the necessity of continued investment in telecenters; however, telecenters have been credited for serving different needs than private mobile technologies. Users and stakeholders are shaping new ways of access, and telecenters and mobile technologies can benefit from each other to address the issue of underserved communities' access to information. The literature has not yet extensively addressed this topic. The study presented in this paper has the twofold goal to understand (i) how mobile technologies are used by telecenters to enhance their services to the public, and (ii) whether telecenter operators perceive mobile technologies as viable instruments to innovate telecenters and pursue community development goals. Informed by the Theory of Social Representations (SR), the study presents responses to a questionnaire to Brazilian telecenter operators. Results show that telecenter operators have a positive attitude towards adopting mobile technologies to extend their telecenters' services and meet their development goals, especially in the areas of education, knowledge, information and communication.

CCS CONCEPTS

- **Social and professional topics** → User characteristics;
- **Human-centered computing** → Accessibility

KEYWORDS

1 INTRODUCTION

Telecenters - public spaces where the public can access computers, the internet, and other digital technologies - and mobile technologies are two interventions for reducing the digital divide in the field of Information and Communication Technologies for Development (ICT4D). [22,25,60] They are among the primary tools of access to information, which is considered a key element in promoting (self-) development [25,51].

Telecenters have historically gained prominence as primary instruments for bringing the benefits of ICTs to underserved communities where technological infrastructure is inadequate and costs of individual access is too high [61]. They are "*driven out of both a social and economic concern, rather than just being an internet café [...] Such centers provide a multitude of add-on benefits such as vocational training, e-services and meeting facilities — eventually becoming part of the community fabric*" [23].

After initial enthusiasm in the late '90s and early '00s, telecenters fell under criticism due to issues related to sustainability and high risk of failure [41]. Recently, the rapid and pervasive adoption of mobile technologies has called into question the necessity of continued investment in telecenters [8,44].

Nevertheless, telecenters continue to receive considerable attention from both practitioners and academics [19], and the number of telecenters has continued to grow, especially in developing countries (see: http://www.telecenter.org). Additionally, more recent studies show how they serve different needs and have not been replaced by private, mobile technologies [4,37,46]. Users and relevant stakeholders are shaping new ways of access [15,42], and telecenters and mobile technologies can benefit from each other and coexist within the access to Information and Communication Technologies (ICTs) framework.

Studies about how telecenters employ mobile technologies to offer their services, though, are still at an initial stage and

suggest that telecenters have either started to implement mobile-related services or that mobile services addressing socio-economic development are among their top priorities [29,42]. This study aims to fill this gap by analyzing perceptions and use of mobile technologies in the field from a bottom-up perspective.

In this paper, we present the results from a survey of telecenters in Brazil with the aim of understanding how mobile technologies are used to enhance telecenters' services to the public and whether telecenter operators perceive mobile technologies as viable instruments to innovate telecenters and pursue community development goals. This research employs the theory of Social Representations (SR) [34] to study operators' attitudes towards - and perceptions of - mobile technologies as related to telecenters' developmental goals.

2 TELECENTERS IN BRAZIL

In Brazil, telecenters are usually nonprofit places where the general public can access ICTs for free. They are typically equipped with computers, a variety of open and closed source software, and offer internet connection. Some offer computer classes and workshops with the intent to promote access to information and technology appropriation within the communities they serve. Numerous entities support Brazil's telecenters including government agencies, NGOs, public and private universities, institutes and foundations, and the private sector. They can be stand-alone facilities or attached to other venues (e.g.: schools, libraries, etc.) [36].

The Brazilian government started to implement telecenters in 1998, and Brazil is one of the countries that has been more active in their maintenance and diffusion [36]. Since then, the country has attempted to promote the spread of these centers through several programs. The most successful and longest operating one is called *Telecentros.BR*.[36]. The national program was established in 2009 under the coordination of the country's Ministry of Science and Technology and Ministry of Communications and Planning with the goal of promoting digital inclusion. In addition to providing communities with telecenters throughout the country, the program also encompassed activities aimed at inclusion and guidance, as well as provisions for maintenance of the telecenters such as continuous monitoring and training of telecenter operators.

