Article

JoLIS

Journal of Librarianship and Information Science
2020, Vol. 52(4) 1197–1208

DOI: 10.1177/0961000620907970
journals.sagepub.com/home/lis
SAGE

Digital local information services in developing countries: Evidence from Colombia

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Abstract

This exploratory research identifies and investigates factors that affect the delivery of local information in a developing country. The service provider and 195 local institutions based in Medellin, Colombia collaborate through an online portal, *Infolocal*, constituting a local information landscape (LIL). The study implements a conceptual framework for the LIL and highlights deficiencies in traditional local information service models. A Delphi study was conducted with global experts of local information services (LIS) in order to refine the traditional Unified Theory of Acceptance and Use of Technology model constructs for the *Infolocal* information service. Second, a survey was developed based on the revised categories (effort expectancy, performance expectancy, social influence, facilitating conditions, organisational support, and affective commitment) and disseminated to the local institutions to assess their perceptions of the service. This data was then evaluated using exploratory factor analysis. The study found that theories of technology acceptance were insufficient in explaining the disjunctions in the information landscape of this service. This study contributes to closing a gap in understanding the perceptions of LIS practice from the perspective of institutions that engage directly with citizens' technology acceptance and use behaviour in a multilevel relationship. This article captures, compares, and analyses the disjunctions between the theoretical frameworks as espoused by experts and the practices of LIS.

Keywords

Colombia, Delphi study, exploratory factor analysis, information deserts, local information landscape, local information services

Introduction

A local information service (LIS) generates, gathers and redistributes information from affiliated partners often through an online portal. Based in Medellin, Colombia, a private sector organisation formed a collaboration with libraries, small museums, theatres and community centres (herein, 'local institutions') to deliver information about local events to residents. *Infolocal* began in 1991 as a paper-based, user-focused system. It is one of oldest functioning local information services in Latin America and served as a model for information practice across the continent (van Klyton and Castaño-Muñoz, 2017). The OECD defines local information as digital or print materials generated by professional or non-professional mechanisms deemed *relevant* to local communities. LIS is often tied to linguistic and/or cultural events and, when shared, can generate revenue and has a unifying effect on local communities (López et al., 2014).

The Colombian Government increased ICT investment and deregulated Internet service provision (Congreso de la República de Colombia, 2011), reshaping the local

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information landscape (LIL), particularly for how people access information and even that which was considered 'local'. This called into question the relevance of local institutions as perceived and lived spaces of local information (López et al., 2014), stymieing the traditional LIS model (Sey et al., 2015). End users began accessing information through smartphones, inadvertently circumventing *Infolocal*'s purview. Users' expectations gap also emerged as smartphone technology outpaced the online portal, the perceived value of *Infolocal*, and, by extension, the value of the local institutions, creating 'information deserts' within the landscape (Evans, 1994).

Surprisingly, little is known on the perspectives of local institutions that provide locally-relevant information to the portal. As critical intermediaries of information practice, these institutions observe the patrons' technology acceptance and usage behaviour. In terms of process, *Infolocal* receives information about an event, verifies it by searching within the channels of the hosting institution, digitalises it, and then disseminates it to a total of 686 institutions in print and on the digital platform (See Appendix A for the list of 34 identified categories of institutional recipients).

We begin with the premise that local institutions face a duality of purpose: they have an imperative to fulfil the needs of constituencies to maintain relevance as a community-building source, and they must maintain a collaborative relationship with *Infolocal*. This duality challenges the mainstream technology usage and acceptance models (Davis et al., 1989). The institutions' relationship with *Infolocal* is mediated through their perceptions of end users' technology usage, which affects the local information landscape (Lee and Butler, 2019; Lloyd, 2010). The success of *Infolocal* becomes contingent on a multilevel, collaborative relationship between the local institutions and the preferences of end users.

Technological advancements can disrupt existing information landscape and challenge existing theories of LIS practice and the opinions of 'expert practitioners' for understanding the actual practice. This case illustrates how technological change can produce information deserts and a fractured information landscape. We test this hypothesis through a two-stage analysis using a two-round Delphi study involving experts based around the world who make intellectual contributions to the practice of LIS. These participants identified and prioritised the factors that they felt enabled effective local information practice. The results were used to augment the traditional technology acceptance model (TAM). The revised constructs then formed a survey, which was distributed to 195 institutions. The responses were analysed using exploratory factor analysis (EFA). The data identified disjunctions between the theorised and actual LIS practice and to some extent exposed a degree of fragmentation of local information (Lee and Butler, 2019). Disjunction in this context can be defined as changes in people's circumstances that 'cause the disruption of familiar and certain information landscapes' (Lloyd, 2017: 36) that, in fact, necessitate a reconceptualisation of information practice and information behaviour in society. The structure of the article is as follows: the literature review examines the interrelated concepts of information landscapes, information deserts and practices, and technology acceptance theories. This is followed by the methodology, findings and the conclusion and recommendations.

