



Research Article

Assessing the Influence of Mobile Technology on Culture a Presentation and Analysis of Research Data Results

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Abstract

This paper presents an analysis of research survey data that was aimed at assessing the influence of mobile technology on culture. The paper is motivated by human-centric approaches to computing and ICT developments, with a focus on the derivation of models of culture that inform the development of culture-aware mobile technology oriented and people-focused solutions. The context of interpretation of culture that is adopted in this paper is based on a culture-component view that was derived from an analysis of survey-questionnaire sourced data whose focus was to derive a meaning of Culture from a perspective of the survey respondent population. Informed by a survey, the paper contributes to the knowledge domain of culture and mobile technology by informing to some level on how culture has been influenced by mobile technology, and by so doing make contribution to the development of tools such as architectures or models that are aimed at informing the development of culture aware mobile technology solutions. Findings indicate a largely positive influence of mobile technology on culture particularly in the areas of music, entertainment and education and a low influence in the areas of *family values*, *traditional ceremonies*, *farming* and *religion*. Findings also suggest that mobile devices though extensively used do not, however, significantly expose or provide opportunities to interact with culture related information. The findings thus point to potential areas of culture upon which the development of culture aware mobile technology oriented solutions can be leveraged.

Keywords: Culture, mobile-technology, user-centred-computing, culture-aware

Introduction

The ubiquitous nature of mobile devices as they continue to become part of everyday life in all areas of society, coupled with rapid developments in mobile technology, thus necessitates the need to understand the interplay between mobile technology and the society within which it is used. Not just from a user interface design perspective but also from a mobile technology development perspective as a whole.

The question is, in this interplay how does the use of mobile technology influence the culture of the societies in which it is being used, and how can such an influence be applied to the enhancement of this technology through culture aware mobile technology development approaches; Approaches that view the human element of culture as central to mobile technology developments.

A resonance for the value of technology developments that maintain a cognisance of the human element as an important factor has been and continues to be sounded by many researchers and scholars alike.

The Human-centric Computing theory as a basis for scientific approaches to developing computing-based systems in which computers interact with people, coupled with the study of major concerns surrounding people and computing, is recognised in Hewett et al (1992).

This premise is also expressed in Oudshoorn et al. (2004) in which the need for a human centred design approach in technology design is recognised, and in Kline (2003) and Wyatt (2003) in which observation is made of the importance to social scientists, of a human-centric approach to technology design.

In addition, Wilson & Peterson (2002) put forward a view that social anthropology plays a relevant role in the emergence of and developments in information technology

Arnold (2005) and, Misa & Schot (2005) also make an observation that technological developments are not only achievable through effective hardware platforms but also rely on an effective political, social, and cultural process.

Gallivan & Strite (2005) observe that the role of culture in the use and adoption of Information Technology (IT) is critical and that "cultural fit is essential to achieving the benefits of IT", particularly in an environment in which technology changes continue to be experienced in and from several dimensions; dimensions within which the human element is encapsulated, in one form or another.

In the same context, Ho et al (2009) present a view of Human Computer Interaction (HCI) for Development (HCI4D) as "research that addresses the needs or aspirations of people in developing regions, or that addresses specific social, cultural, and/or infrastructural challenges of developing regions".

The relevance of a cultural understanding in technology developments is also echoed in Smith et al (2010). Here recognition is made of the need for a design approach that not only improves understanding of the users but also develops a better understanding of "the cultural and technological gaps across stakeholders, and the resulting impacts on design processes" (Smith et al 2010, p11).

The relationship between technology and culture is reflected in various literature sources. Steward (1955) intimates this relationship in an observation that "among all these parts of culture, technology is the obvious place for the human ecologist to start, because it is the way that we make our living in the world that couples us directly to the rest of nature" and that parts of culture could have ecological relevance in the way they in some way affect technology.

On the same subject, Pacey (1983) draws attention to the need to get rid of some of the attitudes that cloud a view to

technology in order to identify neglected aspects of culture. In continuing the argument, Pacey (1983) asserts that training in science and technology tends to focus on general principles, but the human aspect of technology - its organisation and culture - cannot be reduced to general principles.

The paper therefore draws from the human-centric computing paradigm with focus on mobile technology and culture. The paper contextualises ubiquitous systems within a human-centric computing theory that sees a growing capability of computers to interact with people, and a gradual shift towards more computer-to-human than human-to-computer interactions, in the interaction process. The focus of the paper is on the technology-culture relationship. It does so through an investigation that seeks to understand and inform on the influence of mobile technology on culture and further contribute to informing on the role of such an influence on the design of culture aware mobile technology solutions.

This paper thus seeks to make contribution to a research question that enquires on whether culture(s) has a role to play in the design and development of mobile technology and mobile technology oriented solutions. If it does or if it should, how can such a role be modelled and presented in a specification (of components) for the purpose of guiding the development of culture aware mobile technology solutions and implementations.

Mobile Technology and Culture - A Cross-Influence Perspective

Contextualising pervasive systems, within a human-centric theory that sees a gradual shift towards more of a computer-to-human than a human-to-computer in the interaction process, calls for computers to integrate with the human ecology in order to better understand human expectations. Contributing to this view, Flanagan, et al (1997) attribute to Human-Centred computing HCC, the design of a good tool in which the computer “does all the adopting”. In this regard, this paper informs

developments of culture-aware systems by focusing on the human construct of culture and mobile technology. It does so by acquiring information and contributing knowledge on the influence of mobile technology on culture. Such information would be useful to the development of tools whose focus would be to inform culture-aware mobile computing and related developments. Culture-awareness as an essential element of human-centric computing is also expressed in Flanagan, et al (1997).

The need for Human-centred computational tools to support the organisation and exploration of information, as well as derive an understanding of the meaning of information is mentioned in Hoffman et al (2004). Such tools will include software technologies and architectures such as agent technologies (Pour, 2007). For example, these technologies will support the adaptability of software applications in the mobile environment, to the needs of users, from a culture aware perspective.

Within the Human-centric paradigm and the development of structured information repositories, such as those informed by culture and technology, it is envisaged that new forms of interaction will emerge resulting in human-centric information services as the technologies being used become transparent (Creese, 2004).

Bringing mobile technology into the cultural context van, Binsbergen (2004) attests to the “culture in technology relevance”, by drawing attention to the need for scholarly focus on “what Africans do with ICTs through enculturation “instead of what ICTs do to Africans”, toward ‘social-shaping’ of ICT. This advocates for the relevance of cultural inclusion in the process of informing developments in Information and Communication Technologies.

Adding to the argument, Bell (2006) observes that mobile phones have become elements of socio-cultural practices and appear to have “inserted themselves in the cultural fabrics of societies across the

world”, in both their being accepted and their being opposed to.

In WOTRO (2007), emphasis is made on the significance of the culture dimension in relation to technology as reference is made to the shortfalls of focusing in a limited way on mobile phone ownership as a measure of access to ICT at the exclusion of “the importance of the *social and cultural shaping of technologies*”.

Making their contribution, de Bruijn et al (2009) allude to the culture-technology relationship from an ethnographic assessment dimension, drawing attention to how mobile users in Africa have adopted technologies to fit into their daily lives and how new uses of ICT have emerged from on-the-ground users’ practices and specific cultures.

Expanding on the influence-aspect between mobile technology and culture, Chéneau-Loquay (2010) brings this to the forefront with reference to the Sanan population in Burkina Faso. Here the technology and culture influence-aspect is expressed in an observation that with its “unique strong oral tradition” the Sanan population will change as it assimilates more technology enabled content, resulting in the population acquiring its own telephone culture that it (the population) would have played a role in its creation based on its own culture and traditional values.

The pervasive nature of mobile technology and the popularity of the Internet have thus afforded a degree of digital freedom to youth from different cultures and communities, presenting them with a platform for collaboration across geographic and cultural boundaries. In this regard, as expressed by Botha et al (2011), “the need for cross-cultural awareness and communication is thus more important than ever.”

Viewing the culture-technology relationship from a technology determinism view, technology is seen as an independent social aspect that brings about social change, exercising a “causal influence on social practices, and technological

change”, inducing *changes in social organisation and culture regardless of the social desirability of the change* (Mesch, 2009).” This potential for undesirable influences of technology is also echoed in WOTRO, (2007) in which observation is made that “new ICT could also generate new patterns of exclusion and poverty and lead to new social hierarchies, moral and economic problems”.

