DOI: 10.20472/EFC.2018.010.011

KARIKOGA GOREJENA
North West University, South Africa

AN ASSESSMENT OF SOCIAL AND ECONOMIC FACTORS FOR BROADBAND PENETRATION IN SOUTHERN AFRICA DEVELOPMENT COMMUNITY (SADC)

Abstract:

The transformative benefits of broadband on economic and social variables have led governments to set ambitious targets for its deployment. In making a case for public policy on broadband, many studies have sought to identify and measure broadband economic benefits. Such benefits have not been fully realized in Third World economies

In an increasingly integrated global economy, broadband is central in providing economic growth and competitiveness to any organisation, country or region. In spite of this competitive advantage of broadband, in the last four years Africa had mobile cellular penetration of 63% and penetration rate flattened at 5.2%. Social and economic factors have been cited as major contributors to this undesirable phenomenon. This papers assays to identify these factors, rank them and suggest possible remedies in the context of Southern Africa Development Community (SADC). The main research question this paper attempts to answer therefore is: how can broadband penetration within SADC region be improved?

A confirmatory factors Analysis (CFA) was used to ascertain the conformity of these factors as obtained from raw data to what is given by literature. The weighting of these factors and policy interventions were then discussed as possible solutions for decision makers within the region.

Keywords:

Broadband, Penetration, Policy, CFA and Factors

JEL Classification: A14, A12

1 Introduction

This paper endeavours to highlight the reality of broadband situation in Africa in terms of its penetration. As cited by Gorejena and others (2016), broadband penetration refers to the number of citizen who have access and are actually utilizing the internet. This can either be fixed or mobile internet. This research uses as a working definition of broadband as “the provision of telecommunications infrastructure that enables information traffic in a continuous and uninterrupted manner, with sufficient capacity to provide access to data, voice and video applications that are common or socially relevant to users as determined” by the SADC from time to time (World Bank 2014). This paper looks at the context of broadband within SADC. The framework for broadband development as outlined by Southern African Telecommunication Association (SATA) is critiqued and the researcher’s proposed framework is introduced. Results based on the proposed framework are briefly presented and discussed.

2 Background and motivation

The aim of SATA is “to develop Telecommunications and ICT networks and services of a regional nature that are responsive to the diverse needs of commerce and industry in support of the regional socioeconomic development programs. To achieve this mission, SATA is implementing several projects and initiatives through its Membership, including human capacity development programs.” (SATA 2014). Right from its aim we can in part identify some of the components that make up a framework which informs SATA namely; Hard-infrastructure, Services and Human capacity development.

According to SADC Infrastructure Development Report for Council and Summit (2009), the following achievements have been made: Harmonized legislative & regulatory framework, launch of “e-SADC” initiative which seeks to harness ICT for socio-economic development, increased private sector participation in the market, SADC plan for migration from analogue to digital by 2013 and increased private sector participation as a result of fully liberalized market.

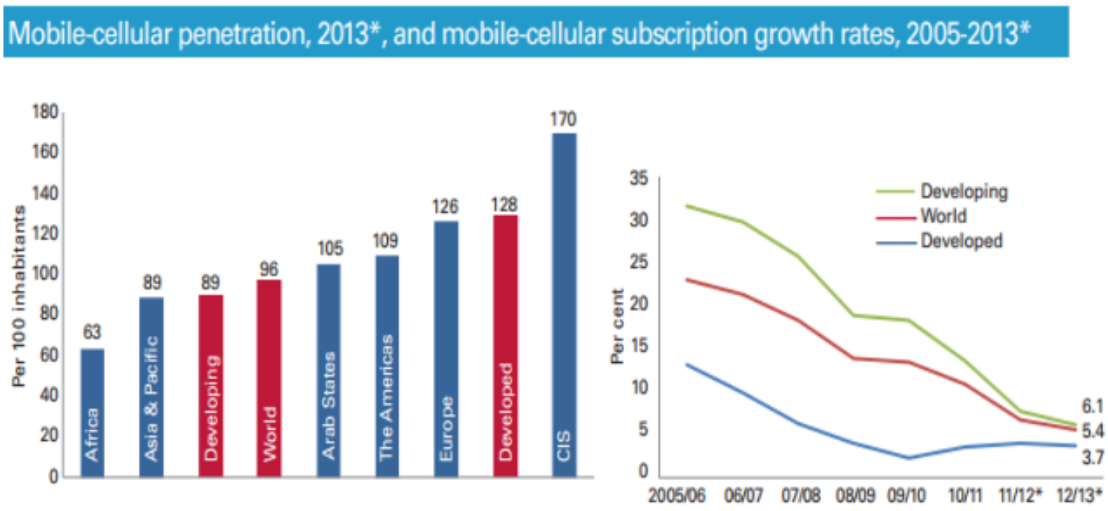
Notwithstanding these successes by SADC in the telecommunications sector, the facts and figures on the ground with regards broadband penetration in SADC reflect a different reality as shown by the following illustration in Fig 1.