Lately, however, the diffusion of mobile technologies has hindered the global allocation of funding to telecenters [20,32]. Brazil is no exception: An example of how funding is being allocated to "more mobile" projects may be found in the city of Vitoria [18]. Here, the mayor decided to diverge funding to create new and open Wi-Fi hotspots throughout the slums of the city. This kind of investment began from the assumption that slum dwellers and people residing in such underserved areas own mobile devices which would be enough to fulfill their access needs. In addition, the investment overlooked the complementary nature of mobile technologies and telecenters, seeing them rather as competing approaches to information access. [14,37,46]

In this paper, we approach mobile technologies as complementary to telecenters, and as existing or potential tools to innovate them. Perceptions and use of mobile technologies are also investigated to ascertain whether Brazilian telecenters' operators perceive these technologies as rival or advantageous to their goal as community development agents.

3 THEORETICAL FRAMEWORK

This study employs the theoretical frameworks of Social Representations (SR) [34] to investigate telecenters operators' conceptualizations of mobile technologies as: (i) instruments for development that have the same goals as telecenters, and (ii) viable technologies to innovate telecenters services in Brazil.

SRs are described as "systems of values, ideas, and practices" shared within a social group about specific "social objects" (i.e.: objects, places, phenomena, concepts as they are conceived in a specific group) [34:IX]. SRs have two functions: to enable people to interpret their world and to communicate with each other. SRs are a product of social interaction and negotiation between an individual and their social group [5,7] and imply a co-construction of meaning with no separation between how individuals perceive them and the socio-cultural context where their meaning is created [24].

When confronted with new phenomena, social actors tend to link them to categories of concepts that are familiar to them, through the processes of "anchoring" and "objectification" [34,35]. Within this process, competing and contradictory SRs of the same phenomenon can coexist within the same group, as people have individual agency and can be part of different social groups at the same time. SRs, then, can evolve and change over time [5,31]. For this reason, SRs are often defined as "dialogical", and—similar to cultures and languages—SRs are dynamic phenomena that are able to account for social change [30].

Scholars in social psychology have used different ways to to formulate SRs [57]. In this study, we employethe structural approach to SRs [1] which deals with their aspects of inter-individual differences, fluidity, and evolution over time, as well as consensuality and rigidity (crystallization). Abric [1] states that SRs are organized in two systems: a central nucleus (or core) and a peripheral system (periphery). The core is defined by a few cognitive elements that are responsible for its stability, rigidity, and consensuality. As it is most closely related to the history and collective memory of a social group, the core is more resistant to change. The central system generates the overall meaning of a social object and determines how other elements of the representations are organized. The peripheral system – organized as three concentric layers around the core – is composed by all the elements that allow for mobility, flexibility, agency and individual differences. The closer to the core, the more stable those elements are. In this way, peripheries permit the integration of individual experiences and contradictions as well as the heterogeneity of different social groups, contexts, and practices. They also provide the bases for SRs to evolve. While the core is molded around absolute and non-negotiable propositions, the peripheral system is conditional [1,38] and can

be useful to evaluate community development interventions, especially where rapidly changing phenomena – such as the ones that deal with ICTs – are happening [52].

Prior investigations have extensively studied communities' SRs of ICTs [12,45], and few studies have incorporated such a perspective into endeavors devoted to the use of ICTs for development [3,54]. The study of SR in the field of ICTs for Development (ICT4D) responds to the repeatedly claimed need for a deeper understanding of the often neglected socio-cultural dynamics underlying ICT4D initiatives [21,26,50,54].

In this study, SR is used to investigate how telecenters' operators perceive "mobile technologies," "telecenters" and "development." Investigating their conceptualizations of these three phenomena will shed light on whether and how the meanings associated with them overlap in order to understand whether operators see mobile technologies as a tool for development and as viable technologies to offer telecenters services. At the same time, investigating their perceptions about these phenomena permits the inclusion of contextual and grassroots elements in the study.

4 METHODOLOGY

This paper presents the results of a study which analyzes (i) the adoption of mobile technologies to offer services at Brazilian telecenters, and (ii) telecenter operators' perceptions of mobile technologies as possible instruments to innovate telecenters. The research was endorsed by Telecenter.org Foundation, the global umbrella organization gathering telecenters' networks around the world. Two main research questions guide this study:

RQ1: What mobile-related services do telecenters in Brazil currently offer?

> *RQ1a: What mobile-related services are offered?*

> *RQ1b: Which areas of development are addressed through these services?*

RQ2: What are telecenter operators' representations of mobile technologies in Brazil?