In accepting that mobile technology influences socio-cultural changes and acknowledging that the potential for such changes shall continue to exist, it is prudent to accept that the process of this change and the final outcome will not necessarily encounter universally similar variables across all society and cultures. This will hence require for any potential changes and expected outcomes to be contextualised within the socio-cultural environment in which the technology is used. And by so doing avoid adopting a “purely deterministic interpretation, recognising the social embeddedness of technology and its variable outcomes”. (Mesch, 2009).

The ubiquitous nature of mobile technology, particularly mobile phones, is thus a factor that is likely to impact on the potential extent of the influence of mobile technology on culture.

Mobile Technology has quickly become a widely adopted technology, becoming widespread even in the rural populations of developing Africa. Based on 2006 statistics, the rural penetration rate of mobile phones in Africa stood at 3 percent with figures of 13 percent in middle income countries. In the urban areas, the penetration of mobile phones ranged from 22 percent to 38 percent in low and middle income countries respectively (Foster and Briceño-Garmendia, 2000).

The rapid spreading of mobile technology and its adoption by the masses as a primary technology for voice calling, text messaging and accessing of multimedia content over the Internet has added to the impetus for developments that are focused on addressing requirements for efficient

and effective user Interaction on hand held devices; particularly in light of design and technical constraints that are inherent to these devices. The drive towards user-centred computing is beginning to focus on culture as a relevant component for requirements analysis in the design of and developments in computing technology. This focus is also observed in McLelland (2007) in which is projected a requirement to view mobile communication as a component of socio and cultural systems that relate to local, regional and global interactions of people and technology. It is therefore necessary that developments in mobile technology be privy and positively responsive to the needs and expectations of the composite environment in which the technology is used.

This growing expectation for human centred computing to take into consideration issues of culture in the development of mobile technology oriented solutions or services, be it from the physical device-design perspective, the device application perspective or the perspective of adopted approaches to mobile service delivery, is further echoed in Xinyuan (2005). Here the need to consider the user 's cultural perspective in improving predictability and "understandability" of user reactions in the design of user interfaces is presented.

As expressed in Pinchot et al (2010). "We need to clearly understand the cultural shift that mobile devices are creating within our society, and work to lessen some of the problems and challenges that it has caused." Along similar lines, Donner (2008) makes an observation of: the potential effects of cross-cultural differences on the physical hardware requirements, the cultural context design on issues of usability and the relevance of language differences on mobile phone or device text-interface requirements.

Contributing to the observation, McLelland (2000) shares a view that acknowledges the influence of culture on mobile technology, stating that "it is clear that pre-existing Japanese cultural norms and practices have exerted a strong influence

on the development of *keitai* technology and its deployments"; *Keitai* being the Japanese name for cell/mobile phones (McLelland, 2000). This placement of the mobile phone within cultural norms and practices inevitably brings into relevance the mobile device usage trend aspect.

Along the same line, Pereira et al (2012) draw attention to an understanding of the need for a responsibility to make sure that technology that is developed and employed does not negatively impact on the socio-technical environment. Attention is also drawn to that, in order to contribute to safeguarding against such negative impact, it is essential that the need to address people's values and cultures be considered as basic to technology development initiatives.

A relevance of the application of culture in technology development is also put forward in Zhao and Zhang (2010) in which they look at the influence of culture on decisions relating to the use or adoption of ICT. The potential influence of mobile technology on different culture-defining areas is suggested in Tenhunen (2008) in which it is observed that mobile technology adds more to the impetus of cultural change but does so in a selective manner.

Vesisenaho and Dillon (2009) discuss a framework for implementing ICT projects in the developing world with integration with a 'cultural ecological framework. This is' in order to come up with 'a framework which better reflects the ecology and localisation of people's interactions with ICT'. Chaula et al (2006) make a presentation that examines the role of culture in the security of computer systems and present a view that "culture defines how people plan, acquire and use information systems in a secure way".

In concluding this section, the consulted literature review has thus presented a case for the relevance of culture in mobile technology and has also demonstrated the existence of a cross influence between mobile technology and culture. An understanding of the influence of mobile technology on culture will thus contribute

to human-centric mobile technology design from a culture-awareness perspective. It is in this regard that this paper contributes towards the creation of a platform that enables the developing and delivering of culture aware mobile technology solutions.

Methodology

The research design adopted a methodological design approach and employed a cross-sectional survey design for the research study. The cross sectional study design was aimed at contributing to a response to the overall research question as previously stated. The research design relied on a retrospective (as in immediate past) reference period to draw-out identified aspects of the culture and mobile technology relationship from a mobile technology and culture cross-influence perspective. The applied investigation is of a non-experimental nature.

A research survey questionnaire was administered for the purpose of collecting the data from respondents. The data were analysed using SPSS and Microsoft excel. The analysis of the data included significance tests, frequency analysis and cross-tabulation confirmatory analysis for assessing the level of respondents' consistency in their responses in the three areas described above. The analysed data included both categorical data which provided nominal options for respondents to make selections and ordinal data in Likert scale ratings. The analysis was largely non-parametric analysis.

Sourcing of the survey data was based on a technology determinism view on the influence of mobile technology on culture.

The analysis relied on three dimensions for the assessment of the mobile technology and culture cross influence, namely: A defined context of culture interpretation bringing into focus the mobile technology perspective, the influence of mobile technology on culture with a view on Internet access in the context of indigenous knowledge information and other identified attributes of culture, and the extent of use of mobile devices by the survey population, for

accessing culture related information or content.

These three dimensions are described below.

- a. A derived understanding of the context of interpretation of what culture is from the perspective of the survey respondent population. *-To allow a better understanding and interpretation of the survey results thus enabling an evaluation of the influence of mobile technology on culture with focus on specific aspects or attributes of culture and in a relevant context.*
- b. Assessing the extent to which mobile technology has influenced or influences culture from the perspective of the use of mobile devices or technology for Internet access in the context of indigenous knowledge information in relation to identified attributes or components of culture - *The Internet presents a platform for the integration of mobile technology with other technology platforms.*
- c. Capabilities of mobile devices in supporting access to culture related indigenous knowledge *-To inform on the status of strengths and limitations of mobile devices or technology in supporting access to culture related information or content and hence enable an assessment of how the status could be contributing to the influence of mobile technology on culture.*

The purpose of the survey and data analysis was to quantifiably assess the influence of technology on culture without necessarily identifying specific examples of forms or types of influence relative to specific socio-cultural activities of a population or group.

Statistical Package for the Social Sciences (SPSS) and Microsoft Excel were used for the data analysis. The data analysis included significance tests, frequency analysis and cross-tabulation. Cross tabulations were used for assessing the level of respondents' consistency in their

responses in the three areas described above. The data included both categorical data with nominal options for candidates to select from and ordinal data in Likert scale ratings. The applied analysis on the data was largely non-parametric.

Table 1 below shows the profile of the survey population. The survey respondents were largely from the same population demography

Table 1: Research survey population statistics

Research Sample Population Statistics		
Gender	Count	Percentage
Male	31	44%
Female	39	56%
Total	70	100%
Age in years		
Age in years	Count	Percentage
16 - 20	17	24%
21-25	41	59%
26-30	1	1%
30+	10	14%
Missing	1	1%
Totals	70	100%

Primary to assessing the respondents' opinions on the influence of mobile technology on culture was the importance of understanding the context of interpretation by the research survey population, of what culture is. To come up with the context of interpretation,

respondents were asked *to list any five attributes, activities or characteristics that closely identify with their culture*. The resultant data are given in table 2 below. The presented list of culture attributes represents the respondents' cognitive culture domain.

