

# Assessing the Dynamic Effect of Users' Background on Dissemination of Electronic Messages

Samuel King Opoku<sup>1</sup>, D. Subba Rao<sup>2</sup>

<sup>1</sup>Computer Science Department, Kumasi Technical University, Ghana, <sup>2</sup>Professor, Computer Science, GMR Institute of Technology (GMRIT), India Email:samuel.k.opoku@gmail.com, dr.dsrao1@gmail.com

## Abstract

Researchers over the years have sought robust ways to develop applications to assist humans. Context-aware applications have been developed to acquire users' context and adapt accordingly to assist users. Current applications focus on users' environment, physical environment, computing environment, time and history. However, some researchers have argued that users' demography can affect context acquisition and utilization. The study, therefore, determines whether the common demographic attributes have a significant effect on categories of electronic messages classified as activity context by answering the research question: "To what extents do the common demographic attributes affect users' preference of activity data?" Quantitative research involving a proportional stratified random sampling technique of 1645 valid respondents across the major ethnic groups in Ghana was carried out. Respondents upon satisfying certain demographic attributes completed the questionnaire which involved ranking categories of electronic messages. A Pearson chi-square test of independence complemented with Cramer's V test was used to determine the significant dependency between the common demographic attributes and activity context. The work revealed that users demography affect activity context significantly. Thus, to ensure rich user experience in system development, industries and researchers should tailor their design to provide individual assistance rather than group level assistance

**Keywords – Activity context, Context-Aware, Electronic messages, SMS, User demography**

## Introduction

Eighteen years passed since the introduction of the first cellular phone in 1973 when Weiser envision in 1991 that there is the need to develop applications that provide personal assistance to individuals through pervasive computing (Weiser, 1991). The difficulty was how to use the existing mobile devices and distributed systems to achieve pervasive computing. Schilit and Theimer (1994) founded context-aware computing as the solution to Weiser's vision. Context-aware computing uses context to provide services and information to users so that personal assistance can be achieved. They listed location, identities of nearby people and objects and changes to those objects as the required contexts for applications (Schilit & Theimer, 1994). However, Brown *et al* (1997) argued that the time of the day, season and temperature should also be added to complete the list. Ryan *et al* (1998) asserted that

the environment could not be left out since there should be an interaction between the user and the environment. These research efforts had limited applications (Dey & Abowd, 2000) since such information as light intensity and height of objects could not be deduced as contexts in developing context-aware applications. Dey and Abowd (2000) concluded that context should be “Any information that can be used to characterize the situation of an entity”. They emphasized that “An entity is a person, place or object that is considered relevant to the interaction between a user and an application including the user and application themselves”

Notwithstanding the above conclusion which allowed researchers to develop applications to suit users' need at a particular period, some researchers deduced that certain types of context such as location, identity, time and activity are more important than others (Dey, 2010). The location context can be determined when the device is outdoor through Global Positioning System (GPS) (Bajaj *et al*, 2000) or indoor through radio frequency technologies like Bluetooth (Opoku, 2011). Concerning the time of the day, the clock system of a mobile device can be used in connection with an external authenticated system (Opoku, 2013). Users' activities are usually tracked using many activity modelling mechanisms. Research works conducted in context-aware computing have focused on five aspects. Three aspects were proposed by Schilit *et al* (1994) as computing environment, user environment and physical environment. Computing environment looks at the available processors, devices accessible for user input and display, network capacity, connectivity, nearby resources like printer and costs of computing. User environment focuses on location, user's profile, a collection of nearby people and social situation. Physical environment focuses on conditions as lighting, traffic conditions, temperature and noise level. Chen and Kotz (2000) added the fourth aspect, Time which involves the time of the day, week, month and season of the year and argued that the first three contexts over time span give History context making the fifth aspect.

Research works over the period handled users equally. Opoku and Subba Rao (2018) indicated that users have different preferences and thus users have to be handled differently in context-aware computing. Opoku and Appiah (2016) deduced that, given the same activities under different circumstances, users' preference and beliefs have an effect on the choice of activities undertaken within a specific period. Their work concluded that user's demography has a part to play in context recognition, adaptation and utilization. However, the dynamics of the various components that determine the overall background of the user were left unhandled. Similarly, Rodríguez-Hernández and Ilarri (2017) asserted that there is a need to determine the effect of static data from users' profile on the dynamic context data from the environment to ensure rich user experience. This paper, therefore, addressed the issue of the effect of demographic attributes on activity context by answering the question: “To what extents do the common demographic attributes affect users' preference of activity data?”