> *RQ2a: Is their social representation of mobile technologies related to their social representations of telecenters and development?*

These research questions were investigated through a questionnaire that was organized into two main parts:

1. In the first part, Social Representations of three verbal stimuli were investigated through an exercise of free association of words, following Abric's structural approach [1]. Respondents were asked to list the first five words that came to mind when thinking of "mobile technologies," "telecenters," and "development" in three different questions and in this order. By leaving the verbal stimulus "development" last, we sought not to influence operators' responses in a development-oriented fashion that they would not have thought of otherwise. Furthermore, the social representation exercise was presented to the respondent as a first task in the questionnaire so that operators' elicited responses were as little influenced as possible by other questions.

2. In the second part, telecenters' current offer of mobile services and the areas of development where operators see a greater possibility for them were surveyed through a series of multiple-choice close-ended questions (including the possibility to add missing choices for services we had not included). Questions and possible response choices were informed by the results of a pilot study done in the field [42], by a literature review on the topic of public access to ICTs spaces and mobile access, and by the feedback from experts in the field of public access to ICTs.

Distribution and submission of the questionnaire was performed online, and it was promoted to Brazilian telecenters in three ways: (i) through Telecenter.org Foundation's mailing list and web platform to reach telecenters in their network; (ii) by contacting other Brazilian telecenters' networks whose contacts were publicly available in anticipation of diffusion; and (iii) by collecting public contacts of Brazilian telecenters. However, public registries were mostly outdated and direct contacts with telecenters were rare. With our contact e-mail, we reached out and included - under the umbrella of the term "telecenter" - venues that offer access to ICTs to the public as defined by Sey [46] and Gomez [43].

After data were collected, the two parts of the questionnaire were analyzed through descriptive statistics to determine the services currently offered. In addition, social representations of the three concepts of "mobile technologies", "telecenters" and "development" were evaluated by applying a prototypical analysis [56] that permitted us to identify the structure of the representations– the central system and the peripheral elements - in line with Abric's structural approach [1,56]. According to the theoretical postulate of prototypical analysis, the words that are more frequently evoked and that present higher average evocation rank constitute the central elements of the representation, while the ones that are less frequently evoked and that present lower average evocation rank may be considered peripheral [56]. The analysis was performed in the original language (Portuguese) by means of the software Evocation 2000 [55], where the average rank was set at 2.5. The terms were translated in English after the analysis, to present them in this paper. The analysis of the data was not meant to present statistically representative results about Brazilian telecenters—rather, it conveys a qualitative reflection on the presence and perception of mobile technologies as compatible with telecenters' development aims.

5 RESULTS

Twenty-five completed questionnaires were collected from telecenter operators working in four out of the five different regions of Brazil, representing a diverse response pool in terms of the country's geographical differences (see Fig. 1). Among them, twenty-two operators reported they worked in urban venues, one in a rural area, one in a semi-urban area, and one did not specify. This distribution reflects the country's situation regarding both telecenters and mobile penetration [37], recounting a very weak presence in rural areas.
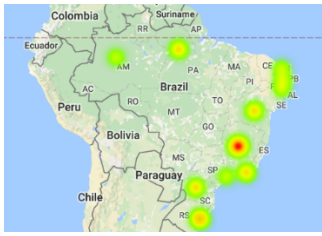
Figure 1 - Map indicating the location of Brazilian telecenters that participated in the study. Source: Google Maps.

Nineteen operators worked in public or governmental centers, and six in non-governmental ones. Ten operators came from independent structures (telecenters), six were attached to an educational institution (school or university), two to a library, and seven did not specify. The majority of centers targeted students as their main audience (13), followed by children (9), and young adults (8). Twenty-two of these venues offered internet access to the public, with an average of sixteen computers connected to the internet per center.

The operators averaged thirty-seven years of age, twenty-one had a higher education degree, and were balanced between male (14) and female (11). Operators were users of mobile technology: most had a personal smartphone (20), thirteen owned a basic cellphone along with another mobile device; almost half of them owned a tablet (12), and four had only a basic cellphone. Seven respondents indicated they owned all three technologies: a basic cellphone, a smartphone, and a tablet.