Table 2: Frequency distribution of culture attributes

Culture Attributes Frequency Distribution			
attribute	frequency	attribute	frequency
language	12.36%	ethics	0.77%
dress code	10.81%	discipline	0.77%
food	9.65%	sharing	0.77%
traditional dance	7.34%	Honest	0.77%
respect	5.41%	humanity	0.77%
religion	3.86%	traditional ceremonies	0.77%
values	3.47%	determination	0.77%
cooperation	3.09%	team work	0.39%
music	3.09%	communication	0.39%
customs	2.70%	bride price (dowry)	0.39%
social gatherings	2.70%	peace	0.39%
norms	2.32%	use of social networking sites	0.39%
behaviour	2.32%	email dependency	0.39%
tradition	2.32%	inadequacy of social interactions	0.39%
song	1.93%	dependency on cell phones	0.39%
courtesy	1.93%	sympathetic	0.39%
Art [the way we build our huts]	1.54%	reading	0.39%
loyalty	1.54%	Farming system	0.39%
morality	1.16%	self reliance	0.39%
caring	1.16%	alcohol	0.39%
education	1.16%	voluntary work	0.39%
Sociable	1.16%	charity events	0.39%
Trust	1.16%	hardworking	0.39%
Entertainment	1.16%	totem	0.39%
openness	0.77%	football	0.39%
extended family (looking after) supportive	0.77%	humility	0.39%
		humble	0.39%

Based on an analysis of the data in table 2 above, a composite view of the survey's population's interpretation or understanding of culture was formulated. The provided list of culture attributes translated to composite elements or units of culture that were identified as cultural domains. The process of identifying cultural domains involved applying a salience based cultural domain analysis and an individual grouping, by eleven respondents, of the elements in the entire list of culture attributes. A visual representation of identified groups was developed and further analysed for group congruency leading to the consolidation

and identification of cultural domains. The cultural domain analysis approach is described below.

Cultural Domain Analysis Method

Free-listed culture attribute data from each respondent were consolidated making use of Microsoft Excel 2010. To determine the level of attribute prominence, a modal based frequency analysis and cultural domain analysis approach was used.

The modal based frequency was computed based on the following formula

$$attribute\ frequency = \frac{count\ of\ each\ attribute\ observations}{total\ count\ of\ observations\ for\ all\ attribute} \times 100$$

"A cultural domain analysis typically begins with the selection of a set of items to work with. In most cases, the items are elicited directly from informants by giving them a general description of a domain, and asking them to name items that belong to it" (Borgatti, 1994).

(Borgatti, 1992) and UCINET (Borgatti et al, 2002).

Cultural domain analysis is employed by cognitive anthropologists as they try to understand cognitive categories (or cultural domains) as participants see them not as we researchers see them. (Medley, 2008)

Hence the appropriateness of this approach to soliciting cultural domains in this research.

The approach employs modal frequency analysis and salience analysis of each respondent- supplied list of attributes.

Cultural domain analysis techniques have been incorporated into commercial computer programmes called Anthropac

Salience is a statistic accounting for rank and frequency. Frequency indicates common knowledge within a culture. Differences in length and content are measures of intercultural variation. (Medley, 2008). Below are the steps for calculating salience.

Calculation of Smith's Salience (Medley, 2008)

- Invert the ranks (so that item mentioned first gets more points)
- Divide inverted rank of item by number of items mentioned = Individual Salience (S)
- First mentioned item always has S=1
- Last mentioned item has S=1/no. items
- Sum S values across all lists and divide by number of lists

The individual salience values S are then used for computing the composite salience (CS)

$$CS = \frac{\sum_{k=1}^{k=n} S}{n}$$

Where n is the number of individual attribute values.

An Analysis of the influence of mobile technology on culture

Assessing the existence of mobile technology influence on culture

This section presents an analysis of data on the influence of mobile technology on culture. The aim of the analysis was to ascertain; whether mobile technology has (had) any influence on culture, in what way (positive or negative) this influence if any has been and which of the identified cultural attributes or domains have been influenced by mobile technology and to what extent.

Table 3 below presents a frequency analysis of data on the influence of mobile technology on culture.

Table 3. How has mobile technology influenced culture?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no influence	4	5.2	5.7	5.7
	yes positive	54	70.1	77.1	82.9
	yes negative	12	15.6	17.1	100.0
	Total	70	90.9	100.0	
Missing	System	7	9.1		
Total		77	100.0		

Table 4: Chi-Square Test on the influence of technology on culture

Frequencies			
How has technology influenced your culture?			
Observed N	Expected N	Residual	
no influence	4	23.3	-19.3
yes positive	54	23.3	30.7
yes negative	12	23.3	-11.3
Total			70

Test Statistics	
How has technology influenced culture?	
Chi-square	61.829a
df	2
Asymp. Sig.	0.001

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 23.3

Asymp. Sig is short for Asymptomatic Significance.

Chi-square test results for frequencies observed against expected data as shown in table 4 indicate an asymptomatic sig of .001 indicating the validity of the significant difference between the

observed frequencies for the three categories of *no influence*, *yes positive* and *yes negative*. These differences can hence be relied upon. Figure 1 below presents the same results in graphical form.

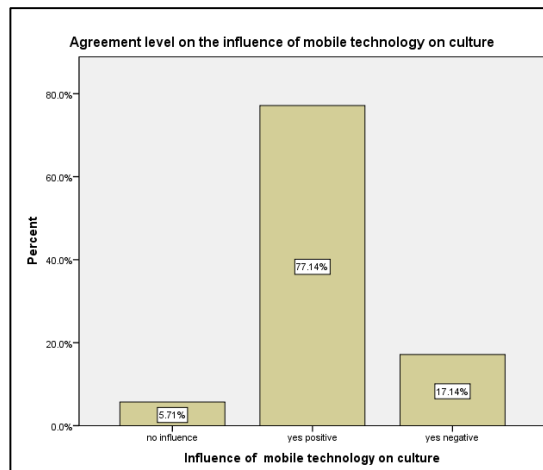


Figure 1: Agreement level on the influence of technology on culture

Figure 1 indicates an overwhelming influence of mobile technology on culture, with combined values of *yes positive* and *yes negative* at 85.7%. However, results also indicate the existence of a small but significant negative influence of mobile technology on culture.

Assessing the Magnitude of Influence of Mobile Technology on Culture

For this analysis, respondents were asked to rate the level of influence of mobile technology on culture on a scale of 1 to 5 where 1 represents NO influence and 5 represents HUGE influence.

Table 5: Ratings of mobile technology influence on culture

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	13	13.2	13.2
	2	3	3.9	3.9	17.1
	3	29	37.7	38.2	55.3
	4	21	27.3	27.6	82.9
	5	13	16.9	17.1	100
	Total	76	98.7	100	
Missing	System	1	1.3		
Total		77	100		

Table 5 above presents a view of the resultant level of influence that mobile technology has on culture. Table 5 further informs on the influence of mobile technology on culture. Excluding Likert level 3, so as to give a bivariate view for *no-influence* and *influence*, gives combined percentages of 17.1% (13.2+3.9) and 44.7% (27.6+17.1) respectively, indicating

that mobile technology has an influence on culture. A reference to the frequency data presented in Table 5 *above* points to a positive influence of mobile technology on culture at 72.3% (computed on the population of Likert levels 1, 2, 4 and 5 *leaving out the median rating*). The same results are shown in Figure 2 below.

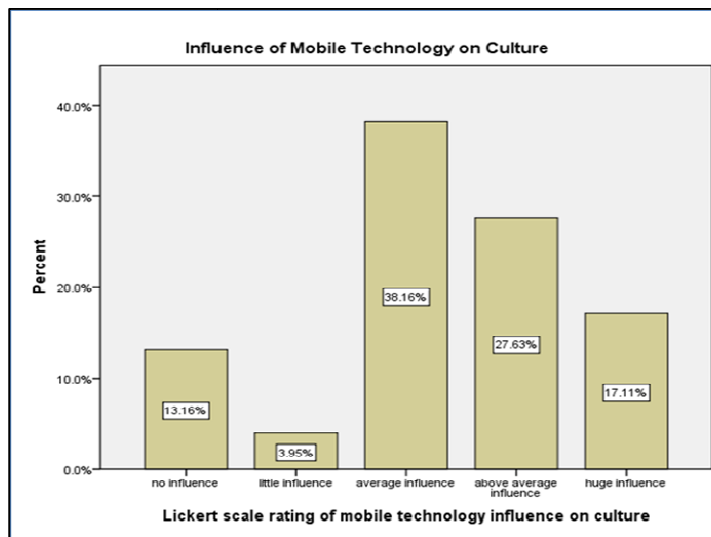


Figure 2: Influence of mobile technology on culture

Table 6: Hypothesis testing of the influence of mobile technology on culture (1)

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The categories of Likert scale ratings of mobile technology influence on culture occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Table 6 above indicates that proportions of respondents who indicated that mobile technology has had an influence on culture and those whose view was that it has had no influence on culture significantly differ (based on Likert scale levels 1, 2, 4, and 5), hence the computed probabilities of

occurrences for these categories are significant.