The graph to the left shows us that Africa is the least in terms of mobile cellular penetration and this translate directly into SADC’s poor penetration globally. The other graph to the right shows that even though there has been an increase in mobile subscriptions over time yet the rate of this growth has been decreasing, even more

rapidly in developing nations like Africa. Both the developed and the developing nations are fast reaching saturation of their markets but for entirely different reasons.

While the flattening out of Internet subscription is in line with trends in other parts of the world, this is due to much higher levels of market saturation than in Africa. However, the high cost of access has meant that the market for services at that price has saturated more rapidly than it might have had if access and usage were cheaper.(Esselaar&Gillwald 2007). This therefore points to the fact that monopoly is still an element in Africa's telecommunications.

Fig 1: Mobile-cellular Penetration and Growth rates (ITU 2013).



3 Theoretical background

This section explores the theoretical framework as used by SATA in SADC, critiques it and introduces an alternative framework upon which the research was conducted and data gathered.

3.1 SADC Framework

The SADC prevailing framework for broadband growth and penetration is illustrated in the following scheme in Fig 2.

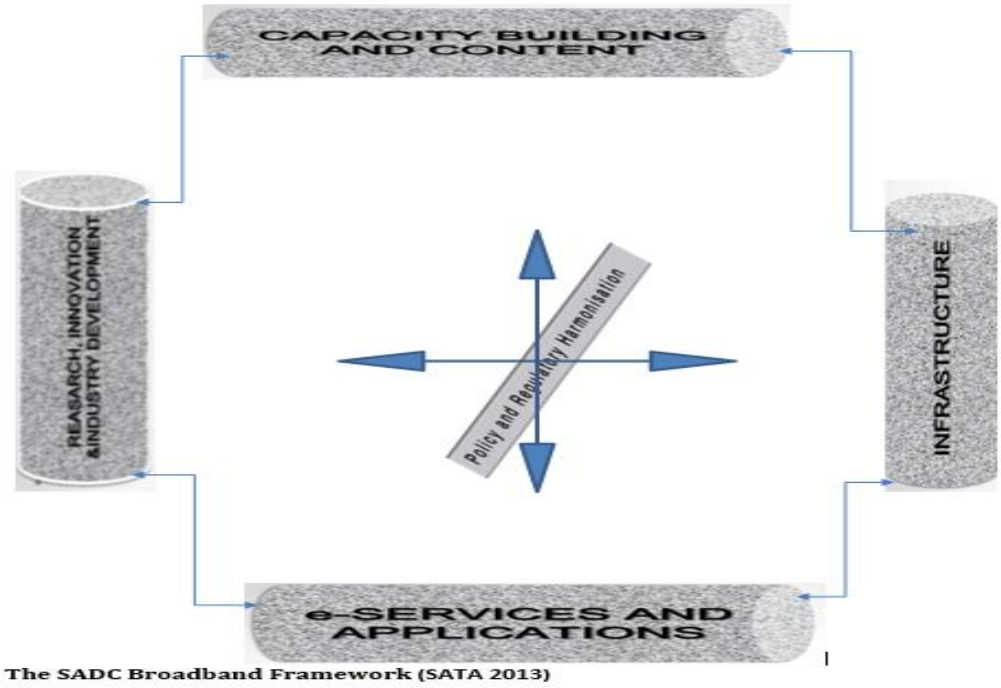


Fig 2.

According to SATA (2014), the subsystems of its broadband framework above are each responsible for specific functions as articulated below:

Research, Innovation and Industry Development: Development of ICT equipment manufacturing, software and applications. Collaboration and knowledge sharing between research centres.