Literature review

Local information landscapes, information deserts and information practices

LIS studies (Baron and Gomez, 2012; Bedoya Mazo, 2011; Betancur, 2002; Ospina, 2018; Sabelli, 2008; Saumell i Calaf, 2002) largely ignored the notion that practices of LIS occur as an interplay between the physical spaces of the institutions, technology, people, and local information itself. This information landscape represents intersubjectively created spaces that result from 'human interaction, where information is created and shared and eventually sediments as knowledge' (Lloyd, 2010: 9). Landscapes are constructed from values systems, contextualised understandings, and practices that generate situated knowledge and reinforce interactions between people (Lloyd 2006: 581). Information landscapes act as an 'informational ecology', where information use and creation occurs holistically from 'the enterprise level to the personal level' (Skovira, 2004: 309). The landscape becomes a holistic and multidimensional system (Skovira, 2004), intertwined within social contexts of the people using the information, producing diverse materialities of information and altering information practices and information-seeking behaviours (Lloyd, 2017).

The confluence of sources, pathways, and practices of local information erodes the presumed singularity of purpose of LIS and can result in information deserts and fractured landscapes (Evans, 1994; Lee and Butler, 2019; Lloyd, 2006), bottlenecks that emerge in information sharing, owing to capacity deficits on where to find useful information (Evans, 1994). Information deserts are spaces of information inequality that are social and material in nature and are a 'by-product of organisational strategies or because of the nature of particular information types' (Lee and Butler, 2019: 10). Deserts also emerge if users' expectations of a technology are not met (Gibson and Kaplan, 2017) or through ICT development initiatives (Lloyd, 2017).

Lee and Butler (2019) identified three elements of LIL including community characteristics, the local information landscape itself and community outcomes. This study will focus on two of the seven community outcomes: equality in information access and residents' knowledge about

information technology, because there is a direct connection between inequality in information access, residents' knowledge, and information deserts, particularly with respect to the network of local institutions that supports this LIS as information intermediaries. As 'carriers' of the social process of technological development (Bijker, 1997), these institutions form a critical link between the end users and the service provider and offer insights into the broader effects of technological change in society. AS intermediaries, they facilitate learning about technology through the provision of a space for constituents. They interpret and develop expectations about the system through their interactions with end users that, in theory, inform *Infolocal* through feedback mechanisms. Lastly, they are brokers who negotiate with *Infolocal* on behalf of local users and articulate changes in the demand for and usage of technology (Schot et al., 2016).

Lee and Butler's (2019) framework does not explicitly consider power relations. Skovira (2004: 309) argues that frames of information use 'bound and structure' a landscape, hence, end users can and do exert power over the landscape. Leonardi (2013: 69) argues that once the technology has 'left the hands of the developers', the interplay of the social and material produce 'perceptions of the utility or impediment, of affordance or constraint' for it. As such, end-user autonomy can create disjunctions between the theorised practice of information management and the actual practice of LIS.

Technology acceptance

Practitioners and researchers agree on the importance of technology acceptance for analysing and predicting technology use (Davis et al., 1989; Venkatesh and Bala, 2008; Venkatesh and Davis, 2000). The technology acceptance model (TAM) has two main constructs: perceived usefulness and perceived ease of use. These constructs are important to understand how end users engage with *Infolocal*. The TAM is underpinned by the determinants of individual differences, system characteristics, social influence and facilitating conditions (Venkatesh and Bala, 2008). Furthermore, the Theory of Planned Behaviour (Ajzen, 1991) and the Unified Theory of Acceptance and Use of Technology (UTAUT I and II) model lend support in measuring technology acceptance (Sovacool and Hess, 2017).

Effort expectancy. Effort expectancy (EE) explains the intention to use technology and, indirectly, the actual use of it, that is, the perception of effort needed were an individual to use the technology (Venkatesh et al., 2003). UTAUT I and II (Venkatesh et al., 2003, 2012) propose EE as an equivalent construct to TAM's perceived ease of use; namely, it is 'the degree to which a person believes that using a particular system would be free of effort' (Davis et al., 1989, p.320). The degree of ease related to actual use is crucial for first-time users, but as use habits develop it becomes insignificant (Venkatesh et al., 2003). Hence, people who do not have experience in navigating the Internet could build bigger expectancies because using *Infolocal* would constitute a new behaviour.

Performance expectancy. Performance expectancy (PE) can be thought of as the degree to which individuals believe that using a technology would help them achieve better outcome over traditional alternatives (Davis et al., 1989; Venkatesh et al., 2003, 2012), which in this case would pertain to how technology could improve the work of local institutions. So, PE would be higher if the institutions perceived that *Infolocal* facilitates the discovery of and access to information for end users.