A similar level of significance is also reflected in the hypothesis in Table 7 summarised below and based on all Likert scale levels for the same data with re-coded data to reduce the categories from five to two.

Table 7: Hypothesis Testing Of the Influence of Mobile Technology on Culture (2)

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The categories defined by q3likertTransform = some influence and no influence occur with probabilities 0.5 and 0.5.	One-Sample Binomial Test	.004	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Table 7 above indicates that proportions of respondents in the survey population who indicated that mobile technology has an *influence on culture* and those who indicated that mobile technology has *no influence on culture* significantly differ.

Measuring Respondents' Response-Consistency Through Cross Tabulated Data Analysis

The purpose of this analysis was to further assess respondents' consistency or otherwise in their given responses to the survey questions. A 100% consistency would require all respondents who indicated that mobile technology has *no influence* on culture to also indicate likewise when it came to the rating of the level of mobile technology influence on culture. It would also require all respondents who opted for either *yes positive* or *yes negative* to rate the presence

of an influence of technology on culture at Likert levels above 3.

The set of results below are a cross tabulation of transformed Likert scale ratings of the level of mobile technology influence on culture, to reflect, *no influence*

(for ratings 1 and 2) and *some influence* (for ratings 4 and 5) against three option selections of *no influence*, *yes positive* and *yes negative* responses to whether mobile technology has had an influence on culture as indicated in Table 5.

Table 8: Cross Tabulation of How Has Technology Influenced Culture

		q2_ How has technology influenced culture			Total
		no influence	yes positive	yes negative	
q3LikertTransformed	no influence	2	11	0	13
	some influence	2	25	6	33
Total		4	36	6	46

Table 8 indicates a 75.5% consistency for *some influence* against *yes positive* and 93.9% consistence for *some influence* against the total for *yes* respondents. There were 13 respondents who argued that technology has had no influence on culture. However, 11 (or 81.6%) of these respondents also opted for *yes positive* when asked to indicate whether the influence was positive or negative. This

indicated a high level of inconsistent responses to these two questions among these respondents. Nevertheless even with these non-consistent figures ignored, it is clear that a significant level of consistency exists in the data in support of mobile technology having some influence on culture. The same results are also shown in Figure 3 below.

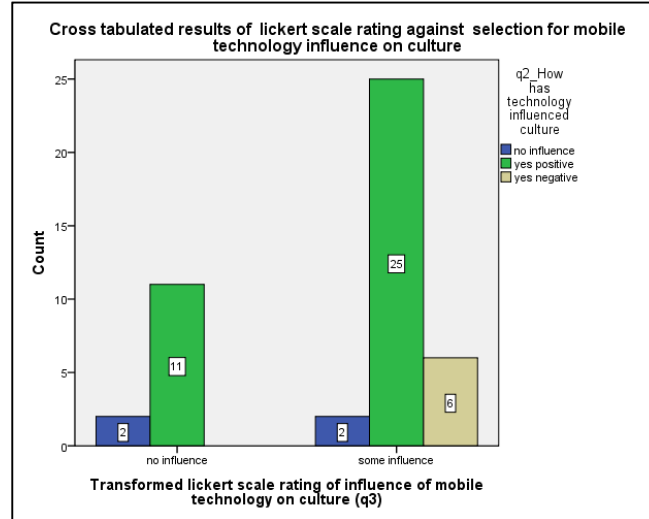


Figure 3: Cross tabulated results of the rating of, against the type of, mobile technology influence on culture

A cross tabulation of results for respondent consistency evaluation for all Likert scale ratings of the influence of mobile technology on culture against whether

mobile technology has had an influence on culture and the type of influence (positive or negative) is shown in Table 9 below.

Table 9 : A cross tabulation of the rating of mobile technology influence on culture and has your culture been influenced by mobile technology influence culture

			Has your culture been influenced by mobile technology				Total
			no influence	yes positive	yes negative	no opinion	
Ratings of mobile technology influence on your culture	no influence	Count	0	5	4	1	10
		% within ratings of mobile technology influence on culture	0%	50%	40%	10%	100%
		% within has your culture been influenced by mobile technology	0%	9%	36%	14%	13%
	little influence	Count	1	2	0	0	3
		% within ratings of mobile technology influence on culture	33%	67%	0%	0%	100%
		% within has your culture been influenced by mobile technology	25%	4%	0%	0%	4%
	average influence	Count	0	22	5	2	29
		% within Likert scale ratings of mobile technology influence on culture	0%	76%	17%	7%	100%
		% within has your culture been influenced by mobile technology	0%	41%	45%	29%	38%
	above average influence	Count	2	13	2	4	21
		% within ratings of mobile technology influence on culture	10%	62%	10%	19%	100%
		% within has your culture been influenced by mobile technology	50%	24%	18%	57%	28%
	huge influence	Count	1	12	0	0	13
		% within ratings of mobile technology influence on culture	8%	92%	0%	0%	100%
		% within has your culture been influenced by mobile technology	25%	22%	0%	0%	17%
Total	Count	4	54	11	7	76	
	% within ratings of mobile technology influence on culture	5%	71%	14%	9%	100%	
	% within has your culture been influenced by mobile technology	100%	100%	100%	100%	100%	

From Table 9 above, the following observations on the influence of mobile technology on culture are made:

- Over 85% of respondents whose view was that mobile technology has a positive influence on culture also rated the level of influence at **average** or **above** with 22% rating the influence at “huge influence. 91% of these respondents also rated the influence of mobile technology on culture at **little influence** or **above** indicating a high level of consistency in these respondents’ responses.
- Of the respondents whose view was that mobile technology has a negative influence on culture, 63% of them rated the influence at average to above, with 0% rating the influence at huge influence
- Of the respondents who rated the influence of mobile technology on culture, 83% of them rated the influence at average and above, with 38% rating the influence at average, 28% rating the influence at above average and 17% rating the influence at huge influence.
- Of the respondents who rated the level of mobile technology influence on culture at huge influence, 92% of them were also

of the view that the influence is positive.

- At this stage, the results suggest that mobile technology has an above average positive influence on culture at 46% with a 71% total positive influence on culture by all respondents who rated the influence of mobile technology on culture. (Very closely correlating with the 77% positive influence indicated in Figure 1 above).
- 36% of respondents whose view was that mobile technology has a negative influence on culture rated

the influence at no influence (a significant level of inconsistency), with 64% rating the influence at little influence or above. This equates to a slightly lower percentage than the 17.1% indicated in Figure 1. Bringing down the 17.1 to $(64\% \times 17.1) = 10.94\%$.

- Considering the level of congruency or consistency of respondents' responses as indicated in Table 9, along with statistics indicated in Table 3 the statistics compute to:

71 * 91% = 64.61% positive influence of mobile technology on culture and
 17 * 64% = 10.94% negative influence of mobile technology on culture
 Computing to about 80% influence of mobile technology on culture.

Figure 4 below shows cross tabulation of results as per Table 9 above, allowing a visual assessment of the consistency of respondents' responses on the influence of mobile technology on culture for all Likert scale categories (no re-coding). Fig 6.3 shows a high consistency for *average influence to huge influence* as they map to *yes positive*. On the other hand, *no influence*

responses indicate a high level of inconsistency as these largely map to *yes positive* and *yes negative* at 50% and 40% respectively. In other words, 90% of the respondents whose view was that mobile technology has no influence on culture were also of the view that mobile technology has either a positive or negative influence on culture.

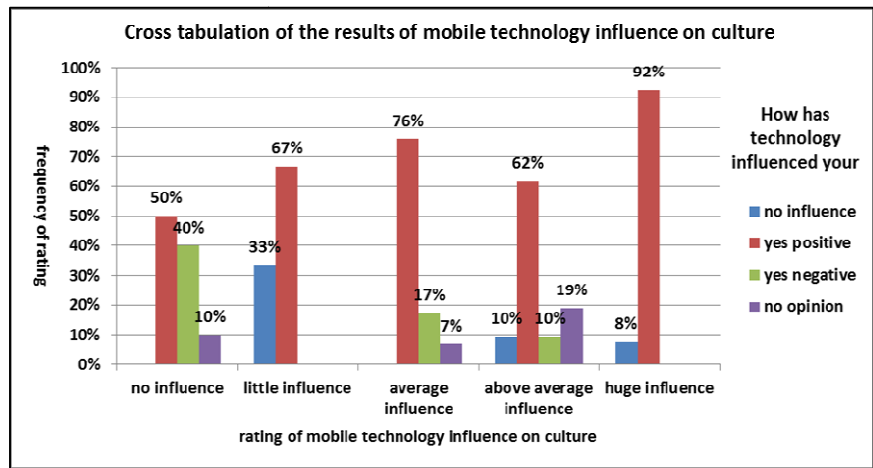


Figure 4: Cross Tabulation Results of the Influence of Mobile Technology on Culture

Analyzing the effect of mobile technology on culture with a focus on identified cultural components or attributes

This section focuses on presenting an analysis of data on the influence of mobile technology on culture with a focus on culture defining attributes. This analysis is aimed at determining the extent to which selected attributes of culture (from table 5.2, chapter 5) have been affected by mobile technology. Results of the analysis further inform decisions relating to the development of culture-aware mobile technology oriented solutions with focus on identified influenced or influential areas of culture.