Among the twenty-five telecenters that participated in our study, only ten declared they offered mobile-related services such as tablets available for the public or printing from phones. All telecenters surveyed had a Wi-Fi network, enabling their users to access the internet from their own private devices. The second most offered service was classes on how to use mobile technologies. Figure 2 shows the complete list of services offered by the telecenters.
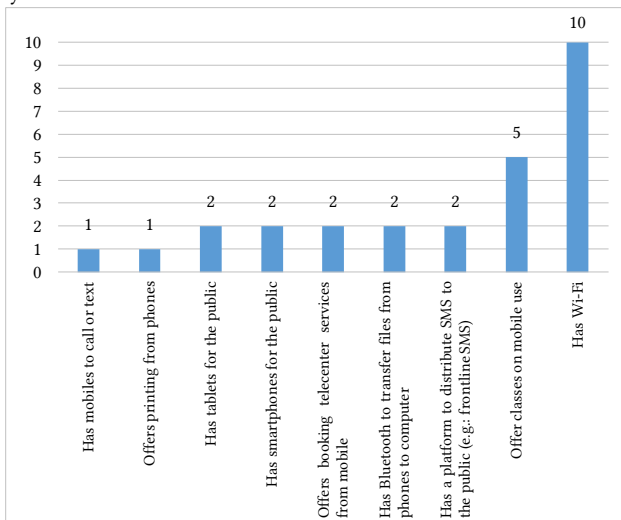
Figure 2 - Mobile-related services offered by Brazilian telecenters participating to our study.

From a list of thirteen, operators were asked to choose three areas of development where they saw mobile devices to have the most potential to support the goals of their telecenters, and to list them in order of importance. Based on operator responses, education was the most popular, both as a first choice (12) and for the majority of responses (22). Communication followed with a total of eighteen responses (6 first choice), and the job market was a distant third with ten responses (4 first choice). Figure 3 reports the full list of responses and highlights if they were first, second, or third choice.
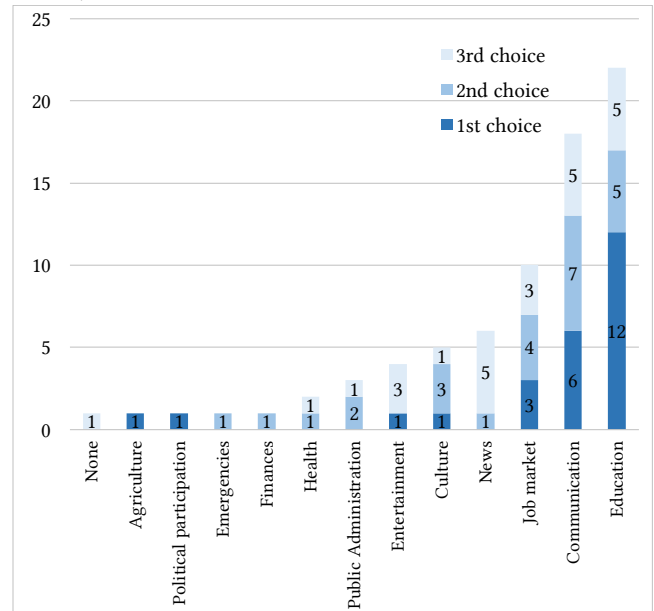
Figure 3 - Development areas in which operators see a greater role for the use of mobile technologies in supporting their work at the telecenters.

5.1 Magnetization Curves and MFM Characterization

5.1.1 Mobile Technologies

Results of the semi-automated prototypical analysis for the verbal stimulus evocation "mobile technology" (see Table 1) reveal that mobiles are certainly perceived as a technology that is *easy* and *practical*, as well as associated with terms like *agility*, *speed* and—understandably—*mobility*. These terms at the core of the perception of mobile technologies remind us of mobile technologies' most acclaimed characteristics: their "anytime," "anywhere," and "on the go" presence [27,47], and their ease of use, especially by new adopters [9]. The concept of *availability* is also mentioned several times, recalling how mobile technologies, because of their mobility and agility, are and make their user available all the time.

At the core of the representation of mobile technologies, we also see the term *knowledge* which we interpret as closely related to the terms *communication* and *information* found in the first periphery. If we look at the second and third peripheries, we can see that mobile technologies are also associated with learning, information exchange, management, and communication. Mobile technologies are an important instrument for people's "information behaviors" [39] such as keeping in touch with family and friends, professionally networking, or for different kinds of learning. Similar terms in the second and third peripheries support these statements: *study, research,* and *education* were mentioned and are found in the peripheries.

Terms referring to the technology itself are also mentioned at the core and first periphery of the verbal stimulus: *cellular, tablet* and *Wi-Fi* are the most frequently mentioned. If this, initially, might not seem to add meaning into the representations of mobiles, it is certainly remarkable for confirming what technologies telecenters' operators in Brazil considered when thinking of their offer of mobile services and when thinking of mobile technologies in their community telecenters' context. At the same time, terms related to technologies are not prominently related to terms describing mobiles' characteristics and uses.