Social influence. Social factors are key for technology acceptance (Ajzen, 1991; Venkatesh and Bala, 2008; Venkatesh and Davis, 2000; Venkatesh et al., 2003, 2012) because the perceptions of behaviour that other relevant people hold with respect to the user becomes a determinant for developing the intention to use technologies (Fishbein and Ajzen, 1975). Social influence shapes the information landscape and alters information behaviour precisely because landscapes are socially-constructed, intersubjective spaces (Lloyd, 2010). Local institutions can observe the impact of social influence on users in situ as they gather information about the technology and its usage by watching actual users and receiving information from the institution. This is accompanied by (imagined) rewards and social punishment to reinforce expected behaviours.

The social context is part of an information landscape in that if an individual perceives that a relevant social group thinks that the individual should execute an accepted '*Infolocal* use behaviour', then the individual is likely to develop such behaviour. Hence, one might expect social influence to be more prevalent during the earlier days of *Infolocal*, when it was necessary to physically go to the local institution to access information. As users gain experience and hence become more autonomous, social influence as a construct weakens (Venkatesh et al., 2012).

Facilitating conditions. Perceptions about the existence of resources, infrastructure and opportunities to adopt technology are relevant for its use (Ajzen, 1991; Fishbein and Ajzen, 1975; Venkatesh and Bala, 2008; Venkatesh et al., 2003, 2012). Even when an intention to use a technology is strong, information deserts (Evans, 1994) can impede access to technology and deter acceptance. It is crucial that users believe that technical infrastructure exists, which would sustain their perception that their use of technology will be supported (Yang and Forney, 2013). Infrastructure is a non-neutral materiality of technology that carries information, cultural norms and values, and the artefact itself, enabling 'certain kinds of human and

non-human relations' while inhibiting others (Slota and Bowker, 2017: 530).

Organisational support. Organisational support is the degree to which employees develop universal 'beliefs concerning the extent to which the organisation values their contributions and cares about their well-being' (Eisenberger et al., 1986, p.501). This component is useful in informing our understanding of senior management provision of sufficient resources to help employees achieve the organisation's goals. Eisenberger et al. (1986) argued that an organisation's treatment of its employees has a direct influence on how employees interpret the organisation's underlying motives. High levels of perceived organisational support would encourage local institutions to support the 'cause' of LIS and foster a feeling that they are an integral part of the organisation, increasing the affective attachment from the institutions (Marique et al., 2013). So, managerial decisions would have a direct effect on the local institutions' perceptions of organisational support.

Affective commitment. Affective commitment is an emotional attachment to, identification with, and involvement with the organisation (Lin and Hwang, 2014; Meyer and Allen, 1991). It leads to a desire to remain with the organisation (Magni and Pennarola, 2008) and affects technology acceptance behaviour (Malhotra and Galletta, 2005). The presence of affective commitment should also influence attitudes and behaviours of individuals (Allen and Meyer, 1996), which could also be developed between the provider of technology and its users (Li et al., 2006). We adapted this concept to capture how local institutions perceived end users with regard to the platform, with the implication that users would adopt attitudes and behaviours for achieving a better relationship with local institutions (Hwang and Kim, 2007).

Methodology

The Delphi study

A two-round Delphi study was conducted with global experts of LIS to enhance the construct validity of the survey, which was then distributed to the local institutions. Following Kerr et al. (2016), the research team used a Knowledge Resource Nomination Worksheet to identify potential panel members with the greatest expertise in LIS. The Delphi method utilises the wisdom of experts to develop a 'reliable consensus' on a given issue and can contribute to construct validity for survey instrument development (Okoli and Pawlowski, 2004). There is no fixed number of respondents; however, 10 is suggested as a suitable amount for a homogenous panel (Kelley, 2007; Okoli and Pawlowski, 2004). The study garnered participation from five scholars and five practitioners from Cameroon, Canada, Colombia, Jordan, Mauritius, the Netherlands, the United Kingdom and the United States. Although the Delphi method can be done in several rounds (Sourani and Sohail, 2015), Gallego and Bueno (2014) argued against using more than three rounds because participants may lose interest or time. Furthermore, there is no guarantee of consensus after two rounds. The first round should include an item pool that contains two or three more times the number of items that will constitute the final scale (Noar, 2003: 626). Therefore, our starting point was to use the existing constructs from the TAM (perceived ease of use, perceived usefulness, social influence) plus constructs derived from theories on access to information (organisational support, facilitating conditions, affective commitment). This produced five dimensions (each comprising of 4–6 questions), yielding an initial scale of 50 items. The items were then sent to the Delphi panel for the first-round considerations.