In this analysis, the influence of mobile technology on culture is also assessed and evaluated in the context of Internet usage and access to indigenous knowledge, so as to determine the potential contribution of the Internet as a mechanism for influencing culture through mobile devices. Considering the potential contribution of access to indigenous, knowledge in projecting culture, the analysis also seeks

to inform on the level of Internet usage in accessing indigenous knowledge in the areas that relate to attributes of culture that were provided by the survey respondents. This analysis approach affords a view of the relationship between attributes of culture and culture indigenous knowledge with respect to the level of utilisation of the Internet – the most prolific vehicle for content sharing and for potential access to culture related information.

Figure 5 below presents a frequency analysis of data that were sourced through a question which asked respondents to indicate on a scale of 1 to 5, where 1 represents WEAK influence and 5 represents STRONG influence, how much influence they think mobile technology has had on their culture in relation to areas of culture as indicated.

Figure 5 indicates that education at 63%, and entertainment at 72%, stand out as areas in which mobile technology has had the most influence on culture.

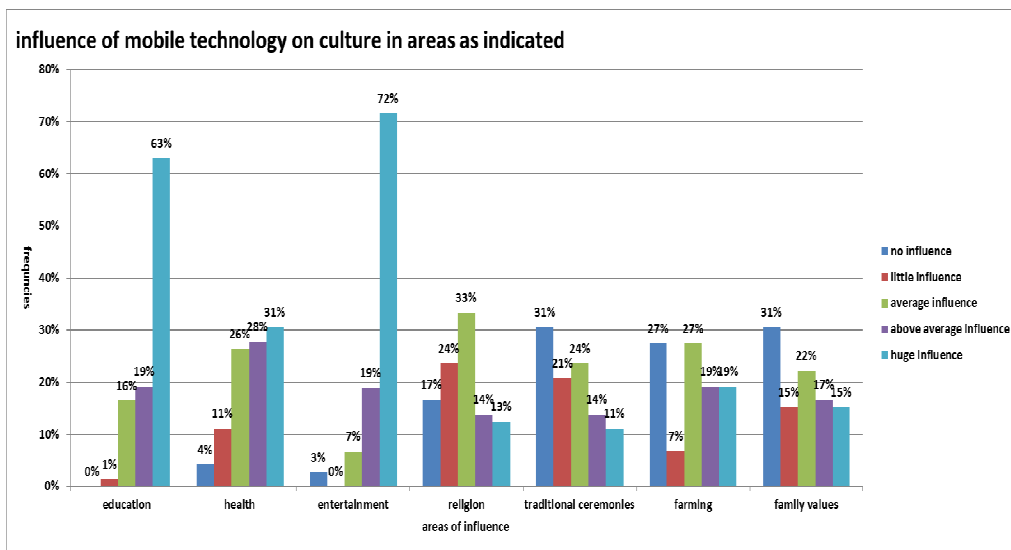


Figure 5: Influence of mobile technology on culture in indicated areas

Bringing the trend of influence as conveyed by Figure 5 above into context of the trend in Internet usage as conveyed by Figure 6

below, it is observed that the respondents use the Internet most for accessing knowledge on indigenous music. A trend

that positively compares with the high percentage of mobile technology influence on culture that is associated with entertainment (huge influence). Figure 6 below also indicates a low utilisation of the Internet for accessing indigenous knowledge on *culture* as a whole, standing at 11%. The low influence of mobile technology on *values* and *traditional ceremonies* as indicated in figure 4 above correlates with the low utilisation of the Internet for accessing indigenous

knowledge on *culture* and *values*. Figure 6 potentially suggests a comparatively low usage of the Internet for the access of information on culture in the indigenous language or more likely an inadequacy of content in the indigenous language on the Web. – In this regard *language* presents itself as a component of culture on which developments of culture-aware technology may leverage on, particularly in view of the prominence of language as an attribute of culture.

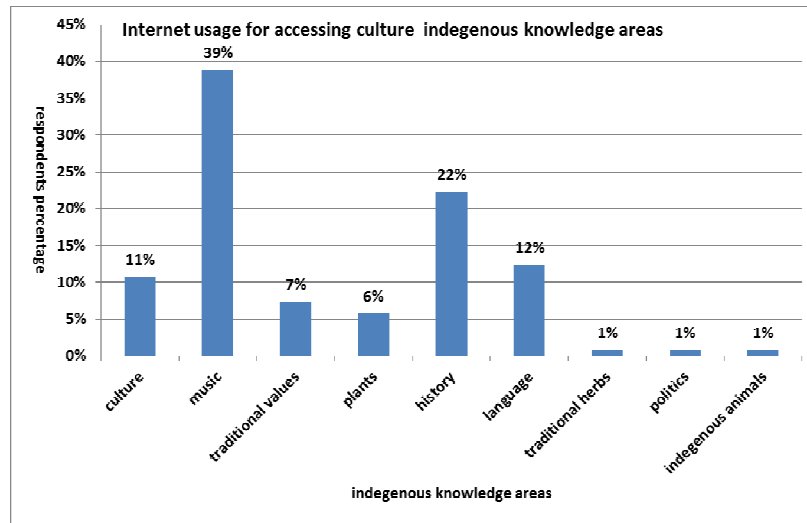


Figure 6: Internet usage for accessing culture related indigenous knowledge areas

Continuing with the analysis, an examination of Figure 7 below, showing results for mobile technology support for access to indigenous knowledge in identified areas, indicates a total highest positive rating of *mobile technology support for access to indigenous music*, with a combined percentage of 71% (for “agree” at 33% and “strongly agree” at 39%), pointing to Internet usage for access to

music as a potential contributing factor to the influence of mobile technology on culture in the area of entertainment or the entertainment domain. The data were obtained in response to the question “Would you agree that developments in mobile technology support mobile access to knowledge about your culture in the areas listed below?”

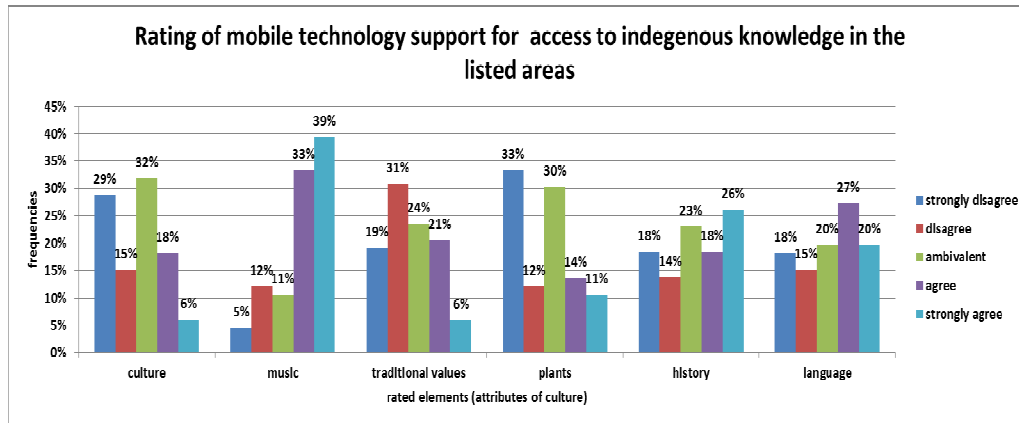


Figure 7: Rating of mobile technology support for access to indigenous knowledge in listed areas

A cross tabulation analysis of the influence of mobile technology on culture from the perspective of culture attributes.