Capacity Building and Content: Broadcasting and universal ICT education programme.

E-Services and Applications: Regional and national development of e-services and applications including e-post. Development of an ICT observatory.

Infrastructure: SADC integrated regional and national broadband infrastructure (Internet Exchange Points, shared satellites networks, Schools, hospitals, meteorology stations, wildlife conservatory centres, etc.)

Policy and Regulatory Framework: The legal aspect of all the above mentioned components of the broadband framework.

The above broadband framework for SADC is quite comprehensive and adheres quite closely to most broadband frameworks elsewhere. The two main sides of most broadband frameworks were addressed. These are the demand side and the supply side. Infrastructure, services and content define the supply side of the broadband while education and awareness pertains to the demand side of the broadband.

The policy and regulatory framework provides the environment in which all players and stake holders operate without short-changing one another. According to Shin & Jung (2012), the SADC framework fits within the conventional economic due to its approach and areas it addresses.

The weaknesses of both the above framework are the following: It reduce the problem of broadband growth and penetration to be attributable to common factors which are GDP, Education and awareness of the consumers of broadband, incentives to stimulate broadband and content development by suppliers, regulation and competition among suppliers to reduce prices. Looking at these factors alone and uniformly as areas of concern for every broadband framework has failed to yield desirable results especially in third world because the uniqueness of a people group has a strong bearing on their behavioural intention to grow and adopt broadband. So a people's social aspects such as culture, history, language proficiency, and politics have a strong influence on broadband growth and penetration (Distaso, Lupi & Manenti 2006).

The approach of the above and many other frameworks on broadband growth and penetration do not reveal the interplay/relationships between social, technological and legal factors without which it's difficult to develop appropriate frameworks (Dutta et al. 2008).

More so, not all factors have the same influence on broadband growth and adoption therefore a framework on broadband needs to show some ranking on factors as a way to help decision making and allocation of resources, that's according to Trkman, Blasic and Turk (2008). The above frameworks do not include that important aspect.

This research intends to address the above mentioned shortcomings identified in the current conventional economic model frameworks.

Results of studies conducted in the recent past on broadband growth and penetration show the prevailing influence of GDP and economic development on the adoption of broadband. Studies of other possibly influencing variables have been inconclusive

(Trkman et al. 2008). It is in these inconclusive studies that this research has its inspiration. The other influencing variables of broadband are social in nature and require a socio-technical investigation to unearth their impact on broadband.

As opposed to the conventional economic model, the use of the socio-technical approach gives assurance that projects that are technological in nature give outcomes that are the result of a more complex interaction between technical and societal factors. “It is widely acknowledged that ICTs and the social and contextual settings in which they are embedded are in a relationship of reciprocal shaping” (Borgman 2000). Some researchers speak of broadband influencing or changing the culture of societies as Borgman (2002) says. This research argues that the shaping is reciprocal therefore society should speak to broadband as much as broadband speaks to society.

3.2 Propose framework: Socio-technical systems theory (STST)

According to Sawyer, Allen, and Lee (2003) an STST perspective is a solid framework for investigating the complex interrelationships of technical and social processes, given that the framework should include technological and social details of large-scale ICT projects. From this perspective, Borgman (2000) conceptualized broadband as a socio-technical system. Sawyer et al. (2003) investigated broadband and mobile infrastructures from a socio-technical perspective. This approach to broadband is consistent with the concept of a broadband ecosystem introduced by Kelly and Raja (2010), in which broadband is a socially constructed artefact that is part of a cultural ecosystem. In a broadband context, STST addresses the social aspects of people and society, as well as the technical aspects of systems and technology. As a theoretical lens for broadband, STT enables the investigation of the technical subsystem (comprised of infrastructure, equipment, applications and service), the social subsystem (market, customers and industry), and the environment (regulation, policy and society) that are all critical components of a developing broadband society.

A socially rich view seems to better conceptualize the role of broadband in its current environment. The socio-technical model takes into consideration important factors such as the social and organizational context of the technologies and the people who use them (Shin & Jung 2012).

This research used STST to examine the determinants for our broadband growth and in SADC and in proposing the resulting framework.

