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Is Digital Technology Urban? Understanding inter-metropolitan Digital Divides in South Africa

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ABSTRACT

Many metropolitan areas, particularly in South Africa, contain urban and peri-urban settlement typologies representative of a diverse range of built forms, lifestyles and livelihoods. Access to Information and Communication Technology (ICT) is influenced by geography, market demand and affordability at household and individual levels. This paper explores how this relationship is manifested spatially in the South African context. The result is not altogether surprising; remote peri-urban areas face bigger obstructions to ubiquitous access due to a number of reasons. Affordability and infrastructure distribution are clearly influential. The assumption is that digital divides exist but little systematic research has been done on how these differences manifest at a metropolitan scale. This paper explores the relationship between the digital divide and spatial trends in Durban, South Africa.

Categories and Subject Descriptors

Mobile and Ubiquitous Computing beyond the City

General Terms

Management, Design, Economics, Reliability, Human Factors, Theory

Keywords

Rural-urban interface, Digital Divide

1. INTRODUCTION

South African cities are wrought with dichotomies that were pervasive under apartheid, but nevertheless continue to characterise the current urban landscape. The dualities exist whereby opportunity and access are determined on economic lines of haves and have-nots, and geographic divides of the

urban and rural nexus.

The post apartheid reconfiguration of contested public urban space has contributed to the transformation of changed urban spatial conditions. The appropriation of public spaces through informal trading at points of transport interchange has resulted in highly activated streets and 'lost (incidental) spaces. New modes of wireless communication enable this trade to exist in a fluid transient business matrix.

Similarly, informal dwelling settlements that have swelled at the fringes of the urban core, whilst lacking municipal infrastructure, have sustained through the emergence of wireless technologies that have served to fill the gap, in communication services. Further indication that municipal infrastructure is not being rolled in quick enough to keep up with rapid expansion, are the myriad of cables and wires disbursed through the settlements, that 'pirate' electricity from nearby substations.

Meanwhile in rural space, there have been no significant changed spatial conditions in the post apartheid time frame. Existing traditional village and dwelling arrangements have not materially altered; there is continued migration of rural dwellers to the city.

However ICT has started to facilitate better communication access within rural communities, but also importantly connecting rural people with their urban relatives and spouses; breaking down the fragmented family social structure of the migrant worker system that was prevalent under apartheid. Memory boxes were made and decorated by urban migrant workers containing letters & photos of their rural family, this tradition is now obsolete as the mobile phone now instantly transmits the same images and messages. The rural and urban divide has been narrowed.

Manuel Castells has warned of a different divide that emerges between the globally connected elite and the 'tribalism of local communities';

The fundamental dividing line in our cities is the inclusion of the cosmopolitans in the making of the new history while excluding the locals from the control of the global city to which ultimately their neighbourhood belongs. [4]

Could it be that at the moment that South African cities have confronted the ravages of its segregated society riddled with decades of mass disadvantage; that a new discrimination has

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emerged, that prejudices those without access to knowledge through ICT?

This paper examines the forces that influence urban change in Durban in conjunction with access to ICT. ICT is defined as consisting of mobile phone, computer, and traditional landline telephone technology. The aim is to determine the nature of the relationship between ICT access and settlement typologies. Two spatial scales are investigated. The first compares Durban metropolitan area with surrounding (largely) rural municipalities. The second compares areas within Durban – in particular neighbourhoods to the north of the city where spatial change has been most pronounced. For the inter-municipal comparison, community survey data compiled by the South African Statistical Services is used. The internal metropolitan divides are examined using 2001 South African census data; Geographic Information Systems (GIS) techniques are used to map it. Recommendations are made on further research necessary to provide a more insightful account of urban-rural digital divides.