This study works with the categorization of electronic messages by Opoku and Subba Rao (2018) as news, advertisement, entertainment, occupation, finance, sports, religious issue, medical issue and family issue. However, in this study, an electronic message is view as an activity context when it contains date and time. There is a seemingly uncountable number

of demographic attributes and all of them cannot be handled in this study. Brounstein (2011) listed the important attributes as religion, ethnicity, gender, sexual orientation, age and abilities. Brookfield and Preskill (2012) argued that the critical demographic attributes are religion, gender, ethnicity, social class and experience. Salleh *et al* (2017) provided influential demographic attributes as religion, gender, ethnicity and qualification whereas Klapproth *et al* (2017) listed the common attributes as gender, age, ethnicity and religion. From the list of demographic attributes provided above, the common attributes to researchers are ethnicity, religion and gender. The study, therefore, focused on ethnicity, gender and religion as the attributes to determine whether they have any dynamic effect on activity context. The paper also discusses the effect of some dynamic attributes like age and educational level on activity data. The remaining parts of the paper are divided into three sections. The sections respectively focus on the materials and methods of the work; presentation of the results and findings; and the conclusion section which provides recommendations for further research

## Materials and Methods

Qualitative data consisting of nominal and ordinal data from a population of 8,049,408 mobile device users (GSS, 2012) across the major ethnic groups in Ghana was collected. The data was analysed quantitatively. The major ethnic groups in Ghana are Akan, Mole-Dagbani, Ewe and Ga-Adangbe (GSS, 2012; Obiorah, 2015). Akan tribe covers 47.5%, Mole-Dagbani 16.6%, Ewe 13.9%, Ga-Adangbe 7.4 making a total coverage of 85.4% of the Ghanaian population. The gender proportion of the population indicated that 4,275,211 (53.1%) are male and 3,774,197 (46.9%) are female. Digging further into the statistical report, 68.8%, 18.3% and 12.9% of the male population are respectively affiliated to Christianity, Islam and other religious groups whereas 73.4%, 17% and 9.6% of the female population are respectively affiliated to Christianity, Islam and other religious groups. Similarly, 46.9%, 7.4%, 14% and 17% of the male population respectively belong to Akan, Ga-Adangbe, Ewe and Mole-Dagbani ethnic groups whereas 48.1%, 7.4%, 13.9% and 16.3% of the female population respectively belong to Akan, Ga-Adangbe, Ewe and Mole-Dagbani ethnic groups (GSS, 2012)

Researchers agree that in determining sample size, a confidence level of 95% and a margin error of 5% are desirable (Penwarden, 2014). With the help of Cochran (1977) formula and online calculator (Penwarden, 2014), the number of respondents needed was 385. This meant that a sample size greater than or equal to 385 was desirable to achieve 95% accuracy. To cater for a response rate of 20% as most researchers suggest (Market Research, 2016), the number of individuals out of the population to participate was stipulated as 1925

Proportional stratified random sampling technique was used. This sampling technique ensures that a sample population that best represents the entire population being studied is obtained by minimizing sample selection bias and ensuring that certain segments of the population are not overrepresented or underrepresented (Gokhale and Srivastava, 2017). This technique was employed by dividing the population into groups called strata. This method cannot be used when every member of the population cannot be confidently classified into a subgroup. This limitation did not affect this work since every member of

the population under study was classified distinctively into gender, religious affiliation and ethnicity. To ensure proper stratification, the percentage occurrences of the variables in the Ghanaian population described in the preceding paragraphs were used. There were 24 strata based on gender, religious affiliation and ethnicity. Using the stipulated sample size of 1925 obtained above, 53.1% of 1925 constitute male respondents whereas 46.9% constitute female respondents. Thus male respondents constitute 1022 and female respondents constitute 903. Table 1 describes the proportion of respondents under the male gender category, using the proportion in religious affiliation followed by ethnicity for each religious affiliation.