Fig 3, is the researcher’s proposed framework for addressing broadband growth and penetration in SADC. This paper however is only looking at broadband penetration. Fig 3

is the abstract version of the framework which is more refined by the decision making table in results anlysis.

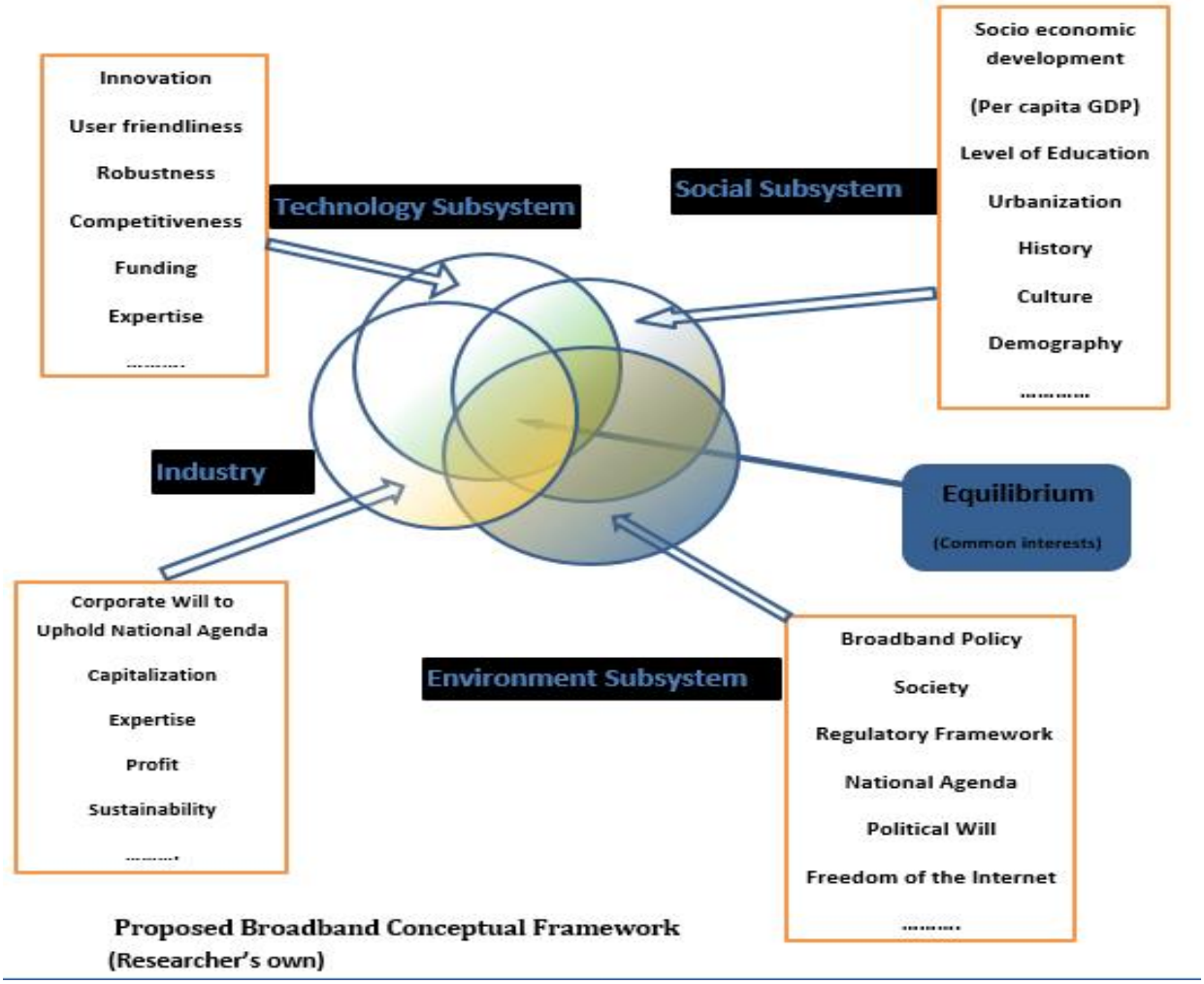


Fig 3

The epistemological analysis of these determinants referred here to as subsystems should establish the underlying, hidden layer of reality that informs the relationships among these. This approach is purely the Socio-Technical theory approach.