2. THE RURAL-URBAN NEXUS AND URBAN DEVELOPMENT IN SOUTH AFRICA

2.1 Space, society and economy

Changes in cities such as Durban, the second largest urban conglomeration and premier African port city, are representative of global trends. During the last quarter-century many policies of both the developed and developing world have undergone a shift towards market-based economic development strategies. Such trends have had wide-reaching implications for the ideologies and practices of urban governance. Ultimately, the urban developmental logic of neo-liberalism is characterized by the emergence of large-scale, privately-financed ‘mega-projects’; as well as public spaces and gated communities that embrace fashionable and internationally-transposable architectural and urbanist themes (Ibid.) contrasted with marginalized ‘edge’ spaces.

Graham and Marvin [9, 10], along with Simon Guy [11, 12] focus specifically on how neo-liberal attitudes towards public space and infrastructure (manifested in internationally popular approaches to infrastructure provision such as demand-side management - DSM) have led to a *splintered* urban condition. The splintering city is a spatially fragmented entity, involving select vicinities of ‘unbundled’ premium infrastructure networks amidst a vast neglected turf of those who cannot afford the costs of new, high-technology deregulated services. Urban spatial forms are increasingly determined by the economic logic of supply and demand, as areas exhibiting higher values in terms of people and places infer a greater degree of integration into these infrastructure networks. This essentially describes a bilateral movement of inclusion (into the transterritorial space of flows) and exclusion, as certain areas are bypassed due to their lack of potential profitability [11, 15, 12]. In the South African context this process is further symbolized by the juxtaposition of closely-watched, enclave-like spaces of wealth and the vulnerable, under-serviced townships of the poor.

Despite early notion that ICTs would enable the transcendence of space, ICT application and urban settlement creation – are

coming to be regarded as supportive of one another [8]. This is in view of the fact that, with continuous technological innovation in all economic sectors within a volatile global economy, there is an associated concentration of such development in centres that have the intellectual, physical, financial and political capacity to support it – hence the emergence of urban technological hubs such as Silicon Valley near Los Angeles [5].

A space-blinkered, cause-and-effect reading of ICT and development might suggest that new spatial forms have arisen as the direct result of the widespread application of information technologies. Yet since the reassertion of space in critical social theory, it has been popular to regard the creation of space as both a product of wider social change and an active dynamic in that change [1, 23].

Manifested in space, are the relations, deliberations, histories and meanings ascribed to urban life. Layering ICT upon this dynamic provides an interesting vantage point for the consideration of the relationship between urban and rural. Cities embody more than the physical. They are places where information, cultures and ideas are exchanged. These flows of information are now facilitated through accelerated transmissions enabled through information and communication technologies. The images, insights and imperatives exchanges through television, radio, the Internet and mobile phones represent more than just data however. The global exchange of information has deepened a sense of connection yet paradoxically also brought difference into relief. As much as we celebrate inclusion we have also become acutely aware of the chasms that underpin social exclusion and the marginalized spaces (physical, economic and social) that embody our regions. We are left to ponder what happens to those left out of this dynamics – those at the edge of the urban margins.

A popular thesis in recent urban literature relates globalisation with a complex process of fragmentation, by which various inequalities are produced and reproduced within the physical, socio-economic and political landscapes of cities [13]. Shatkin [22] recognizes that these inequalities can take the following generalized forms:

- *Social inequality* arises as the politico-economic conditions of the social classes become more acutely mismatched [24, 13].
- The generation of *political inequality* refers to the restless, disproportionate transfer of power between actors and institutions involved in urban politics. Shatkin [22] suggests that internationally, the ‘decentralisation’ of political power has occurred to the benefit of knowledge-intensive, pro-growth, globally-connected firms (especially trans-national corporations) and individuals.
- *Uneven spatial development*, entailing the socio-spatial segregation of urban residential groups and the ongoing generation of disparities in terms of communal access to urban space (see [9]; [6]; [24]).