Internet usage for access to music, as a potential contributing factor to the influence of mobile technology on culture in the area of entertainment is confirmed in Table 10 below. Table 10 shows a correlation between statistics for agree and strongly agree (for music) against huge influence of mobile technology on the entertainment component of culture, with 30.4% of respondents who rated the influence of mobile technology on culture in the area of entertainment at huge also agreeing that mobile technology provides support to indigenous knowledge access in

the area of music, while 43.5% **strongly agree** that mobile technology provides support to indigenous knowledge access in the area of music; bringing the total to about 74%.

In addition, of the respondents who **agree** that mobile technology provides support to indigenous knowledge access in the area of music, about 64% of them are of the view that mobile technology has a **huge influence** on the entertainment component of culture and about 77% of those who **strongly agree** that mobile technology provides support to indigenous knowledge access in the area of music are of the view that mobile technology has a **huge influence** on the entertainment component of culture.

Table 10: Cross tabulation of rating of mobile technology influence on culture in the area of entertainment and the rating of mobile tech support for access to indigenous knowledge in the area of music

[REDACTED TABLE CONTENT]

However, it is also worth noting that though the figures for entertainment in Figure 5 (influence of mobile technology on culture areas) and music in figure 6 (mobile technology support for indigenous knowledge access) compare closely at 72% and 71% respectively, the actual usage of the Internet for access to content on indigenous knowledge in the area of music stands at 39%. This could be due to, for example: lack of content on indigenous music, lack of interest in indigenous music,

greater availability of more interesting or appealing and hence more preferred content over indigenous music, Internet connectivity costs on mobile devices for music access, etc.

Figure 8 below shows the trend for: *Internet support for access to indigenous knowledge in the area of music and influence of mobile technology on culture in the entertainment area.*

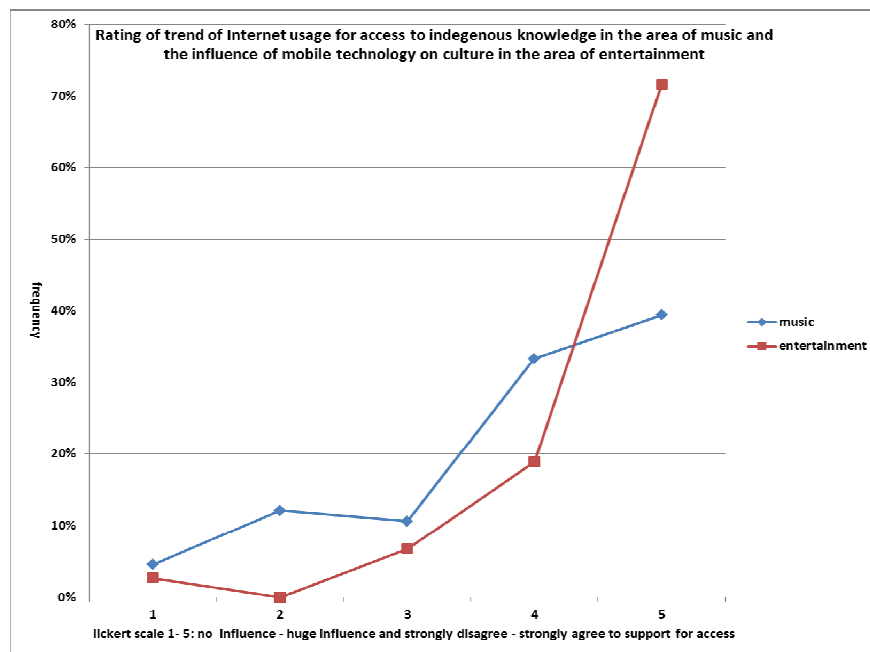


Figure 8: Rating of: trend of Internet usage for access to indigenous knowledge in the area of music and the influence of mobile technology on culture in the area of entertainment

Figure 8 indicates a huge influence of mobile technology on culture in the area of entertainment coupled with a lower Internet usage for access to indigenous knowledge in the area of music. However, music still ranks highest in the area of Internet based access to indigenous knowledge. Fig 6.7 also indicates a similar trend between Internet-based access to indigenous knowledge in the area of music and the influence of mobile technology on culture in entertainment. Also suggested is a positive correlation between music and

entertainment from the average rating to the highest rating of 5.

Table 11 presents normality test results for data that rate the *influence of mobile technology on culture in specific areas* as listed (included are areas that were listed by respondents as attributes of culture), against ratings of the *influence of mobile technology on culture* as a whole. *Sig values* for both the *Kolmogorov-Smirnova* and the *Shapiro tests* indicate that the dependant variables against the factor variable (influence of technology on culture) are not

significantly different to a normally distributed set of figures for the Likert levels whose *sig* values are in blue or bold font and representing Likert levels on the

extreme Likert ratings (*no influence* and *huge influence*). These data are thus reliable.

Table 11: Normality Test Results of the Rating of Mobile Technology Influence on Selected Culture Attributes

Tests of Normality ^b							
	Likert scale ratings of mobile technology influence on culture	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
q5_Likert scale ratings of mobile technology influence on health	no influence	.269	9	.059	.808	9	.025
	little influence	.253	3	.	.964	3	.637
	average influence	.229	26	.001	.856	26	.002
	above average influence	.248	20	.002	.832	20	.003
	huge influence	.198	12	.200^a	.894	12	.134
q5_Likert scale ratings of mobile technology influence on entertainment	no influence	.519	9	.000	.390	9	.000
	average influence	.248	26	.000	.761	26	.000
	above average influence	.520	20	.000	.354	20	.000
	huge influence	.460	12	.000	.552	12	.000
q5_Likert scale ratings of mobile technology influence on religion	no influence	.209	9	.200^a	.889	9	.194
	little influence	.385	3	.	.750	3	.000
	average influence	.202	26	.008	.874	26	.004
	above average influence	.218	20	.014	.905	20	.050
	huge influence	.201	12	.197	.884	12	.100
q5_Likert scale ratings of mobile technology influence on traditional ceremonies	no influence	.284	9	.035	.863	9	.102
	little influence	.385	3	.	.750	3	.000
	average influence	.225	26	.002	.856	26	.002
	above average influence	.214	20	.017	.851	20	.006
	huge influence	.144	12	.200^a	.907	12	.197
q5_Likert scale ratings of mobile technology influence on farming	no influence	.267	9	.064	.843	9	.062
	little influence	.175	3	.	1.000	3	1.00
	average influence	.203	26	.007	.865	26	.003
	above average influence	.176	20	.103	.851	20	.006
	huge influence	.208	12	.161	.884	12	.100
q5_Likert scale ratings of mobile technology influence on family values	no influence	.195	9	.200^a	.870	9	.122
	little influence	.385	3	.	.750	3	.000
	average influence	.199	26	.009	.851	26	.001
	above average influence	.205	20	.027	.869	20	.011
	huge influence	.205	12	.177	.875	12	.076
q5_Likert scale ratings of mobile technology influence on education	no influence	.286	9	.033	.727	9	.003
	little influence	.385	3	.	.750	3	.000
	average influence	.349	26	.000	.740	26	.000
	above average influence	.499	20	.000	.447	20	.000
	huge influence	.354	12	.000	.732	12	.002
a. Lilliefors Significance Correction							
*. This is a lower bound of the true significance.							
b. q5_Likert scale ratings of mobile technology influence on entertainment is constant when Likert scale ratings of mobile technology influence on culture = little influence. It has been omitted.							

Based on the statistics output in Table 11 above, for the five Likert scale levels that rate the influence of mobile technology on culture, the dependent variables were normally distributed for the Likert levels as indicated in blue and or bold font, for *sig* values that are greater than 0.05. A cross

tabulation example-table for each of the rows that show normality as per Table 11 above is Table 12 below. As an example, Table 12 below shows the areas of normal data for *family values* for the Likert levels *no influence* and *huge influence* (read in conjunction with Table 11).