It should be noted that the equilibrium section of the framework above will comprise common factors of broadband development. These factors should be the most prevalent in the resulting decision and policy making framework shown below.

The proposed decision making framework in Table 1 is four dimensional. It relates broadband influencing factors, type of intervention to be taken and the ration of the one intervention category to another. At same time it also ranks these factors according to

their order importance in influencing BGP in the region. It should be noted that the forth subsystem if the STST was added by the researcher as the original theory comprises only three subsystems.

Table 1: Decision Making Framework

Interventions / Factors	Economic Policy	Social Policy	Weights or Rankings	Ratio of Economic to Social Policy per Factor
Society Subsystem Factors				
Environment Subsystem Factors				
Technology Subsystem Factors				
Industry Subsystem Factors				

Once this table is populated with data from research results it becomes a useful tool for decision making, especially in terms of allocation fo resources and inacting policies for different area of the STST. Part of the results obtained on this research are shown in the next section

4 Methodology

In this work a mixed method approach was used for complementarity and completeness.

Complementarity

This when mixed methods are used in order to gain complementary views about the same phenomena or relationships (Soffer& Hader 2007). An example would be when a qualitative study is used to gain additional insights on the findings from a quantitative study.

Completeness

This when mixed methods designs are used to make sure a complete picture of a phenomenon is obtained. The qualitative data and results provided rich explanations of the findings from the quantitative data and analysis (Venkatesh et al. 2013). While the quantitative results mentioned social policies, qualitative results explained what the social policies were and how they would apply.

Data was collected across SADC member states with a sample size of over 500 participants including university students, academics and experts.

5 Results and interpretation

This section begins with the actual measurement model, with keen interest in values of the factor loadings. Many researchers agree on cut- off value of 0.4 on factor loadings, with any indicators of less than 0.4 discarded.

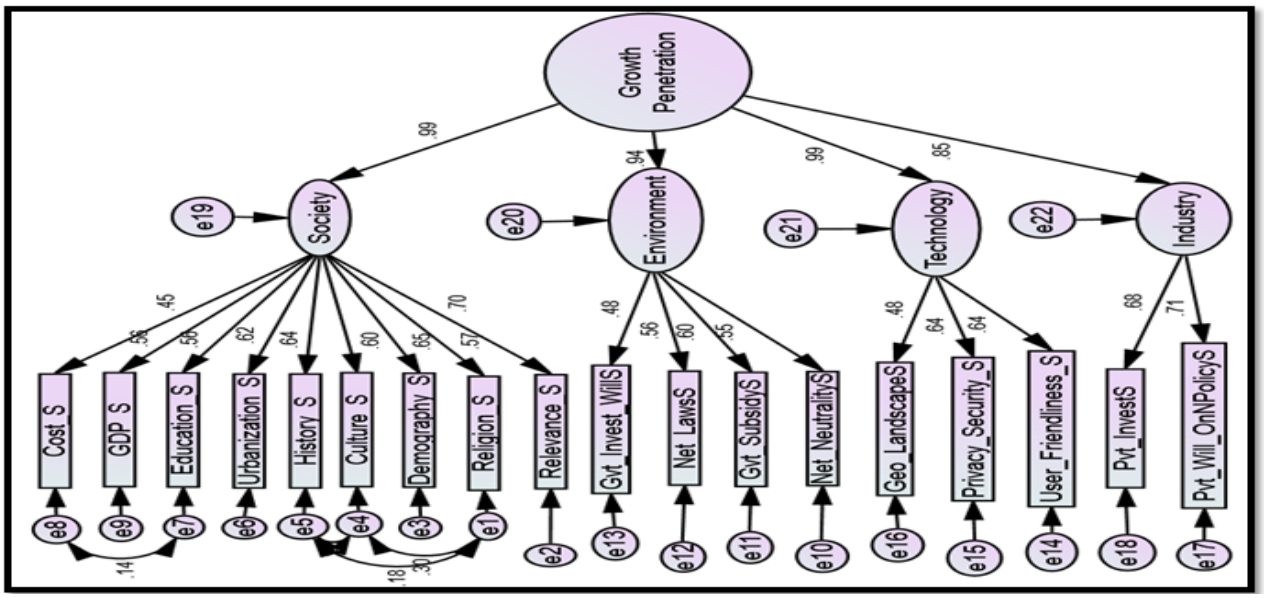


Fig 4

As can be observed in Fig 4, none of the factor loadings are below 0.4. This validates all the BGP factors as suggested by literature. From the tables of indices of the best fit model only the indices of interest were extracted and presented in Table 2 below.