2.2 Local Government

The postmodern urbanism that entails much of the above speaks of a poly-nuclear metropolitan form – nodal points linked through high-speed movement routes and communication infrastructure. In the South African context, areas under local government administration, especially the cities, comprise semi-

regions comprising a range of settlement typologies. Local government restructuring has resulted in 'wall-to-wall' demarcations across the country with individual local (grouped within district council areas) and metropolitan municipalities responsible for areas ranging from rural to urban, under a mix of land tenures and under varying patterns of ownership. This body of legislation also allowed for large metropolitan areas to qualify for a single-tier system of local government (in other words the absence of a district authority). At present there are six metropolitan municipalities in South Africa, including Durban (or the eThekweni Metropolitan Area).

The major implication of post-apartheid policy, in terms of institutional and governmental reform, has been the decentralization of political and economic power; a trend in keeping with the policies of many other developing nations [14]. In the South African context, local government institutions have been landed with a constitutional mandate to provide an 'enabling environment' for development, which has necessarily entailed the reorganization of government structures. Whereas in the past municipalities were primarily concerned with providing bulk infrastructure services, the new legislative context necessitates that local government take an active role in the promotion and coordination of development. Much of this includes ICT as an enabler of economic and social development [18]. Thus, municipalities are mandated to utilize resources to enable development across their whole municipal areas, and this of course includes ICT policy implementation.

3. DIGITAL TECHNOLOGY ACCESS IN SOUTH AFRICA

3.1 Towards the Information Society in South Africa

The process of Internet diffusion in South Africa between 1990 and 2003 was negotiated around a number of critical issues that include economic liberalization of the telecommunications sector and access to facilities [17]. The telecommunications sector is contested given the monopoly enjoyed by Telkom, the South African service provider, until recently when a second service provider was introduced early 2008, and the high cost of telecommunications. Van Audenhove [26] identifies a number of phases in the evolution of political discourses in this regard: the initial commitment to ICT for social development (as embedded in the Reconstruction and Development Programme) followed by a transformation stage that sought to establish a regulatory authority (the South African Telecommunications Regulatory Authority) and a new legislative framework. Recognition that telecommunications policy has implications for social and economic development was identifiable in early aspirations towards the creation of an information society, as well as in the inclusion of a number of government portfolios in pursuing this aim. The result was an implementation phase that relied on cooperation between divergent government and private sector actors in pursuing the common goal of ICT access to as broad a spectrum of the population as possible. Predictably implementation was beset with difficulties that ranged from limited infrastructure roll out by Telkom, limited sustainability of telecentres provided by the Universal Service Agency (USA), problems in negotiating the deregulation of Telkom and the third mobile service license as well as legitimacy issues with regards to the state regulator [26].

The most recent phase entails the evaluation of implementation and new measures to ensure universal access. Van Audenhove [26] notes the shift from 'universal service', individual access to basic telecommunications, to 'universal access', access to ICTs in general (including the Internet) at the community level. These intentions are, however, constrained by a legislative framework that effectively supports Telkom's monopoly and maintains high ICT costs, whilst the neo-liberal economic environment encourages high quality infrastructure investment in wealthier areas. The recent package of policies is contradictory and not necessarily supportive of achieving universal access (Ibid.). The implications are profound in terms of the geographic divides that exist between information 'haves' and 'have-nots'. Given that only 13.6% of South African households could access a Personal Computer (PC) in 2003 [25], communal access through public facilities increases in importance. The most notable of these are multi-purpose community centres established by the Universal Service Agency as well as private companies such as Microsoft and Hewlett Packard. Experiences of these have been patchy, with many suffering from lack of capacity to ensure sustainability and lack of initial community engagement [1]. High internet connection bills, lack of staff for ongoing training and maintenance as well as lack of community buy-in have undermined a lot of these initiatives [2].

3.2 Distribution of ICT Access in South Africa

Studies show that Internet access in South Africa is largely confined to urban areas with race, age, income, gender and education important informants; the majority of Internet users in South Africa are younger than 50, have a tertiary education and are white and male [16].

Despite the low rate of access to computers, an exponential growth in access to cell phones was identifiable in 2003; total cell phone subscribers increased from 6 per 100 inhabitants in 1999, to 30 per 100 in 2003 (Ibid.). By contrast, a decline in landline connections resulted from the increase in telephone tariffs (an average increase of 24% per annum) from 1997 to 2004 (Ibid.).