In the first round, the panellists used a 5-point Likert scale to rate the degree to which they felt that the constructs were allocated appropriate definitions: 1 (strongly disagree) to 5 (strongly agree). They were also asked to give feedback on ratings of less than 4 and to add constructs (and definitions) they felt were not represented. Constructs that averaged a rating of 3 or less were removed. In the second round, the panel were sent the five highest-rated constructs (including any suggested ones from the previous round) and the items that best addressed each construct. The experts were asked to evaluate item appropriateness and offer feedback for ratings of less than 4. The final list of constructs was finalised with these items, put into survey form, and distributed to the institutions. The resulting constructs and items from the Delphi study are shown below:

- Perceived usefulness of information: The degree to which the respondent feels that constituents value the information on the platform as relevant, objective and trustworthy.
- Perceived usefulness of the system: The degree to which the system is perceived as flexible and intuitive enough by the user so that it can be extended quickly and easily; including toward disabled users.
- Resources (facilitating conditions): The degree to which all resources (HR, infrastructure, system, local and state policy) are perceived to be in alignment to achieve the identified objectives of the LIS system.
- Conformity to community values (social influence): The degree to which the respondent feels that the end user feels it is important that others use the service and that this end user is willing to tell others in the community about the service.
- Community's flow and context: The degree to which the respondent feels that the community he/

she serves can build appropriate mechanisms to produce, collect, organize and disseminate information that addresses local needs.

Exploratory factor analysis

The organisation provided the contact details for the 195 participating institutions. The survey developed from the Delphi study was used to measure the perceptions of the provision and relevance of LIS. The questionnaire was responded to by 89 institutions, giving a response rate of 49.6%. Exploratory factor analysis (EFA) with equamax rotation was used to investigate that the dimension structure for each construct. Equamax rotation is an orthogonal method that optimises the results by distributing variables more uniformly between the extracted factors and spreading variance more equally across them (Hair Jr et al., 2010; Sass and Schmitt, 2010). We proposed a structure of the latent relationships identified through the Delphi study; however, when tested through EFA, the resulting structure proved different. We assert that the difference reflects disjunctions between the expert opinions and the local institutional perceptions that speak to the presence of information deserts and a fractured information landscape, hindering effective operation of this information service.

Findings: Delphi study

Several differences emerged between the expert opinions and the literature on LIS practice worthy of discussion. For example, the literature uses performance expectancy of technology to refer to the probability of experiencing a better performance by using the technology. However, the experts interpreted performance expectancy as the perceived usefulness of information, that is, the degree to which local institutions feel that constituents perceive the information on the platform as relevant, objective, and trustworthy. In addition, the literature refers to effort expectancy (Venkatesh et al., 2003, 2012) and the perceived ease of use (Davis et al., 1989), which we interpreted as users not only seeing the technology as user friendly, but also as extendible to other types of users. The panel experts concurred with this interpretation. The third construct, resources (closely associated with facilitating conditions) is the extent to which all resources (e.g., HR, infrastructure and systems) are perceived to be in alignment to achieve the identified objectives of LIS. The Delphi study revealed that this was also useful for considering state policies, emphasising that not only the existence of resources matters but also the resources' alignment with local and state policy.

The experts derived conformity to community values as a fourth construct, referred to in the literature as social influence. However, they felt that conformity does not only influence other actors but the users' willingness to tell others about the service (e.g., word-of-mouth recommendations). The fifth construct is the community's flow and context. The literature uses organisational support as a proxy to capture the relationship between local institutions and *Infolocal*. However, given that this construct does not consider the end user, it would appear not to fully address the complexities faced by the institutions. The experts did not include organisational support in their appraisal, at least not as a full construct; however, similar items within organisational support were found in the other constructs. Hence, there is a need to reinterpret the theoretical frameworks used for understanding technology acceptance to capture the *actual* implications of using the technology within an LIS context.

Findings: Exploratory factor analysis

Using a principal components extraction method, the Kaiser's criterion of eigenvalues of equal or greater than 1.0 was established. The KMO (Kaiser-Meyer-Olkin indicator) and Bartlett's test of sphericity guaranteed sufficient significant correlations between the variables, which is required for correct factor extraction (Norusis, 1985). Thus, adequate values greater than 0.5 for KMO (KMO = 0.838) and a significant test of sphericity (Bartlett's X^2 =1173.13; d.f.=300; p=0.000) were obtained. The Bartlett's test of sphericity showed a high significance (p = 0.000) and Cronbach's alphas were 0.696, 0.786, 0.807, 0.766, 0.816, and 0.811 for factors 1, 2, 3, 4, 5, and 6, respectively, which met the acceptable threshold of 0.70 (Churchill, 1979; Nunnally and Bernstein, 1994).[1]

Some 25 variables were clustered around six factors with Eigenvalues above 1.0. These factors explained 67.19% of the variance (see Table 1 to observe the initial and rotated information). A cut-off threshold for the factor loadings of 0.3 was used (Hair Jr et al., 2010) to assure statistical significance. The average Cronbach's alpha=78.03 indicates that, in general, the items grouped in each factor are a reliable measure of them. Each factor was named according to the relation of the variables that constituted it. Table 1 shows the output for each factor with the rotated component matrix after equamax rotation was performed and factor loadings were depurated.