Table 2: Fit Indices

Chi-square	RMSEA	CFI	GFI
330.026	**.054**	**.937**	**.935**

The chi-square value has reduced significantly through the four modifications done. This last value of chi-square owes its size to a large sample used and is vindicated by other indices.

Broadband penetration, according to the results of this research is affected by three sets of factors: developmental factors, attributes of the ST environment and repercussions of an ST environment as shown in the following three tables. Some of these factors are common across the three categories.

Table 3: Policy ration Per Penetration Factor

Factors	3:1	1:3	2:1	1:2	1:1	Other	Count
GDP per capita	86	100	101	75	52	9	423
Cost	71	76	144	90	63	14	458
Level of education	83	72	124	100	59	10	448
Urbanization	57	54	109	113	58	15	406
History	47	45	120	79	75	12	378
Culture	52	61	98	82	81	14	388
Demography	50	60	120	92	64	11	397
Privacy and security	37	88	91	112	61	14	403

Table 4: Attributes and Policy solutions

Attributes	Fast paced evolution	Globalization	Technophobia	Expert Knowledge	Complex contexts	Value differences	Social-ICT support	Resistance to change	Cost	Negotiated and multivalent relationships
Policies	Prototyping and consulting	Access	Upskilling	Collaborations	consultation	Education	Support rights education	Education	Market forces	Consultation
	Shadow IT	Policy flexibility	Education	Incentivized Sharing of expertise	Training	consultation	Support budget	Early introduction to ICT	Government subsidy	Negotiated solutions
	Negotiated solutions	Policy flexibility	Help desk		Self - regulation	collaborations		Policy enforcement	Policy enforcement	Prototyping and consultation
	Collaborations	Self - regulation	Access	After effect	After effect	After effect	After effect	Access		After effect
	Policy flexibility	Public-private partnership	Early introduction to ICT			Training				
	Public-private partnership									

Table 5: Social repercussions and policy solutions

Social repercussions								
Conformity to Technology	Cyber bullying	Data confidentiality	Health issues	Isolation	Unemployment	E-Gambling	Indecent content	Abductions
Policies for Social repercussions								
Consultations	Human rights	White hat hackers	Work gym	Team work	Training	Traffic monitoring	Traffic monitoring	Traffic monitoring
Reciprocity	Education	Education	Education	Education	Education	Education	Education	Education
prototyping	Traffic monitoring	Encryption	Wellness campaign	Mentorship	Up skill	Law enforcement	Law enforcement	Law enforcement
Cultural values					Redeployment			

If Table 1 is populated with results, especially of Table 3, it becomes a useful decision making tool. Fig 5 gives the first five highly ranked factors of broadband penetration. It notable that all these factors are social factors.