The spatial distribution of ICT access nationally shows a predictably urban bias with Gauteng and Western Cape the dominating in terms of provincial access. In KwaZulu-Natal, ICT is strongly concentrated in eThekweni and Msunduzi [25]. Telecentre access is sparsely distributed; over 500 000 are within a 5km radius of each of the 3 centres in Durban (Ibid.). The 6 cyberlabs in schools serve on average about 145 000 pupils between the ages of 15 and 19 (ibid.). Composite indicators that show combined private access (households with landline access, households with access to mobile phones and households with access to computers) shows that eThekweni falls in the highest group that indicates average access per household between 28.51 and 42.64%. A composite indicator of access to ICT through public facilities such as libraries, Cyberlabs, telecentres and MPCCs shows eThekweni to falling with the second lowest defined rate of 0.03 – 0.06 public ICT services per 1000 people (ibid.). Clearly the latter is due to the high population densities as well as a policy focus on providing such centres in remote areas.

The spatial distribution of ICT access, therefore, represents a patchwork of technologies and agency interests. A paradox

emerges: whilst the range of technologies enable a number of communications solutions, this range is represented of a range of private and public stakeholder interests that are not necessarily coordinated. Thus, the technology can integrate, but can also lead to increasing fragmentation due to splintered agency interests.

4. DIGITAL ACCESS IN DURBAN

4.1 ICT Access in eThekweni Metropolitan area compared to other cities and surrounding municipal areas

Durban is surrounded by rural hinterland areas either farmed commercially (mostly sugar) or under traditional tenure, coastal villages on the Indian Ocean and small towns inland. Data from a survey done in 2007 by the South African Statistical Services¹ was used to determine how technology access in Durban relates to its surrounds. Comparisons are made with Johannesburg, the other primary urban centre in South Africa, Msunduzi, which includes Pietermaritzburg, the provincial capital city for KwaZulu-Natal, Umzumbe, a largely rural area under traditional tenure to the south of Durban and KwaDukuza, a coastal municipal area that contains seaside villages, a small manufacturing centre and rural areas under traditional tenure. Table 1 shows the results.

All areas show a high proportion of cell phone access in comparison to other technologies. Of the metropolitan areas, Johannesburg shows the highest prevalence at household level, with eThekweni second. Umzumbe, the most remote of the selected local municipal areas, shows a relatively low cell phone access rate of 56.6%.

Access to telephony in the form of fixed lines in Durban (32.4%) is almost ten times that of access in largely rural Umzumbe (3.4%), but lags behind Cape Town at 47%; Johannesburg shows a lower access rate at 28.7%. Interestingly Msunduzi and Umdoni show similar rates of 28.7 and 28.9% (despite very dissimilar settlements typologies) with KwaDukuza at 20.5%. Access to the Internet and computers is exceptionally low with Cape Town showing the highest figures; Internet access in Durban is at 18.9% and households with access to computers at 34.3%. The lowest figure, not surprisingly given its rural nature, is Umzumbe, whilst eThekweni shows lowest access figures of the three selected metropolitan municipalities.

¹ The data used to compile this comparison was taken from the Statistics South African Community Survey for 2007. A total of 284 000 households were surveyed across the country randomly sampled within all different enumeration areas as demarcated in the 2001 Census, (excluding those classified as institutions and recreational areas) – these figures were then used to project population distributions across municipal areas. Households are defined as a group of persons who live together and provide themselves jointly with food or other essentials for living, or a single person who lives alone (STATSSA 2007).