Table 1 Composition of Strata under Male gender

Ethnicity	Religious Affiliations				Total
	Percentage Compositions	Christianity	Islam	Others	
Akan	46.9	330	88	62	480
Ewe	14.0	98	26	18	142
Ga-Adangbe	7.4	52	14	10	76
Mole-Dagbani	17.0	120	32	22	174
<b>Total</b>		<b>600</b>	<b>160</b>	<b>112</b>	<b>872</b>

From Table 1, there were 12 strata under the male gender. From a total of 703 stipulated respondents representing 68.8% of Christians, 330 respondents representing 46.9% in sample size were Akans, 98 respondents representing 14.0% in sample size were Ewes, 52 respondents representing 7.4% of the sample size were Ga-Adangbes and 120 respondents representing 17.0% in sample size were Mole-Dagbani. Thus the sample size for the Christian population was reduced from 703 to 600 due to population representation of ethnicity. The remaining 103 represent Christians in the other ethnic groups that were not handled in this study.

Similarly, from a total of 187 stipulated respondents representing 18.3% of Muslims, 88 respondents representing 46.9% in sample size were Akans, 26 respondents representing 14.0% in sample size were Ewes, 14 respondents representing 7.4% of the sample size were Ga-Adangbes and 32 respondents representing 17.0% in sample size were Mole-Dagbani. Thus the sample size for the Muslim population was reduced from 187 to 160 due to population representation of ethnicity. The remaining 27 represent Muslims in the other ethnic groups that were not handled in this study.

Finally, from a total of 132 stipulated respondents representing 12.9% belonging to others, 62 respondents representing 46.9% in sample size were Akans, 18 respondents representing 14.0% in sample size were Ewes, 10 respondents representing 7.4% of the sample size were Ga-Adangbes and 22 respondents representing 17.0% in sample size were Mole-Dagbani. Thus the sample size for the other religious affiliations was reduced from 132 to 112 due to population representation of ethnicity. The remaining 20 represent other religious affiliations in the other ethnic groups that were not handled in this study. Thus the total number of male respondents was reduced from 1022 to 872. The outstanding number, 150,

represents the other ethnic groups that were not handled in this study.

Table 2 on the other hand, describes the proportion of respondents under the female gender category, using proportions in religious affiliation and then ethnicity under each religious affiliation.

Table 2 Composition of Strata under Female gender

Ethnicity	Religious Affiliations				
		Christianity	Islam	Others	
	Percentage Compositions	73.4% = 663	17.0% = 154	9.6% = 87	Total
Akan	48.1	319	74	42	<b>435</b>
Ewe	13.9	92	21	12	<b>125</b>
Ga-Adangbe	7.4	49	11	6	<b>66</b>
Mole-Dagbani	16.3	108	25	14	<b>147</b>
<b>Total</b>		<b>568</b>	<b>131</b>	<b>74</b>	<b>773</b>

From Table 2, there were also 12 strata under the female gender. From a total of 663 stipulated respondents representing 73.4% of Christians, 319 respondents representing 48.1% in the sample size were Akans, 92 respondents representing 13.9% in the sample size were Ewes, 49 respondents representing 7.4% of the sample size were Ga-Adangbes and 108 respondents representing 16.3% in the sample size were Mole-Dagbani. Thus the sample size for the Christian population was reduced from 663 to 568 due to population representation of ethnicity. The remaining 95 represent Christians in the other ethnic groups that were not handled in this study.

Similarly, from a total of 154 stipulated respondents representing 17.0% of Muslims, 74 respondents representing 48.1% in the sample size were Akans, 21 respondents representing 13.9% in the sample size were Ewes, 11 respondents representing 7.4% of the sample size were Ga-Adangbes and 25 respondents representing 16.3% in the sample size were Mole-Dagbani. Thus the sample size for the Muslim population was reduced from 154 to 131 due to population representation of ethnicity. The remaining 23 represent Muslims in the other ethnic groups that were not handled in this study.

Finally, from a total of 87 stipulated respondents representing 9.6% belonging to others, 42 respondents representing 48.1% in the sample size were Akans, 12 respondents representing 13.9% in the sample size were Ewes, 6 respondents representing 7.4% of the sample size were Ga-Adangbes and 14 respondents representing 16.3% in the sample size were Mole-Dagbani. Thus the sample size for the other population was reduced from 87 to 74 due to population representation of ethnicity. The remaining 13 represent the other religious affiliations in the other ethnic groups that were not handled in this study. Thus the total number of female respondents was reduced from 903 to 773. The remaining number, 130, represent the other ethnic groups that were not handled in this study.