Determinants of technology acceptance from the local institutions' perspective

The resulting six factors were interpreted based on the responses of the participating institutions and labelled accordingly. The latent structure identified by the EFA showed that digital autonomy, responsiveness to user needs, mobile access, and digital citizenship varied significantly, while facilitating conditions and perceived usefulness of

Table 1. Exploratory Factor Analysis Output.

Items by factor	Commonalities	Final eigenvalues	Rotated structure	Explained variance
Factor 1: Digital autonomy		3.18		12.7%
Our institution effectively uses social networks to access a greater number of users.	0.65		0.74	
Our institution understands the consequences of reducing information on physical media for information in digital formats	0.58		0.66	
Users upload or update daily the information on LIS	0.63		0.46	
Factor 2: Responsiveness to user needs		3.04		12.2%
Our institution has the necessary capacity for the design of relevant and pertinent products according to each population segment	0.62		0.71	
The bandwidth speed is appropriate for the services we offer	0.61		0.68	
Our institution adequately responds to the different needs of users based on their age ranges.	0.72		0.45	
Our institution has appropriate equipment so that users have full access to LIS	0.58		0.42	
Factor 3: Mobile access		2.95		11.8%
It is more likely that a user uses the phone to access local information services instead of the computer	0.81		0.88	
A user uses frequently the device with which he or she feels more comfortable to access the LIS	0.82		0.85	
Mobile technology has strengthened the purpose of *Infolocal*	0.71		0.56	
Local and state policies can facilitate the creation, introduction and access to more local content that is not available on LIS	0.78		0.49	
Factor 4: Perceived usefulness of information		2.73		10.9%
In the last year, our institution experienced an increase in the use of facilities	0.71		0.81	
In the last year, our institution has experienced an increase in the use of the website	0.70		0.75	
The social impact of *Infolocal* is reflected in more educated citizens, informed and literate in Antioquia	0.59		0.58	
Digital content generated in the last year was useful for users	0.56		0.54	
Factor 5: Facilitating conditions		2.60		10.4%
Our institution receives organisational support to store information	0.70		.70	
Our institution has tutorials and tools to help users retrieve digital information	0.57		.64	
The special needs of our community are appropriately included in organisational and state policies	0.55		.63	
Our community has channels or mechanisms that provide incentives to create local content	0.67		.59	
Users frequently use LIS on the premises	0.69		.58	
Our institution interacts with community leaders for the production, dissemination and organisation of local content.	0.66		.48	
Factor 6: Digital citizenship		2.30		9.20%
In the future we will be able to encourage/incentivise other uses to use LIS on our premises	0.78		.77	
LIS protects/secures personal information as required	0.80		.76	
The more likely a circle of friends have an *Infolocal* ID. the more likely they will all use *Infolocal*	0.65		.69	
A satisfied user of *Infolocal* will encourage others to use it.	0.66		.60	

information remained consistent. In the reliability analysis, one redundant item was removed leaving 25 items dispersed over six factors through 13 iterations. These factors are described below according to the degree of variance. In the next section are the findings from the EFA survey, which have been theorised within the context of a local information landscape to produce an integrated framework that informs our understanding of local information practice.

Factor 1: Digital autonomy. Digital autonomy (DA) accounted for 12.70% of the variance, with three items composing it. DA can be characterised as a relationship of experiences, habits, and facilitating conditions. In the event that institutions and users experience *Infolocal* and develop the habit of using it, autonomy can be expected (Venkatesh et al., 2012). Once autonomies occur, facilitating conditions have greater importance at the early implementation stages for the acceptance of LIS by novel users, but diminish as users become more experienced and digitally autonomous, making support staff, tutorials or additional strategies offered by the institutions less relevant.

The loadings for the DA items ranged from 0.465 to 0.742. The calculated alpha value for these three DA items was 69.6%, which highlights an autonomy for both end users, and for the local institutions whose dependence on the organisation diminished. This would yield a differentiated set of information behaviours that redraws the boundaries between the end user, the institutions, and the organisation. DA would promote equality in information access and lead to an increase in residents' knowledge about information technology (through continued use). These community outcomes lead to reduced information deserts because the end users would be better able to define 'local' information and the relevant sources for it, disqualifying in a sense, the 'material pre-conditions of inequality' of information practice (Lee and Butler, 2019: 2). Increased levels of DA translate to a new self-orientation for information practice, facilitated in no small part by the government's improving the digital infrastructure. This change in users' circumstances would disrupt the 'familiar and certain information landscape' and create 'disjunctions' that fracture the information landscape (Lloyd, 2017: 36), once dominated by *Infolocal*. In fact, this process raises questions regarding the capacity of an LIS to show resilience.