Other interesting concepts are encompassed and repeated within the second and third periphery. Terms appearing at the peripheries indicate their meaning is not yet crystallized in the main representation of the social object at stake. At the same time, their presence can make their way into a more shared representation and has the potential to become socially shared. First, mobiles as a way to access ICTs and information are depicted by the appearance of terms such as *access, connection, connectivity,* and *internet*: in this sense, mobile technologies seem to undertake the same function that telecenters do, permitting people access to information as theorized in the literature [11,49].

Beyond the mere technical access to the internet, the term *access* is also connected to *inclusion*, indicating that operators problematize access not as a mere technical capacity, but as a more complex issue that encompasses skills and opportunities. Both terms are present in the representation of telecenters, indicating a close connection between the two social objects.

The concept of communication, present in the first periphery of the representation, is restated in the third periphery with references to *contact, Facebook* and *Whatsapp,* terms pointing to social networking activities, which suggests that people are used to engaging in these activities via their mobiles. Reference to *global* is also connected to the possibility of mobile technology's extending networks and enabling people to keep in contact over a wider range, especially when mobiles are connected to the internet through data plans or via Wi-Fi.

Finally, mobile technologies are connected to the concepts of *innovation* and *entrepreneurship*. Their *communication* functions, their mobility and speed, and their networking capacity establish the perception of them as an aid for business creation. Table 1 summarizes the results for the core and first periphery of the verbal stimulus "mobile technologies."

Table 1 - Prototypical Analysis for Mobile Technologies. Results for the core and 1st periphery of the verbal stimulus are presented, including the translation into English of the original terms in Portuguese, and the frequency and average rank of each term. Only the terms of the 2nd and 3rd peripheries presented in the analysis are presented in the table.

Term	Frequency	Avg. rank
Core: frequency is >= 3 and avg. rank is < 2.5		
agility	3	2.333
cellular	4	1.000
knowledge	3	2.333
ease	9	2.111
mobility	4	1.000
practicality	5	2.400
speed	7	2.286
1st Periphery: frequency is >= 3 and avg. rank is >= 2.5		
communication	3	3.000
availability	3	4.333
information	7	3.143
tablet	4	2.500
wi-fi	3	3.000
2nd Periphery: frequency is <3 and avg. rank is <2.5		
data	1	2.000
study	1	2.000
globalized	1	2.000
internet	2	2.000
online	1	2.000
research	1	1.000
usability	1	1.000
3rd Periphery: frequency is <3 and avg. rank is >=2.5		
accessibility	2	4.000
access	2	2.500
connected	1	5.000
connectivity	1	3.000
connection	1	5.000
contact	1	4.000
education	1	5.000
entrepreneurship	1	3.000
Facebook	1	3.000
training	1	5.000
inclusion	1	5.000
innovation	1	5.000
integration	2	4.000
modernity	1	3.000
network	1	3.000
networks	1	5.000
Whatsapp	2	5.000

5.1.2 Telecenters

Results of the verbal stimulus evocation "Telecenters" (see Table 2) reveal a multifaceted image of these venues. The concepts of *access* and *accessibility* appear, connected to the concepts of *inclusion* and *opportunity*. These ideas are at the core of telecenters and their movements since they were first

conceptualized [28], and their presence is still the core of their representations. These same concepts are found in the representations of "mobile technologies," even if only in their periphery.

The *internet* is the main technology that enables access and inclusion, connected in the second and third periphery to terms such as *connection* and *computer*. Compared to the representations of mobile technologies where mobility was a noted concept, the representation of telecenters, while also connected to the internet, focus more on terms related to physical spaces and infrastructure (e.g.: *library, parks, laboratory*, all found in the second and third peripheries). Descriptions of telecenters do not mention mobile technologies.

Telecenters in the literature are often presented as educational venues [10,40]. Not surprisingly, *education, knowledge,* and *information* are at the core of their representation, reinforced by terms such as *formation, capacitation, research,* and *culture* in the second and third periphery. This concept of education is present also – even if to a lesser extent – in the representation of mobile technologies.

Unique, however, to the conceptualization of telecenters are the ideas of *community* and *interaction* that depict them. These concepts are only present in the periphery of the representation, but they are referred to a plethora of times, causing them to appear as prominent. The idea of *community* is connected to *interactions* with *people* and *friends* at the *telecenters*, and also to a broader idea of *integration, cooperation*, acceptance of *diversity*, all the way to *democracy* and *citizenship*. The underlying idea is that telecenters are places for everybody where the community can practice quality citizenship and learn about good government practices. *Interaction* is also connected to the *help* received by the communities at the telecenter, help that is done in the form of *tutoring* and *free* of cost.