Thus the sample size for the study (872 + 773) was 1645. The questionnaires were printed out with gender, ethnicity and religion already ticked according to the figures in Tables 1 and 2. When respondents satisfied the ticked demographic attributes, they were given the copy to complete the other demographic attributes like age, educational level, years of

smartphone usage and acquaintance with smartphones. They then continued to rank the electronic messages. Thus a total of 1645 valid responds were collected and analysed.

Data were gathered from both primary (from respondents) and secondary (research works in literature, official statistics and web information) sources. The data was collected at the individual level but analysed at the group level. A Pearson chi-square ( $\chi^2$ ) test of independence complemented with Cramer's V test was used.  $\chi^2$  was used since with nominal data gathered, the distribution unlikely approached normal distribution which is a requirement for t-test, correlation, regression and analysis of variance. To prevent type 1 error (false positive) of the  $\chi^2$  test due to its sensitivity to large sample size (Pett, 2015), Cramer's V was used to measure the strength of association. Though there were other methods that could have been used to determine the strength of association between variables, Cramer's V was appropriate for this work. For instance, phi is only suitable for 2x2 tables, contingency coefficient does not generally achieve a magnitude of 1 even when there is a complete dependency between the variables. Moreover, lambda is not suitable for ordinal data which occurred due to the data ranked by respondents. Other measurements like Gamma, Somer's D, Kendall's Tau-B and Kendall's Tau-C are only useful for the interval, scaled or scored ordinal data (Corder & Foreman, 2014; Ott & Longnecker, 2015). A confidence level of 0.05 was adopted. Crosstabs of the various demographic attributes (IV) with the preferred categories of messages (DV) were developed in order to analyse the data.

Demographic attributes would have weak, moderate and strong associations using the values of Cramer's V test such that 0.100-0.199 indicates weak association whereas 0.200-0.299 indicates moderate association and 0.300-1.00 represents strong association using the usual convention in social science which differs from the medical science. The difference is acceptable due to the dynamic nature of moderating factors.

A description of the data was employed to get the general picture of the data. However, the inferential statistic was used to ensure generalization of the results. Hypothesis was, therefore, tested to determine the significance level. The null hypothesis ( $H_0$ ) tests for independence between demographic attributes (IV) and Categories of messages (DV). The demographic attributes (IV) were Gender, Religion, Ethnicity, Age and Educational Level whereas the categories of messages (DV) were News, Entertainment, Sports, Finance, Occupation, Medical, Advertisement, Religious Issues and Family Issues

## Results and Findings

Opoku and Subba Rao (2018) discussed the demographic data related to gender, age, educational level, years of phone usage and users' acquaintance to smartphones of the same data. The respondents were scattered across all the regions in Ghana. Table 3 below depicts the religious distribution of the respondents.

Table 3: Religious Distribution of Respondents

Religion	Frequency	Percent	Valid Percent
Christianity	1168	71.0	71.0
Islamic	291	17.7	17.7
Others	186	11.3	11.3
Total	1645	100.0	100.0

From Table 3, 1168 representing 71.0% of the respondents were affiliated to Christianity. 291 respondents representing 17.7% were affiliated to Islam and 186 representing 11.3% of the respondents were affiliated to other religious groups. Though there were more Christians than the other religious groups, it reflects the religious demography of Ghanaians due to the sampling technique used. The responses were obtained from respondents with varying ethnicity. Table 4 below shows the ethnic distribution of the respondents.

Table 4: Ethnicity Distribution of Respondents

Ethnicity	Frequency	Percent	Valid Percent
Akan	914	55.6	55.6
Ga Adamgbe	142	8.6	8.6
Ewe	267	16.2	16.2
Mole Dagbani	322	19.6	19.6
Total	1645	100.0	100.0

From Table 4, 914 respondents representing 55.6% were Akan. 142 respondents representing 8.6% were Ga Adamgbe. Also, 267 respondents representing 16.2% were Ewe and 322 respondents representing 19.6% were Mole Dagbani. The modal ethnicity is Akan representing more than one-half of the total number of respondents

Crosstabs were required in order to compute the expected frequencies. There were five demographic attributes and nine categories of electronic messages making a total of 45 (5 x 9) crosstabs that were developed. Pearson chi-square ( $\chi^2$ ) test at the 0.05 confidence level was calculated to test the null hypothesis,  $H_0$ : X has no effect on Y; X (Gender, Religion, Ethnicity, Age, Educational Level) and Y (News, Entertainment, Sports, Finance, Occupation, Medical, Advertisement, Religious Issues, Family Issues).  $H_0$  was rejected for all combinations except the relationship between Educational level and Sports. Thus almost all demographic attributes have an effect on all the categories of electronic messages except that educational level has no effect on sports. Table 5 below depicts the results of the Pearson chi-square ( $\chi^2$ ) tests