Table 1: ICT Access in eThekweni and others

	Yes	No	No response	Total
	%	%	%	%
<u>eThekweni Metropolitan Municipality</u>				
Access to cell phones	77.6	21.5	0.8	100
Access to telephones	32.4	67.1	0.4	100
Access to the Internet	9.2	90.1	0.7	100
Access to computers	19.4	80.6		100
<u>City of Johannesburg Metropolitan Municipality</u>				
Access to cell phones	81.6	17.5	0.9	100
Access to telephones	28.7	70.7	0.6	100
Access to the Internet	14.2	85.1	0.7	100
Access to computers	26.1	73.9		100
<u>Umzumbe Local Municipality (KZN213)</u>				
Access to cell phones	56.6	43.1	0.2	100
Access to telephones	3.4	96.3	0.3	100
Access to the Internet	0.9	98.4	0.6	100
Access to computers	1.6	98.4		100
<u>The Msunduzi Local Municipality (KZN225)</u>				
Access to cell phones	70.0	29.4	0.6	100
Access to telephones	28.9	70.7	0.4	100
Access to the Internet	7.5	91.6	0.9	100
Access to computers	19.1	80.9		100
<u>KwaDukuza Local Municipality (KZN292)</u>				
Access to cell phones	69.6	30.1	0.3	100
Access to telephones	20.5	79.2	0.4	100
Access to the Internet	7.8	92.1	0.1	100
Access to computers	11.3	88.7		100

Source: STATSSA Community Survey 2007

A number of important findings emerge from this data. There is indeed an urban bias to technology access given the need for high cost infrastructure as well as the nature of settlement distribution in places such as Umzumbe (rural and dispersed settlement). A comparison between technologies shows a high uptake of cell phones compared with the low rate of landline access and the nature of infrastructure that is less hampered by topography and dispersed settlement.

4.2 ICT Access *within* eThekweni

Settlement patterns within the eThekweni municipal area vary considerably including rural areas and high density urban spaces. Outward dispersal of commercial and residential development has been a common theme of Durban's post-1990

spatial change. The portside central business district has experienced an exodus of knowledge-intensive firms to peripheral commercial nodes in the north and west (Freund 2007). North Durban, in particular, displays an interesting trajectory of private-sector led development contrasted with large scale townships with informal settlement and peri-urban development. The areas included in the study here focus mainly on the north, and can be described as displaying the following settlement types (labelled in Figure 1):

- Previously allocated to sugarcane farming, *Umhlanga Ridge* has been the focus of mass infrastructural development and private investment since the late 1990s. The seamless conversion of agricultural land into the ‘new town centre’ represents an interesting, almost instantaneous, metamorphic translation from rural to urban and has been largely driven by the private sector, one sugar industry role player in particular.
- *Mount Edgecombe* is a high-income gated estate that includes a golf course residential estate and offices.
- *Inanda* –is largely rural to peri-urban and displays high degrees of poverty. Settlement typologies vary from traditional rural settlement on the outskirts, denser peri-urban settlement closer to the main movement routes. *Ntuzuma* is a township established fairly late in Apartheid history whilst *KwaMashu* was one of the first townships to be established under the Nationalist government in the early 1960’s. Dense urban settlement containing lower density townships to very high density informal settlements on the edges of the urban spaces.
- *Hillcrest* is a high income area that has been overtaken recently with gated estates as well as office and commercial development.
- *Durban Harbour* has the CBD to the west and industrial development to the south.

ICT access across northern Durban (eThekweni metropolitan areas) is examined using 2001 South African Census data mapped using GIS² and compared with settlement type. Three sets of variables were mapped (at the household level): landline access, cell phone access and access to a computer.

Table 2. Composite Indicators and mapping legend (Fig 1)

CI	Variables					
	Information poor - values			Information rich - values		
	Comp. Access. 39– 53%	Tel. access 60– 79%	Cell access 60 – 73%	Comp. access 39 – 53%	Tel. access 60 – 79%	Cell access 60 – 73%
3						
2						
1						