While some negatively denoted terms are present – some connected to the broader community reality (*absence*), some to the people using the venues (*abandonment*), and some to the technical and financial issues that telecenters face (*expensive, limited, slow, frustrating*) – the majority of the terms give an image of telecenters as affordable places for the community to meet and receive help, *study, apply for jobs*, and learn something useful for their *professions*. Finally, they seem to be an inclusive place, working for the communities they serve to foster integration, diversity, *development* and *progress*.

This last concept of development and progress – present also through the words *investment, economy*, and *projects*, relates telecenters directly to the analysis of the conceptualization of development. Table 2 summarizes the results for the core and first periphery of the verbal stimulus "Telecenters."

Table 2 - Prototypical Analysis for Telecenters. Results for the core and 1st periphery of the verbal stimulus are presented, including the translation into English of the original terms in Portuguese, and the frequency and average rank of each term. Only the terms of the 2nd and 3rd peripheries presented in the analysis are presented in the table.

Term	Frequency	Avg. rank
Core: frequency is >= 3 and avg. rank is < 2.5		
accessibility	5	2.400
access	7	2.000
inclusion	11	1.636
opportunity	3	2.333
1st Periphery: frequency is >= 3 and avg. rank is >= 2.5		
knowledge	5	3.200
education	3	4.000
ease	3	2.667
information	5	3.400
internet	3	3.333
2nd Periphery: frequency is <3 and avg. rank is <2.5		
abandonment	1	1.000
help	1	2.000
libraries	1	1.000
computers	1	2.000
communitarian	1	2.000
connection	1	2.000
democracy	1	2.000
digital	2	1.000
training	1	2.000
free/gratuitous	1	1.000
gratuity	1	1.000
interaction	1	1.000
projects	1	2.000
public	1	2.000
responsibility	1	1.000
3rd Periphery: frequency is <3 and avg. rank is >=2.5		
friends	1	5.000
absence	1	4.000
capacitation	2	3.000
citizenship	1	3.000
communities	1	5.000
cooperativism	1	5.000
culture	1	5.000
democratic	1	4.000
development	1	4.000
diversity	1	4.000
economy	1	5.000
study	1	3.000
frustration	1	5.000
gratuity	1	4.000
informatics	1	3.000
integration	2	3.000
investment	1	5.000
laboratory	1	3.000
business	1	4.000
parks	1	4.000

research	1	4.000
possibility	1	3.000
professionalization	1	3.000
progress	1	4.000
public (plu, f.)	2	3.000
public (plu, m.)	1	4.000
socialization	1	5.000
technology	1	3.000
work	1	4.000
tutoring	1	3.000
job opening	1	3.000

5.1.3 Development

The semi-automated prototypical analysis for the verbal stimulus evocation "Development" (see Table 3) shows how it interconnects to both "mobile technologies" and "telecenters." The concepts of *education* and *information* are already at the first periphery of the idea of development: these concepts not only are present in the three verbal stimuli, but in each of the three of them are present in between the core and the first periphery. Telecenter operators recognize how education and *access* to information are fundamental to empower people and communities since they provide the *possibility* for individuals to enable their own development. The terms are recalled in the second and third periphery by the terms *communication* and *knowledge*, also present in the other two verbal stimuli.

Technology is also at the core of operators' representation of development. However, their representation of development does not seem to give much thought to technological determinism [6]. Rather, technology appears to be seen as an enabler to access and learning. Operators firmly believe in the mission of their telecenters as instruments to create *opportunities* and, ultimately, to contribute to the development of their own communities.

Entrepreneurship and *planning* are also at the core of the representation of development, and they appear in the peripheries of "mobile technologies" and "telecenters," respectively. These ideas connect development to both individual responsibilities and collective ones. In the second and third peripheries, these terms are related on the one hand to terms such as *business*, *investment*, and *employment*, and, on the other hand, to terms as *society*, *government*, *projects*, and *cooperation*.

The conceptualization of development as a collective phenomenon is shown in the peripheries also by several terms that are related to each other: *citizenship*, *solidarity*, and *globalization*, together with *sustainability* and *participation*, recall a sense of *responsibility* both at a national and international level. The idea of development as something that is meant for all and reached only collectively is recalled also by the terms *equality*, *respect*, *inclusion*, *integration*, *emancipation*, *partnership*, *union*, and *consent*.