Table 5: Results of Dependency Test between Demographic Attributes and Electronic Messages

Demographic Attributes	Electronic Message Categories									
	News	Advertisement	Entertainment	Occupation	Finance	Sports	Religious Issue	Medical Issue	Family Issue	
Gender df(8)	$\chi^2=49.5$ p=0.00	$\chi^2=74.2$ p=0.00	$\chi^2=84.7$ p=0.00	$\chi^2=57.1$ p=0.00	$\chi^2=37.7$ p=0.00	$\chi^2=260.3$ p=0.00	$\chi^2=101.6$ p=0.00	$\chi^2=100.9$ p=0.00	$\chi^2=136.1$ p=0.00	
Religion df(16)	$\chi^2=71.8$ p=0.00	$\chi^2=181.7$ p=0.00	$\chi^2=130.8$ p=0.00	$\chi^2=109.0$ p=0.00	$\chi^2=163.2$ p=0.00	$\chi^2=130.6$ p=0.00	$\chi^2=176.8$ p=0.00	$\chi^2=178.9$ p=0.00	$\chi^2=240.7$ p=0.00	
Ethnicity df(8)	$\chi^2=147.8$ p=0.00	$\chi^2=151.6$ p=0.00	$\chi^2=273.4$ p=0.00	$\chi^2=249.5$ p=0.00	$\chi^2=123.7$ p=0.00	$\chi^2=142.9$ p=0.00	$\chi^2=180.9$ p=0.00	$\chi^2=231.5$ p=0.00	$\chi^2=127.0$ p=0.00	
Age df(8)	$\chi^2=212.6$ p=0.00	$\chi^2=126.4$ p=0.00	$\chi^2=131.1$ p=0.00	$\chi^2=225.0$ p=0.00	$\chi^2=215.6$ p=0.00	$\chi^2=101.0$ p=0.00	$\chi^2=103.4$ p=0.00	$\chi^2=182.5$ p=0.00	$\chi^2=219.2$ p=0.00	
Education df(8)	$\chi^2=74.7$ p=0.00	$\chi^2=43.1$ p=0.00	$\chi^2=66.5$ p=0.00	$\chi^2=47.9$ p=0.00	$\chi^2=50.3$ p=0.00	$\chi^2=25.6$ p=0.60	$\chi^2=52.3$ p=0.00	$\chi^2=56.3$ p=0.00	$\chi^2=48.0$ p=0.00	

From Table 5 above, only the cell resulting from Education and sports had p-value greater than 0.05. This indicated that Educational level has no effect on sports. Gender, religion, ethnicity, age have an effect on all the categories of electronic messages since the p values were 0.00. Cramer's V test was therefore required to determine the strength of dependency or association. Table 6 below shows the values obtained using the Cramer's V test.

Table 6: Results of Association Test between Demographic Attributes and Categories of Electronic Messages

Demographic Attributes	Electronic Message Categories									
	News	Advertisement	Entertainment	Occupation	Finance	Sports	Religious Issue	Medical Issue	Family Issue	
Gender df(8)	C=.173 p=0.00	C=.212 p=0.00	C=.227 p=0.00	C=.186 p=0.00	C=.151 p=0.00	C=.398 p=0.00	C=.249 p=0.00	C=.248 p=0.00	C=.288 p=0.00	
Religion df(16)	C=.148 p=0.00	C=.235 p=0.00	C=.199 p=0.00	C=.182 p=0.00	C=.233 p=0.00	C=.199 p=0.00	C=.232 p=0.00	C=.233 p=0.00	C=.270 p=0.00	
Ethnicity df(8)	C=.173 p=0.00	C=.175 p=0.00	C=.235 p=0.00	C=.225 p=0.00	C=.185 p=0.00	C=.170 p=0.00	C=.191 p=0.00	C=.217 p=0.00	C=.160 p=0.00	
Age df(8)	C=.208 p=0.00	C=.160 p=0.00	C=.163 p=0.00	C=.214 p=0.00	C=.209 p=0.00	C=.143 p=0.00	C=.145 p=0.00	C=.192 p=0.00	C=.211 p=0.00	
Education df(8)	C=.151 p=0.00	C=.114 p=0.00	C=.142 p=0.00	C=.121 p=0.00	C=.124 p=0.00	C=.088 p=0.60	C=.126 p=0.00	C=.131 p=0.00	C=.212 p=0.00	