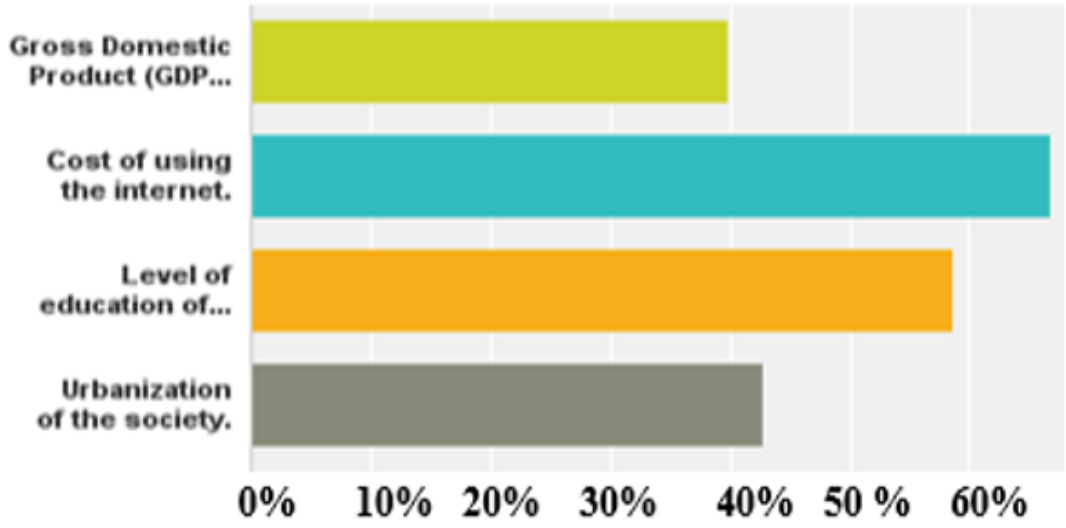


Fig 5: Factor ranking

6 Inferences and conclusions

The following inferences can be drawn from the results:

6.1 Broadband is a social construction

6.2 Developmental factors, attributes and repercussions are contained in the subsystems of the STST, hence exist as an ecosystem

6.3 Developmental factors and social repercussions require more social policies as remedies whereas attributes require more business policies than social policies

6.4 Attributes and repercussions are inherent to a socio-technical environment and may not differ among societies

These result is in the main are true within SADC region. The resultant framework only becomes useful globally if it's preceded by consultative research. Presently, there is no comprehensive framework for broadband penetration that takes into account the social settings of a people group. The framework developed helps policy makers not only in identifying ranked factors that influence broadband penetration but also with what social and business policies to enact in what ratio. The framework is generalizable to any society with a condition of consulting the society in question first and use the data gathered to populate the framework and herein lies the contribution of this work.

7 Refences

Borgman, C. (2002). From Gutenberg to the Global Information Infrastructure: Access to Information in the Networked World. Cambridge, MA: MIT Press

Dutta, A., Gervey, R., Chan, F., Chou, C.-C., & Ditchman, N. (2008). Vocational rehabilitation services and employment outcomes for people with disabilities: A United States study. Journal of Occupational Rehabilitation, 18(4), 326–334. http://doi.org/10.1007/s10926-008-9154-z

Esselaar, S., Gillwald, A. & Stork, C.,2007, "Towards an African e-Index 2007. Telecommunications Sector Performance in 16 African countries", viewed 14 September 2016, from http://ictlogy.net/bibliography/reports/projects.php?idp=1159

Gorejena, K., Mavetera, N. &Velempini, M., 2016 "A critique and potency of socio-technical systems theory: A quest for broadband growth and penetration" Public and Municipal Finance, Volume 5, Issue 2, 2016

Kelly, T., & Raja, S., 2010, "Building Broadband: Strategies and Policies for the Development. Global Information and Communication Technologies Department of World Bank", viewed 11 of March 2014, from, http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1208273252769/Building_broadband.pdfS

SATA, 2013, “Developing SADC through ICT”, viewed 12 January 2015, from http://www.sata-sec.net/index.php

Sawyer, S., Allen, J.O. and Lee, H., 2003, “Broadband and mobile opportunities: a socio-technical perspective”, JBoruorandablaonfd I nafnodrmmatoiobnileToepchpnorotluognyiti(eJsune 2003) 18, 121–136

Shin, D. & Jung, J., 2012, “Socio-technical analysis of Korea’s broadband convergence network: Big plans, bigprojects, big prospects?” *Telecommunications Policy* 36(2012) 579–593, viewed 20 March 2014 from http://www.sciencedirect.com/science/article/pii/S0308596112000456

Trkman, P., Blazic, B.J. &Turk, T., 2008, “Factors of broadband development and the design of a strategic policy framework”, Telecommunications Policy 32(2008) 101-115, viewed 22 March 2014, from

Venkatesh, V., Brown, S.A. &Bala, H., 2013, “Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in Information Systems”, MIS Quarterly Vol. 37 No. 1, pp. 21-54/March 2013

Walter Distaso, W., *Lupi, P.*& *Manenti*, F., “Platform competition and broadband uptake: Theory and empirical evidence from the European Union”, *Information Economics and Policy*, 2006, vol. 18, issue 1, 87-106

World Bank Group, 2014, “Broadband Strategies Toolkit”, viewed 12 September 2013, from http://broadbandtoolkit.org/0