DA does not eliminate information inequality entirely. Local information can be present in formats outside of the digital space that can hinder the exercise of autonomy for users, which could be considered as varying forms of fragmentation in the sourcing and dissemination that information experiences (Lee and Butler, 2019). For example, *Infolocal* receives print forms of events and bulletin boards that are still used at the community level, suggesting that local information maintains a degree of rootedness that falls outside of the reach of the digital systems and vice versa. These two parallel systems contain different types of information that cannot flow across the digital/analogue boundary, thus sustaining some inequalities and unevenness in information access, and the persistence of information deserts.

Factor 2: Responsiveness to user needs. Factor 2 measures the local institutions' perceptions of their ability to meet the needs of their constituencies and of the relationship that *Infolocal* maintains with them. This factor contains four items and accounts for 12.20% of the total rotated variance. The four factor loadings ranged from 0.424 to 0.711 and yielded a Cronbach's alpha values of 78.6%. The factor is composed of items related to internal and external capacities (items 1 and 3, and 2 and 4, respectively) needed for the delivery of *Infolocal*. The internal-capacities related items (1 and 3) are tied to perceived institutional capacity to respond to the needs of different user age groups. This capacity deficit was described in van Klyton et al. (2017), where they show that while *Infolocal* was using restrictive 1.0 webpages to disseminate local content (i.e., one-sided communication), users were already using Web 2.0 technologies (e.g. Facebook and Twitter). Leonardi and Barley's (2010: 12) interpretation perspective asserts that users often 'transfer or modify previously cognitive frameworks' to fit new technology situations. Hence, end users would have wanted to interact with local information contents through their mobile devices in the same way that they used social media. The second and fourth external-capacity related items pertain to the infrastructure (i.e., bandwidth and equipment) provided by the state that are subject to policy decisions regarding investment and budgets. All four items have direct implications for the 'information-giving behaviour' (Pettigrew, 1999) of the institutions, which is represented in the LIL model as 'information provision.'

Factor 3: Mobile access. Mobile access is constituted by four items and accounts for 11.80% of the total rotated variance, with loadings that ranged from 0.492 to 0.884 and a Cronbach's alpha of 80.7%. The items here pertain to the impact that state investment and policies have had on users' information behaviour. Ironically, these efforts have in some ways incapacitated the local institution's ability to increase accessibility because these physical spaces have limited geographical coverage (Lee and Butler, 2019). According to information provided to the research team by *Infolocal*, the portal was being accessed with mobile technology at a significantly higher rate rather than on the computers, demonstrating a preference for individual access to information rather than the shared community engagement within a specified geospatial arrangement, such as a library, further fracturing the information landscape (i.e., users no longer needed to physically gather together to partake in local information). This factor illuminates how the material aspects of information inequality can create information deserts for both digital and physical forms of information. For example, users who avidly retrieve local information digitally would be bereft of accessing content not available in digital form. On the other hand, consumers of local information who are not as skilled in using mobile technologies also experience a disparity in accessing content available in online form only. Therefore, information poverty occurs in both instances but for different reasons.

Factor 4: Perceived usefulness of information. Perceived usefulness of information is a well-recognised factor in the TAM. This factor contains four items and accounted for 10.90% of the variance in the model. Items loadings ranged from 0.544 to 0.806. This set of items allowed for local institutions to reflect on the past year of user engagement and on the impact of *Infolocal* on the region of Antioquia, Colombia. The Cronbach's alpha for this factor was 76.6%, which is above the threshold for acceptability. Hence, all the items were retained. The factor's four items linked to the website's usefulness, its contents and the broader social effects of *Infolocal* and examined the ease of access and the relevance of information deployed on the platform by measuring the local institutions' perceptions of end-user engagement. The 'social impact' of this factor intersects with two community outcomes of the local information landscape framework: psychological and social well-being. This suggests that information usage affects and changes citizens' behaviour and their perception of the institutions.

Factor 5: Facilitating conditions. Composed of six items, facilitating conditions is the fifth factor and accounts for 10.40% of the model's variance. The item loadings range is from 0.481 to 0.702, with a Cronbach's alpha of 81.6%, relatively strong. These items pertain to support received from *Infolocal* and from the government, while the construct encourages respondents to reflect on their internal capacities. This factor also examines the degree of collaboration between the institutions and community leaders, owing to the influence of the latter and their ability to promote local discussion spaces by holding debates, forums and similar events at the institution. Intuitively, facilitating conditions would be negatively correlated with digital autonomy because as users become more digitally literate, the need for facilitating conditions at the institutions is reduced. Ironically, while institutions are compelled to enhance information literacy, they are also capacitating end users to become self-sufficient in their information-seeking behaviour and contributing to reshaping the local information landscape (Lloyd, 2006).