From Table 6, there exist strong relationship between gender and sports (C=0.398 p=0.00) whereas there is no relationship between educational level and sports since the p-value is greater than 0.05, given the values as C=0.088 p=0.60. There exist weak relationship between gender and news (C=0.173 p=0.00), gender and occupation (C=0.186 p=0.00), gender and finance (C=0.151 p=0.00) whereas moderate relationship exist between gender and advertisement (C=0.212 p=0.00), gender and entertainment (C=0.227 p=0.00), gender

and religious issues ( $C=0.249$   $p=0.00$ ), gender and medical issues ( $C=0.248$   $p=0.00$ ) and gender and family issues ( $C=0.288$   $p=0.00$ ).

Another demographic attribute, religion, has weak association with four categories of electronic messages and moderate association with five categories of electronic messages. The four categories of electronic messages with weak association were news ( $C=0.148$   $p=0.00$ ), entertainment ( $C=0.199$   $p=0.00$ ), occupation ( $C=0.182$   $p=0.00$ ) and sports ( $C=0.199$   $p=0.00$ ) whereas the five categories of electronic messages with moderate association were advertisement ( $C=0.235$   $p=0.00$ ), finance ( $C=0.233$   $p=0.00$ ), religious issues ( $C=0.232$   $p=0.00$ ), medical issues ( $C=0.233$   $p=0.00$ ) and family issues ( $C=0.270$   $p=0.00$ ).

Regarding ethnicity, six categories of electronic messages exhibited weak association with ethnicity and three categories of electronic messages had moderate association. The six categories of electronic messages that demonstrated weak association were: news ( $C=0.173$   $p=0.00$ ), advertisement ( $C=0.175$   $p=0.00$ ), finance ( $C=0.185$   $p=0.00$ ), sports ( $C=0.170$   $p=0.00$ ), religious issues ( $C=0.191$   $p=0.00$ ) and family issues ( $C=0.160$   $p=0.00$ ) whereas the three categories with moderate associations were entertainment ( $C=0.235$   $p=0.00$ ), occupation ( $C=0.225$   $p=0.00$ ) and medical issues ( $C=0.217$   $p=0.00$ ).

The Age demographic attribute on the other hand had weak association with five categories of electronic messages, namely, advertisement ( $C=0.160$   $p=0.00$ ), entertainment ( $C=0.163$   $p=0.00$ ), sports ( $C=0.143$   $p=0.00$ ), religious issues ( $C=0.145$   $p=0.00$ ) and medical issues ( $C=0.192$   $p=0.00$ ). Notwithstanding the above weak association, the same attribute had moderate association with four categories of electronic messages, namely, news ( $C=0.208$   $p=0.00$ ), occupation ( $C=0.214$   $p=0.00$ ), finance ( $C=0.209$   $p=0.00$ ) and family issues ( $C=0.211$   $p=0.00$ ).

The last demographic attribute is educational level. This attribute had weak association with seven categories of electronic messages including: news ( $C=0.151$   $p=0.00$ ), advertisement ( $C=0.114$   $p=0.00$ ), entertainment ( $C=0.142$   $p=0.00$ ), occupation ( $C=0.121$   $p=0.00$ ), finance ( $C=0.124$   $p=0.00$ ), religious issues ( $C=0.126$   $p=0.00$ ) and medical issues ( $C=0.131$   $p=0.00$ ). As stated above, educational level has no association with sports. However, it had moderate association with family issues ( $C=0.212$   $p=0.00$ ).

## Conclusions and Recommendations

An empirical study employing quantitative analysis to determine the effect of demographic attributes on the activity context had been carried out. Gender, Religion, Ethnicity, Age have dynamic effects on news, entertainment, sports, finance, occupation, medical, advertisement, religious and family issues. Educational level, however, dynamically affects all the above activities except sports. Thus, user's environment aspect by Schilit *et al* (1994) of context-aware computing should be refined to include user's demography. To ensure rich user experience in system development, industries and researchers should tailor their design to provide individual assistance rather than group level assistance. Future work should focus on developing mobile applications to assist individual users.

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