Overall, these ideas connect to a sense of *justice* that is also mentioned in the peripheries. At the core of operators' representation of development, we also find human values such as *health*, *quality*, and *life*. Finally, development is also connected

to wealth and economic independence: the terms *economy*, *income*, and *job* are mentioned in the first periphery, while in the second and third peripheries we find the terms *growth*, *strengthen*, and *evolution*—therefore including in the representation the idea of development as linear progress. Table 3 summarizes the results for the core and first periphery of the verbal stimulus "Development."

Table 3 - Prototypical Analysis for Development. Results for the core and 1st periphery of the verbal stimulus are presented, including the translation into English of the original terms in Portuguese, and the frequency and average rank of each term. Only the terms of the 2nd and 3rd peripheries presented in the analysis are presented in the table.

Term	Frequency	Avg. rank
Core: frequency is >= 3 and avg. rank is < 2.5		
access	3	2.333
economy	3	2.333
entrepreneurship	4	2.250
opportunities	3	2.333
planning	3	1.667
technology	3	2.333
1st Periphery: frequency is >= 3 and avg. rank is >= 2.5		
growth	3	3.000
education	4	2.750
lack	4	2.500
information	3	3.333
possibilities	3	2.667
quality	4	3.500
income	4	2.750
health	3	3.667
work/job	3	3.000
life	3	4.000
2nd Periphery: frequency is <3 and avg. rank is <2.5		
internship/learning	1	2.000
capacitation	1	1.000
citizenship	1	2.000
community	1	1.000
knowledge	1	2.000
cooperativism	1	2.000
rights	1	2.000
strengthening	1	1.000
equality	1	2.000
integration	1	1.000
intellect	1	1.000
interaction	1	2.000
internet	1	1.000
justice	1	1.000
necessity	1	1.000
partnership	1	2.000
respect	2	1.000
solidarity	1	1.000
solidarities	1	2.000
3rd Periphery: frequency is <3 and avg. rank is >=2.5		

capacity	1	3.000
communication	1	4.000
consensus	1	3.000
growing	1	4.000
culture	1	5.000
digital	1	3.000
money	1	4.000
distribution	1	4.000
economic	1	4.000
emancipation	1	3.000
job	2	3.500
team	1	4.000
evolution	1	3.000
strength	1	4.000
globalization	1	3.000
government	1	4.000
inclusion	2	4.500
interactivity	1	5.000
investment	2	4.000
improvement	1	4.000
business	1	5.000
opportunity	1	3.000
participation	2	2.500
policies	1	4.000
project	1	5.000
responsibility	1	3.000
social	2	3.000
solidarity	1	5.000
solidarities	1	4.000
success	2	3.500
sustainability	2	3.000
sustainable	2	3.500
union	2	3.500
valorization	1	5.000
will	1	4.000

6 CONCLUSIONS

Mobile technologies are spreading worldwide due to the lower cost of smartphones and tablets, as well as the ability of wireless infrastructures to deliver far-reaching coverage. Although mobile devices still cannot provide the same experience and functionality as personal computers, mobile technologies promise to bring a billion or more people online [33]. As Donner and Walton claim [16], the arrival of these private, and accessible mobile technologies have implications for telecenters serving developing countries. Some practitioners have suggested that telecenters are irrelevant in the age of mobile internet (see [2,44]), however, as we posit in this paper, telecenter operators perceive mobile technologies as complementary rather than competing tools to these centers. Thus, our paper expands upon the existing, but thin literature (see [37,42,59]) that aims to understand the role of both telecenter and mobile technologies in achieving developmental goals.

The results from the case study in Brazil demonstrate that telecenter operators show a positive attitude towards adopting mobile technologies since they perceive such devices as a good

way to extend their telecenters' services and goals. One of the areas in which they see a greater potential for this is *education*, which appeared at the core of the SRs of all of the three verbal stimuli- telecenters, mobile technologies, and development— indicating an interconnection in the conceptualization of these three concepts within education. Also, the DIT analysis shows that operators see a greater role for mobile technologies in their work to address *education* and *learning* activities. As noted in section 5, many of the surveyed centers target students, children, and young adults as their main audience, so educational uses for mobile technologies may not be a surprising interest for telecenter operators. The results also show telecenters are seen as educational venues, not surprising as scholars and practitioners have been researching and developing learning activities in these centers (see [10,40]). However, some scholars have claimed that mobile technologies, such as smartphones, are seen as a distraction and a competitor to learning for classroom performance (see: [48,58]. Thus, our findings not only bring a different understanding of the engagements of mobile technologies in learning activities, but also suggest that operators take advantage of the telecenters' technological apparatus and flexible environment to promote a smoother integration with mobile technologies- such flexibility and apparatus are not always found in traditional classrooms.