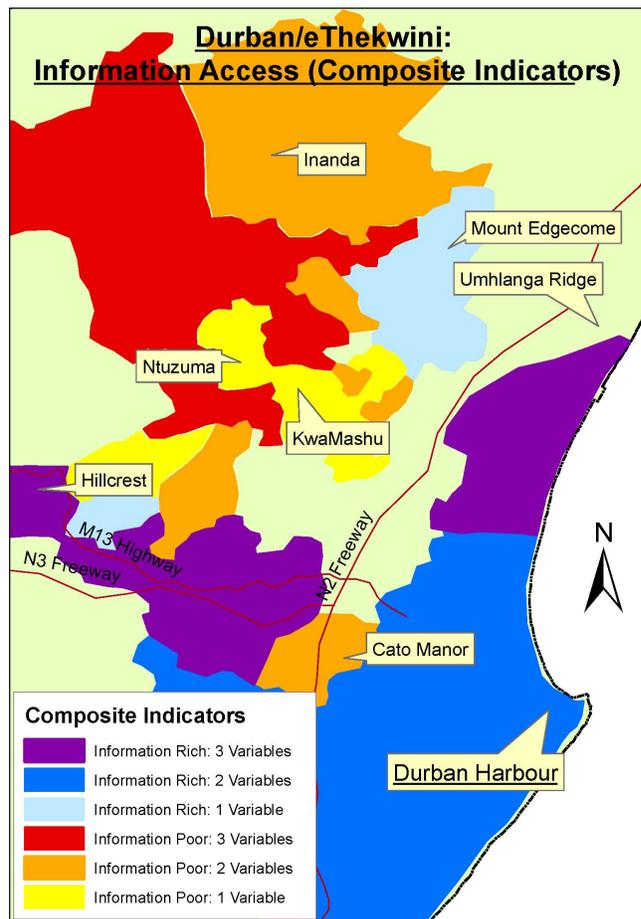


Figure 1: Durban/eThekweni Information Access (Composite Indicators)

² 2001 Census data used; ICT access has most likely changed most significantly in terms of cell phone access, but the overall spatial pattern is unlikely to be substantially different given the high household cost of telecommunications.

These three are taken as being indicative of ICT access. The lowest cohorts of Landline access are 2 to 17% households with

access to a landline, Cell phone access - 16 to 24% of households with at least one member that has access to a cell phone and computer access (0 to 6%). The best access cohorts were 60 to 79% Landline access, 39 to 53% access to computers and 60 to 73% access to cell phones.³

Six composite indicators (CI) were developed using the variables above (indicated in Table 2). Areas that reflect three information poor variables, lowest cell phone, land line and computer access are considered the information poorest, whilst the areas corresponding with the presence of three information rich variables, highest computer, land line and cell phone access, are considered the richest. Table 2 corresponds (using colour) with Figure 1 which indicates this spatially

When considering the north-eastern portion of Durban (eThekweni Municipality), with the major access arteries (N2 and N3 Freeways), ICT access gradually declines away from these two transport corridors as settlement becomes more rural. Figure 2 shows a very strong correlation between the location of clusters of private investment in Umhlanga Ridge with transport corridors clearly demarcating investment also. A 'splintering urbanism' emerges where ICT access correlates strongly with clusters of private investment and greater urban settlement.

Of the technologies examined, access to computers is lowest. Communal access, facilitated through schools and libraries,

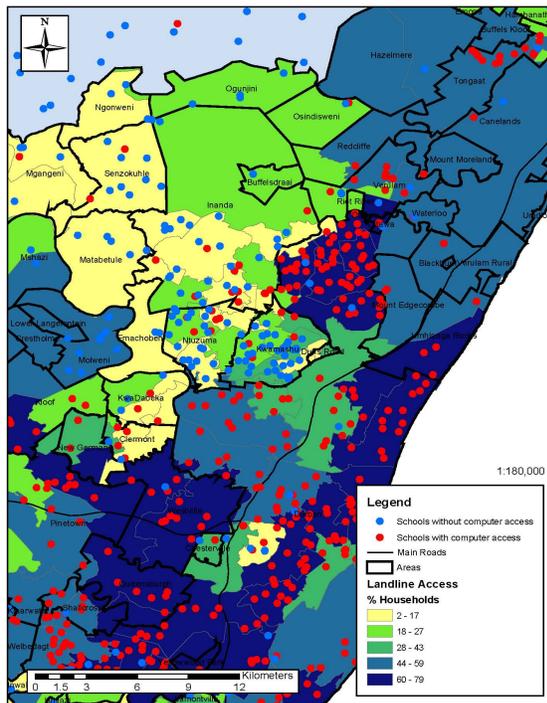


Figure 2: Computer Access in Schools

carries some potential for addressing this. Figures 2 and 3

³ The cohorts are GIS generated as natural breaks divide values in 5 groups at equal intervals.