Table 12: Cross Tabulation of Mobile Technology Influence on Family Values against Influence on Culture

		Likert scale ratings of mobile technology influence on culture					Total	
		no influence	little influence	average influence	above average influence	huge influence		
q5_Likert scale ratings of mobile technology influence on family values	no influence	Count	2	0	9	6	5	22
		% within q5_Likert scale ratings of mobile technology influence on family values	9%	0%	41%	27%	23%	100%
		% within Likert scale ratings of mobile technology influence on culture	22%	0%	35%	30%	38%	31%
	little influence	Count	2	1	5	1	1	10
		% within q5_Likert scale ratings of mobile technology influence on family values	20%	10%	50%	10%	10%	100%
		% within Likert scale ratings of mobile technology influence on culture	22%	33%	19%	5%	8%	14%
	ambivalent	Count	2	0	4	7	3	16
		% within q5_Likert scale ratings of mobile technology influence on family values	13%	0%	25%	44%	19%	100%
		% within Likert scale ratings of mobile technology influence on culture	22%	0%	15%	35%	23%	23%
	above average influence	Count	3	0	4	3	2	12
		% within q5_Likert scale ratings of mobile technology influence on family values	25%	0%	33%	25%	17%	100%
		% within Likert scale ratings of mobile technology influence on culture	33%	0%	15%	15%	15%	17%
	huge influence	Count	0	2	4	3	2	11
		% within q5_Likert scale ratings of mobile technology influence on family values	0%	18%	36%	27%	18%	100%
		% within Likert scale ratings of mobile technology influence on culture	0%	67%	15%	15%	15%	15%
Total	Count	9	3	26	20	13	71	
	% within q5_Likert scale ratings of mobile technology influence on family values	13%	4%	37%	28%	18%	100%	
	% within Likert scale ratings of mobile technology influence on culture	1.0	1.0	1.0	1.0	1.0	1.0	

The table indicates that 31% of respondents ranked the influence of mobile technology on culture in the area of family values at “no influence”. In addition, the largest proportion of respondents who ranked the influence of mobile technology on culture as *average*, *above average* and *huge* (37%, 28%, 18%) also ranked the influence of mobile technology on culture in the area of *family values*, at “no influence” (35%,30%,38%).

Based on a highest frequency statistics analysis of Table 11 above, mobile technology has an influence on family values with 69% of the respondents agreeing to the influence. However, this influence is only moderate considering that a “huge influence” rating was given by only 15% of the respondents while a “no influence rating was given by 31% of the respondents, and 32% of the respondents rated the influence at average and above. On the other hand, a more visible influence of mobile technology on culture is

projected, with 87% of the respondents agreeing that mobile technology has an influence on culture and 45% of the

respondents rating the influence at average and above

- Could the lower influence of mobile technology on family values be anyway linked to the low support of mobile technology access to indigenous knowledge content on traditional values as indicated in Figure 7 above at 50% disagreement? And what components or which culture domains contribute most to a more significant projection of the influence of mobile technology on culture as a whole?
- Informed by responses to questions such as above, models or architectures for culture aware developments in mobile technology should seek to find ways of promoting the preservation or promotion of culture (through family values, language, indigenous knowledge, traditional practices etc.). Software developers and social programmes developers can then rely on the architectures and models to realise or develop culture aware solutions within their areas of expertise.

Furthermore, of the 15% respondents who ranked the influence of mobile technology on family values at *huge*, there is a strong indication of the influence of culture from the perspective of family values, with 0% of the respondents in this group ranking the influence of mobile technology on culture at *no influence* and 81% of the respondents in this group ranking the influence of mobile technology on culture at *average influence or above*.

The results shown in Table 12 thus suggest that mobile technology has an influence on culture as a whole as well as an influence on family values (a component of culture) though to a lesser extent. The results also suggest that a huge influence of mobile technology on family values is likely to result in a significant influence on culture.

Basing on the componential aspect of the influence of mobile technology on culture as presented within the family values component, a requirement for models to enable the componential aspect of culture (as projected by culture attributes and domains) to be expressed and employed as a vehicle for delivering culture aware solutions is substantiated

Discussion and Conclusion

The survey results and analysis that have been presented in this paper confirm that mobile technology has an influence on culture. Results yielded an 86% agreement to that mobile technology has an influence on culture. A strong indication of a 70% positive influence of mobile technology on culture is indicated by the analysis results. However a 17% negative influence of mobile technology on culture is also indicated. The existence of a both positive and negative effect of mobile technology is also reflected in Mieczakowski et al (2011), in which a positive as well as a negative impact of communication technology on families and individuals was observed. Results also suggest an average magnitude (from Likert ratings) of influence at about 38%, with a 44% indication of a huge influence of mobile technology on culture. Chi-square test and binomial tests were used to confirm the significance of the analysis results. Cross tabulation analysis was applied for the assessment of respondent response consistency. Above 85% of respondents who rated the influence of mobile technology on culture at positive also rated the level of influence at average or above average. 22% of these rated the influence at "huge influence and 91% of these respondents also rated the

influence of mobile technology on culture at *little influence* or *above*. These results indicate a high level of consistency in the respondents' responses. The results have also shown that an influence of mobile technology on culture can be achieved or effected through an influence of mobile technology on components of culture. For example the analysis projected a significant influence of mobile technology on culture in the area of entertainment and education at 72% and 63% respectively. 31% of respondents ranked the influence of mobile technology on culture in the area of family values at "*no influence*".

In addition, the results indicate that the largest proportion of respondents who ranked the influence of mobile technology on culture as *average*, *above average* and *huge* (37%, 28%, 18%) also opted for the influence of mobile technology on culture in the area of *family values*, at "no influence" , and in the following proportions: 35%,30% and38% respectively. This therefore indicates that though mobile technology has an influence on culture, the degree of the influence is bound to differ depending on the culture attribute under observation.

In this regard, it would hence be of value to draw an understanding of the prominence of culture components in the definition or profiling of a particular user's cultural context or domain, and rely on the significant culture components, together with knowledge on the extent of influence that a technology-influence on a culture component can have on a culture as a whole. A focus on culture attributes that are mostly influenced by mobile technology is hence likely to present more effective approaches to delivering a culture aware context on the socio mobile technology platform. The conducted analysis results therefore suggest that, the huge influence of mobile technology on culture that was projected in the first stages of this analysis was largely an outcome of an influence of mobile technology on selected attributes or components of culture.

Based on the results, the projection of culture, through Internet access to

indigenous knowledge in the area of language, has only been slightly demonstrated, with results indicating a very low utilisation of 12% of the Internet for access to *indigenous knowledge* in relation to language. However, mobile technology support for access to indigenous knowledge in the *language* area rated average at 47%. This suggests an inadequacy of content in the indigenous language of the primary research population. Nevertheless 47% is low when compared to mobile technology support for access to indigenous knowledge in the area of music, rating at 72%.

Based on the analysis presented in this paper, the areas of *music*, *entertainment* and *education* present opportunities for improving the influence of mobile technology on culture as well as opportunities through which an improvement in the projection of culture through the low rated areas of mobile technology influence on culture, such as *family values*, *traditional ceremonies*, *farming*, *religion* and *language* can be achieved.

Furthermore, there is a deducible indication of a requirement to promote access to culture related information through provision of relevant content as well as developing the capability for mobile technology support for *indigenous knowledge* access through addressing infrastructure development and the development of culture-aware content models. A similar reflection on technology and the indigenous knowledge element is suggested in Lumun (2013), in which attention is drawn to an urgent need for Africa to develop its own indigenous knowledge "that is consistent with African Cultural Values" (Lumun , 2013, p28).

A reflection of the existence of an influence of technology on culture is also reflected in Pinchot et al (2010) in which an exhibition, though minor, of what could be seen as a cultural-norm violation and an extension of the boundaries within which it is agreeable for one to answer a phone call was exhibited as eleven percent of students indicated that they had answered a cell

phone call while at a funeral, and in Mutekwe (2012) in which it is noted through a discussion that a change in technology always brings about a change in culture.

Through this paper contribution is made towards informing the creation of an enabling and enabled environment for developing and delivering culture-aware technology solutions; an environment that is informed by an understanding of, and leveraging on, the influence of mobile technology on culture. Such developments could be supported by culture-aware software or system architectures, culture-aware convergence models, culture-aware policies, and culture-aware community project implementations. These solutions would be delivered through participatory approaches that present opportunities for the digital technology environment and its citizens to influence cultural evolution and actively contribute to influencing the techno-cultural trend (Uzelac, 2010).

For the research survey population, findings also suggest that mobile devices though extensively used do not, however, significantly expose or provide opportunities to interact with culture related information. The findings thus point to potential areas of culture upon which an enhancement of culture awareness in mobile technology can be explored.

This paper has thus presented a profile of the influence that technology has on culture. It has done so in an approach that allowed and demonstrated an association of mobile technology influence not only on culture as a whole but also to specific attributes or components of culture.