When community leaders host debates at the institutions local knowledge is being produced, thus garnering relevance for the institutions. This knowledge could be considered as transient information (Lee and Butler, 2019) within the LIL model because these events are not systematically (digitally) registered and thus users in different localities may not know how to find the information, thus creating a form of information desert.

Factor 6: Digital citizenship. Digital citizenship is composed of four items and has an item loading range of 0.602 to 0.766. The factors explain 9.20% of the variance in the model and the Cronbach's alpha is a relatively strong 81.1%. The items in this factor pertain to the institutions' perceptions about the relationship that users maintain with *Infolocal.* Digital citizenship refers to those voluntary behaviours that users develop, such as recommending the service, helping other users, and tolerance of system failures (Yi and Gong, 2013). These behaviours serve to magnify the perception of value and the in-use value of the system, both for users and the potential users with whom they interact. Digital citizenship promotes community sharing of practice, and meaning making where the information is accessed (Lloyd, 2006). Digital citizenship can be seen as a community outcome in the LIL model, a combination (and a culmination) of all seven aspects of this element. Perceived digital citizenship highlights the importance of information behaviour that favours the adoption of the platform and its contents. The positive interactions among users would be mechanism that encourages others to use the platform.

Theoretical implications of the study

The effectiveness of *Infolocal* pivots on changes within the information landscape and on the emergence of information deserts, which act as inhibitors to information sharing and can lead to fractured information landscapes. This circumstance presents complexities for designing and managing an LIS. Our results reveal disjunctions between theories of LIS and the actual practices of it, creating difficulties not only with the technologies and facilities of LIS but also in understanding the concept of 'local', both conceptually and computationally (López et al., 2014). The government-led digital infrastructure projects no doubt contributed to the emergence of a fractured information landscape in that they reconfigured information seeking behaviour and altered users' expectations of *Infolocal*.

The TAM and UTAUT literature indicate that each cultural context is unique and deserves to be evaluated (Tarhini et al., 2016; Venkatesh et al., 2012). As such, our findings built upon the shortcomings of these models and lent support to the work of Sovacool and Hess (2017), where they argued that models and theories can include a large number of constructs and relationships in order to explain the phenomenon of acceptance and use of technology with greater rigour (e.g., Singh et al., 2016). This study identified and examined the dualistic role of the local institutions because they constitute a critical component for the operation of the LIS system. However, our intent was not to develop an extremely complex framework. Rather, we sought to explain the particularities of acceptance and use of the LIS in a specific context. Therefore, we have used a parsimonious model to reach theoretical conclusions that clarify the complexities of this case.

The TAM literature refers to one kind of actor dealing with the technology usage behaviour, in this case we actually do not have an innovative technology (so our

concern was not the innovation itself). Rather, we presented a socio-technical system (Bijker, 1997) within which the local institutions were obliged to reflect on their perceptions of end user acceptance of technology rather than on their own technology acceptance. Hence, while in theory the normal constructs attempt to explain acceptance behaviour, in this case, they should be redefined to capture and contextualise the overlapping interests of these actors.

The pre- and post-EFA variable associations indicated that disjunctions exist between the idealised norms of local information service provision articulated by scholars and practitioners of LIS and the discursive and material practices at local institutions. Technology has potentially outstripped the raison d'être of *Infolocal* and facilitated the emergence of a socio-technical change that obliges *Infolocal* to be more adaptive toward popular platforms or modify its services and contents to achieve the best experience for users.

The disjunctions also arose because of the differences in meaning attributed to the service by these different stakeholder groups (Bijker, 1997). van Klyton et al. (2017) argued that because the Colombian government began its own capacity building activities for Colombian citizens to access online information individually, *Infolocal*'s layering of new technologies onto its system did little to halt diminishing demand. In addition, the local institutions began directing their own information to mass audiences online through web 2.0 tools, further enabling digital autonomy for end users. The reconfiguration and reconstitution of key factors associated with LIS delivery may indicate that local institutions are moving farther away from the beliefs about information practices and information behaviour as espoused by Delphi study participants and existing academic literature.

Conclusion and recommendations

This study integrated a modified TAM with the newly developed LIL framework to identify disjunction between the theorised concepts and expert opinions of LIS and actual information practices of a functioning LIS. We used a two-stage Delphi study to develop the survey instrument, which was then deployed to local institutions in Medellin that participate in the *Infolocal* LIS. Using exploratory factor analysis, the survey revealed six factors that highlighted the disjunctions that have contributed to the production of information deserts and ultimately fractured the information landscape.