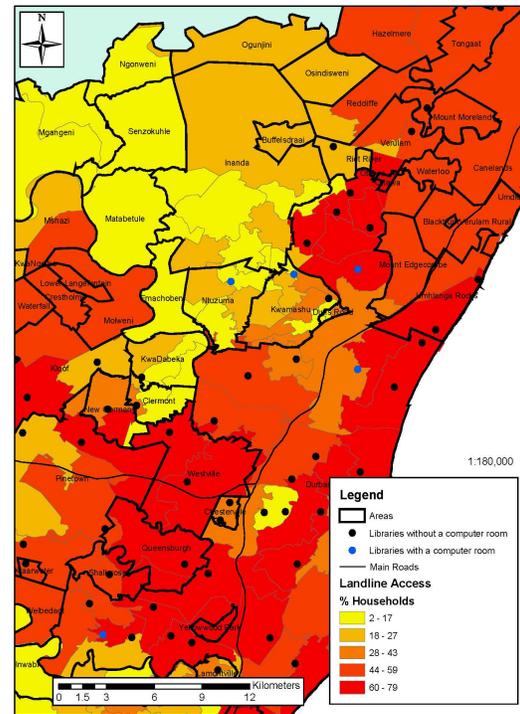


Figure 3: Computer access in libraries

reflect schools with/without computer access and libraries with/without computer access. This is compared to landline access (given that these facilities rely on traditional telephony - 'dial-up- for Internet connections). Predictably, and with the odd exception, libraries and schools with computer access are sparsely distributed in the more rural information poor areas.

The stark picture that emerges indicates a worrying trend where investment in urban areas correlates with high ICT access and of course the converse.

5. CONCLUSION

Spatial shifts in Durban have been informed by private investment decisions and global market trends. Urban place making is a messy terrain that is no longer under the exclusive visionary direction of the planner but subject to deal making and coordination of vested interests. The added 'layer' of ICT deepens this dynamic. As an economic sector it is a contested terrain fraught with competitive advantages and historical monopolies that keep prices high and contain high quality access. As a policy realm it is fragmented, informed by divergent government agency agendas that frustrate implementation. As a social objective, an essential service, its reach is limited.

The spatial manifestation of this shows that ICT access correlates with higher incomes and clustered private investment. This development is urban in nature, whether within a given metropolitan area or when comparing it with other surrounding rural areas. New forms of exclusion are not discernable but existing divides are echoed through ICT access.

This relationship has been explored at a broad spatial scale using secondary data. It shows a strong correlation between urban investment and ICT access. Variation between

technologies hints at lower cell phone access than would be expected. Further insight is needed into household as well as individual access and use in order to determine if access is merely a function of cost and infrastructure or whether constraints are a function of lifestyle and demographics also. Detailed qualitative research is needed on whether ICT is associated with an urban 'mindset' and its associated demographic assumptions (such as those associated with age and gender). A true reflection of how technology interfaces with urban life would necessitate a finer analysis of the appropriation of ICT at a personal and inter-personal level. What this research shows, however, is that the macro conditions are not necessarily conducive to enable individuals to become fully engaged with the digital city. The departure point of this research remains that having access to information and markets (amongst other necessities of city living) through ICT is essential to the 21st century urban experience. The findings reported in this chapter show that relying on market interests to facilitate this is simply a neo-liberal pipe dream in a contested industry that has become particularly adept at pursuing the profit fantasy

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