Findings of this paper should however be interpreted in the context of the research survey population and may not be subject to generalisation.

References

1. Arnold D (2005). Europe, technology, and colonialism in the twentieth century. *Hist. Technol.* 21:85–106
2. Bell, G (2006). The Age of the Thumb: A Cultural Reading of Mobile Technologies from Asia. *Knowledge, Technology, & Policy*, Summer 2006, Vol. 19, No. 2, pp. 41-57
3. Borgatti, S P (1994). Cultural Domain Analysis. *Journal of Quantitative Anthropology* 4, 261-278, 1994. Kluwer Academic Publishers, Netherlands
4. Borgatti, S.P (1992). ANTHROPAC 4.0. Columbia, SC: Analytic Technologies.
5. Borgatti, SP., Everett, M.G. and Freeman, L.C. (2002). *Ucinet for Windows: Software for Social Network Analysis*. Harvard, MA: Analytic Technologies.
6. Botha, A., Vosloo, S., Kuner, J., van den Berg, M. (2011) Improving Cross-Cultural Awareness and Communication through Mobile Technologies. IGI Global 2011. (DOI: 10.4018/978-1-60960-481-3.ch019).
7. Chaula, J (2006), Yngstrom L (2006), Kowalski, S. (2006). Technology as a Tool for Fighting Poverty: How Culture in the Developing World Affect the Security of Information Systems Proceedings of the 4th IEEE International Workshop on Technology for Education in Developing Countries (TEDC'06) 0-7695-2633-0/06 IEEE
8. Chéneau-Loquay, A (2010). Innovative ways of appropriating mobile telephony in Africa, UIT, 2010 International Telecommunication Union (ITU), Geneva© MAEE, 2010 Ministry of Foreign and European Affairs (MAEE) ISBN : 978-2-11-098247-6 ISSN : 1160-3372 .
9. Creese, S., Roscoe, B., Zakiuddin, I. (2004) Research directions for trust and security in human-centric computing.
10. de Bruijn, M., Nyamnjoh, F., Brinkman, I. (2009). *Mobile Phones: The New Talking Drums of Everyday Africa*, edited by Bamenda, Langaa Research and Publishing Common Initiative Group (RPCIG) and Leiden, African Studies Centre, 2009.

11. Flanagan, J., Huang, T., Jones, P., Kasif, S. (eds.), "Human centred systems: Information, Interactivity, and Intelligence," Report, NSF, 1997.
12. Foster, V (2000), Briceño-Garmendia C (2000) Editors Africa's Infrastructure . A Time for Transformation . Information and Communication Technologies: A Boost for Growth The International Bank for Reconstruction and Development / The World Bank, Washington, DC 20433.
13. Hewett, T., Baecker, R., Card, S., Carey, T., Gasen, J., Maneti, M., Perlman, G., Strong, G., & Verplank, W. (1992). ACM SIGCHI Curricula for Human Computer Interaction. New York: ACM Press,
14. Gallivan, M, Srite M (2005) Information technology and culture: Identifying fragmentary and holistic perspectives of culture. Information and Organization 15 (2005) 295–338
15. Ho, M. R., Smyth, N. , Kam, M., Dearden, A. (2009). Human-Computer Interaction for Development: The Past, Present, and Future . USC Annenberg School for Communication & Journalism Volume 5, Number 4, Winter 2009, 1–18.
16. Hoffman, R., Roesler, A., Moon, B M. (2004). What Is Design in the Context of Human-Centred Computing? 1541-1672/04/\$20.00 © 2004 IEEE 89 Published by the IEEE Computer Society. IEEE 978-0-7695-4287-4/10, 2010 IEEE DOI 10.1109/PDCAT.2010.30
17. Kline, R. (2003) ."Resisting consumer technology in rural America: the telephone and electrification".
18. in Nelly Oudshoorn and Trevor Pinch (eds) *How Users Matter the Construction of Users and Technology*; Cambridge, MIT Press
19. Lumun, AN, (2013). The effects of Western Technology on African Cultural Values. IOSR Journal of Humanities and Social Sciences (IOSR-JHSS) Volume 8, Issue 4 (Mar.-Apr. 2013), pp 26-28
20. McLelland, MJ, (2007). Socio-Cultural Aspects of Mobile Communication Technologies in Asia and the Pacific: A Discussion of the Recent Literature, Continuum. Journal of Media and Cultural Studies, 21(2), June 2007, 265-275.
21. McLelland, MJ (2000). Socio-Cultural Aspects of Mobile Communication Technologies in Asia and the Pacific: A Discussion of the Recent Literature, Continuum: Journal of Media and Cultural Studies, 21(2), June 2007, 265-275.
22. Mesch, G S (2009). The Internet and Youth Culture. The Hedgehog Review / SPRING 2009.
23. Mieczakowski, A., Goldhaber, T., Clarkson, J. (2011). Culture, Communication and Change: *Summary of an investigation of the use and impact of modern media and technology on our lives*. University of Cambridge, 2011
24. Misa, TJ (2000) and Schot, J. (2005). Inventing Europe: technology and the hidden integration of Europe. Hist. Technol. 21:1–19
25. Mutekwe, E (2012). The Impact of technology on social change: a sociological perspective. Journal of Research in Peace, Gender and Development (ISSN: 22251-0031) Vol. 2(11) pp 226-238, November 2012.
26. Oudshoorn N, Rommes E, Stienstra M. 2004. Configuring the user as everybody: gender and design cultures in information and communication technologies. Sci. Technol. Hum. Vol. 29:30–63
27. Pacey, A (1983). The Culture of Technology. Basil Blackwell Publisher Limited 108 Oxford OX4 1JF, England.
28. Pereira, R. (2012), de Miranda, LC (2012). Baranauskas, M C (2012). Godoy Piccolo, L S (2012, Anhol Almeida, L D (2012), dos Reis, J C (2012) Towards a Culturally Aware Design for Social Software. International Journal of Digital Society (IJDS), Volume 3, Issue 1, March 2012

29. Pinchot, J L. (2010), Paullet, K L (2010). Rota, D R (2000). How Mobile Technology is Changing Our Culture. Conference on Information Systems Applied Research 2010 CONISAR Proceedings Nashville Tennessee, USA v3 n1519.
30. Pour, G. (2007). Software Engineering Education for the Pervasive Human-Centric Computing Era Global J. of Engng. Educ., Vol.11, No.1 © 2007 UICEE Published in Australia.
31. Smith, A., Abdeinour-Nocera, J., Camara, S B., Oyugi Ca. (2010). HCI and international Development with African Farmers. Interfaces, Design without Boundaries 2010.
32. Steward, J H (1955). Chapter 2. Environment, technology and culture.
33. Tenhunen, S (2008) Mobile technology in the village: ICTs, culture, and social logistics in India. Journal of the Royal Anthropological Institute (N.S.) 14, 515-534
34. The Johns Hopkins University and Amy Medley.(2008). Methods in Cultural domain analysis
35. Uzelac, A(2010) Digital culture as a converging paradigm for technology and culture: Challenges for the culture sector. Digithum No. 12 (May, 2010) ISSN 1575-2275
36. Van Binsbergen, W (2004). 'Can ICT belong in Africa, or is ICT owned by the North Atlantic region?' in: Wim van Binsbergen and Rijk van Dijk (eds.), Situating globality: African agency in the appropriation of global culture, Leiden, Brill, pp. 107-146.
37. Vesisenaho M (2009) and Dillon P (2009). Information and Communication Technology Education Contextualized in a Cultural Ecological View of Learning. 39th ASEE/IEEE Frontiers in Education Conference IEEE October 18 - 21, 2009, San Antonio, TX
38. Wilson, SM (2002) and Peterson LC. (2002). The anthropology of online communities. Annu. Rev. Anthropol. 31:449-67
39. WOTRO (2007). Mobile Africa Revisited: A comparative study of the relationship between new communication technologies and social spaces (Chad, Mali, Cameroon, Angola).
40. Wyatt, S (2003). "Non-Users Also Matter: The Construction of Users and Non-Users of the Internet". in Nelly Oudshoorn and Trevor Pinch (eds) *How Users Matter the Construction of Users and Technology*; Cambridge, MIT Press 67
41. Xinyuan, C (2005). Culture-Based User Interface Design. IADIS International Conference on Applied Computing 2005
42. Zhao, J (2010) and Zhang S (2010). Cognition and Culture in ICT Experience.