Despite the operators' positive attitudes toward mobile technologies, our DIT analysis suggests that they may need more experience (*triability*) in offering services using mobile devices so as to better offer such services in their centers. The integration of mobile technologies in telecenters is still in its initial stage, and as claimed by Nemer [36], in Brazil, some telecenter operators are still reluctant to allow users to employ their mobile devices in the centers. Mobile technologies, when connected to either the telecenters' Wi-Fi or computers, could increase the efficacy of the usual free one-hour slot in telecenters. Also, tablet and smartphone storage could cut down on the cost of printing school material, one of the most requested services at telecenters in developing countries [53]. This may give users some advantages since telecenters are predominently located in low socioeconomic areas.

Telecenter operators may benefit from specific training and encouragement oriented towards the opportunities presented by the integration of mobile technologies. According to Donner and Walton [16], with the proper skills, they could help telecenter users save time waiting for shared resources and encourage them instead to seek resources online on their mobile devices. Operators also need new skills to help mobile-centric users with configuring email on phones, searching, cloud storage, and local caching, as well as less technical (but critical) skills, such as managing time, contacts, online reputation, use of mobile-accessible resources for leisure and school (p. 13), and information literacy [13]. Hence, promoting explicit rules about the use of such devices could improve the experiences of those facing digital inequalities.

Whilst we agree that mobile technologies afford new possibilities to offer more innovative services, we acknowledge that the simple use of these devices will not necessarily help

telecenters achieve their development goals. Their integration should be followed by conscious appropriation [17] and through learning activities [13].

Telecenter operators in Brazil demonstrate such awareness and criticality when (thinking of) integrating mobile devices. This is reflected in the way they conceptualize "mobile technologies" and "telecenters" as emerging in the SR analysis (see sections 5.1.1 and 5.1.2). Technology and technological artifacts are, indeed, present at the core and first periphery of the analysis of the two verbal stimuli (see: *tablet* and *Wi-Fi* for mobile technologies, and *internet* for telecenters). Nevertheless, their presence is not prominent, whereas the concepts of *access*, *education*, *knowledge*, *communication*, and *information* are more manifest. Similarly, the term *technology* is present at the core of operators' conceptualizations of "development", but it is surpassed in number by the terms *access* and *opportunities* (at the core), and *education* and *information* (in the first periphery).

7 CONCLUSION

Telecenters and mobile technologies, initially regarded as competitors, then as complementary ways to bridge the digital divide, are being used to provide new ways of access to information and ICTs. This paper presents the results of a study conducted in Brazil through a questionnaire informed by the Theory of Social Representations [34].

This study uncovers a reality not highly investigated in the ICT4D literature: the presence of mobile within telecenters' services. Results indicate that telecenter operators in Brazil are at an initial stage of adopting mobile technologies to offer their services. Operators also show a positive attitude towards mobile technologies' integration in their telecenters, seeing them as compatible with and strategic in their centers' function of enabling community development. Operators are especially focused on their use to promote education, knowledge, information, and communication activities.

The exploratory nature of this study did not allow for a deep understanding of the quality of the services already offered and of telecenters' most critical barriers when dealing with mobile services. Thus, this research will continue on a second phase that will investigate - through a qualitative approach – telecenters' education and information literacy services, as well as opportunities and challenges to be addressed to enable telecentres to fully leverage mobile technologies' potential.

As this and previous studies have shown, the diffusion of mobile technologies has not fully compensated for the lack of access to technologies and to the skills divide confining many marginalized communities in the Global South [37,46]. And whilst mobile technologies may afford new possibilities for offering more innovative services within telecenters, we acknowledge that the simple use of these devices will not necessarily help telecenters achieve their development goals. We advocate for a stakeholders' investment in policies and activities that enhance operators' skills, awareness, and appropriation of these technologies so they may be conducive to

the deployment of relevant services for the development of communities. We support a different approach to the one enacted by the mayor of Vitoria, which overlooks the actual technology capabilities of the inhabitants of the city in terms of access, and we endorse a complementary, non-competing approach to telecenters and mobile technologies.

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