By integrating TAM with LIL, our study makes three important contributions to understanding local information practice. First, all six factors resulting from EFA were affected by the changing pace of technology. The government's investments in digital infrastructure reduced barriers for end users and facilitated an independence from *Infolocal* and jeopardised the relevance of the local institutions. This course of events changed the local information landscape. Lloyd's (2010) work on local information landscapes gives explicit focus to infrastructure and associated government policy that empowers end users (i.e., the promotion of digital literacy). However, the infrastructure focus all but disappears in Lee and Butler's (2019) LIL framework and is subsumed within the community/characteristic feature, 'policy' (which also does not appear to receive any significant treatment in the model). In fact, Lee and Butler (2019) seemingly ignored infrastructure altogether as a relevant factor of information practice, while the experts in the Delphi study prioritised it, which flowed into the resources factor (facilitating conditions). Infrastructure was also well acknowledged by local institutions in the survey.

The second contribution concerns the fact that the LIL framework does not attribute the exercise of power to end users and does not explicitly acknowledge their capacity to reshape the local information landscape. Two of the six factors in the EFA, digital autonomy and mobile access, function as sources of empowerment for end users. The resulting user autonomy altered information practices and information behaviour, and contributed to the production of information deserts and a fractured information landscape.

The third contribution speaks to the perceived linear nature of the LIL model. The models proposed by Lee and Butler (2019) and Lloyd (2010) allude to the notion that more knowledgeable citizens emerge in terms of information literacy and technology usage. Hence, the LIL framework should give greater attention to the potential contributions of these users in the initial phase of the model (Community Characteristics/Factors), and draw on the totality of end-user knowledge about the various forms of local information retrieval. This suggests that the model could be more resilient, flexible, and iterative in adapting to the growth of citizen's digital literacy. This would enhance digital citizenship, improve the perceived usefulness of information, and better respond to user needs (three of the six factors from the survey).

This case operationalises aspects of the LIL model and raises critical questions about *Infolocal*'s capacity for resilience. We bring a few recommendations to better align user expectations with the *Infolocal.* The online portal risks becoming obsolete with its technological platform unless intermediaries and end users are able to create content interactively. Therefore, the organisation should place contents on mobile-friendly platforms that take advantage of the government's digital infrastructure improvements, and design and implement information curation tools in order to gather automatically local information from the local institutions' social media.

The authors acknowledge some limitations of this study including a modest sample size of 89 responses out of the 195; however, if this had been a random sample, the sample

size would be adequate for a case study. Sending questionnaires to a fixed population was appropriate in this case, but there is an inherent limitation for the generalisability of the results. However, in a practical sense, our findings are in accordance with the conclusions and recommendations offered by Singh et al. (2016) design flexibility should be considered, where possible. *Infolocal* should develop interactive solutions, such as giving active control to users, reducing response time, and two-way communication. Given greater interactivity, the service can make greater use of social media to enhance online visibility and offer local institutions and end users mobile access platforms, which would enhance loyalty from end users (Cyr et al., 2009) and close the gap between the current platform capabilities and 2.0 technologies.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This project was funded through grants received from The University of Greenwich and the University of Antioquia.

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Note

1. For the descriptive statistics, please see Appendix B.

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Appendix A

Local institution categories

1. Libraries: 111
2. Theaters: 37
3. Notary publics: 34
4. Non profit organisations: 25
5. Museums: 19
6. Library parks: 15
7. Shopping malls: 15
8. Cultural organisations: 15
9. Hotels: 13
10. Travel agencies: 13
11. Local clinics: 12
12. Foundations: 10
13. Universities: 11
14. Parks: 9
15. Municipal offices: 9
16. Health Services: 9
17. Watchdog organisations: 7
18. Taxi cab services: 6
19. Sport complexes: 5
20. Arts schools: 5
21. Police or military: 5
22. Hospitals: 4
23. Cultural Centres: 4
24. Banks: 4
25. Local Government offices: 3
26. Bookstores: 3
27. Language centers or programs: 3
28. Cooperatives: 2
29. Newspapers: 2
30. Public Library Networks: 2
31. Dance programs: 2
32. Mayor's Office: 2
33. Theatre Groups: 2
34. Vocational Colleges: 2

**The remaining 73 institutions were classified as 'other' because they did not fit closely enough to the 34 categories.

Appendix B

Descriptive statistics.

Factor	Code	Mean	SD
F1	E2	4.045	.9642
	C5	3.764	1.0003
	E4	3.045	1.2052
F2	D4	3.573	1.0323
	D3	3.809	1.0540
	C6	3.944	.9695
	D1	3.539	1.1780
F3	C1	3.494	1.2443
	C2	3.663	1.2242
	C4	3.258	1.3015
	D5	3.727	1.0140
F4	B2	3.685	1.0401
	B4	3.663	1.1574
	B3	3.449	1.1967
	B1	3.685	1.0829
F5	F2	3.202	1.1792
	C7	3.180	1.2392
	F4	3.416	1.1059
	F1	3.489	1.0933
	C3	2.944	1.2188
	F5	3.523	1.1545
F6	E5	4.056	.9927
	D6	3.820	1.1732
	E1	3.730	1.1458
	E3	4.360	.8693