Personality Traits Influence on Usage of Health Informatics System: Kenya's Case

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Abstract- This paper presents the study concerning how the personality traits influence usage of health informatics systems in Kenya, especially Nyanza Region. The objectives of this study were, first to examine the personality traits exhibited by the health professionals' in Level 5 hospitals in Nyanza, Kenya. Second to analyze the health workers' usage of health informatics and third was to examine how the personality traits influenced usage of health informatics in Nyanza, Kenya. The questionnaire survey technique was purposefully adopted for this study to collect the data randomly from a sample population of 163 health workers in Level 5 Hospitals in Nyanza, Kenya. This study also used LisRel software and SPSS in analysing the big 5 personality traits (conscientiousness, openness, extraversion, neuroticism and agreeableness) of health workers. This study found out that the personality traits of Kenyan health workers have direct influence on acceptance of biometric based health informatics. But not all the Big 5 traits have positive influence. Using LisRel modelling software, only

Index Terms- Hospital, Biometrics, Health, Informatics and Traits

I. INTRODUCTION

This paer present an analysis of personality traits influence usage of health informatics in the selected level 5 hospitals in Nyanza region in Kenya. The main objective of this study was to assess the relationship between the health workers' personality traits and perceived ease of use of the patients' records in the selected level 5 hospitals in Kisii and New Nyanza hospitals. The paper begins with data presentation, variables result analysis, followed by descriptive statistics and then summarises the analysis.

II. DATA PRESENTATION

The health workers were then asked (Table 1) to state how satisfied they are with the provision of healthcare services. The majority (67.3%) said were satisfied, 9.7% were very satisfied and 19.4% were unsatisfied and meanwhile 1.8% said they don't know their satisfaction with the work they are doing.

Table 1 Health professionals' work satisfaction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	16	9.7	9.8	9.8
	Satisfied	111	67.3	68.1	77.9
	Don't Know	3	1.8	1.8	79.8
	Unsatisfied	32	19.4	19.6	99.4
	Very unsatisfied	1	.6	.6	100.0
	Total	163	98.8	100.0	
Missing	System	2	1.2		
Total		165	100.0		

Most of the respondents (53.7%) are using paper-based health record in their station of work for carrying out their health care tasks while 46.3% have adopted the use health information systems as displayed in Table 2.

Table 2 Type of Health System Used

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paper-based	87	53.4	53.7	53.7
	HIS	75	46.0	46.3	100.0
	Total	162	99.4	100.0	
Missing	System	1	0.6		
Total		163	100.0		

The health workers were asked to rate the big five personality traits that best describe their personality traits. The individual big five personality traits (Table 3) with their means and deviation are presented.

Table 3 Individual Item with mean and deviation

Construct	Survey Item	Mean	Std. Deviation
Conscientiousness	Thorough Job	1.90	1.318
	Reliable worker	1.87	1.258
	Perseveres	1.60	.997
	Efficient	2.12	1.304
	Plans	1.91	1.229
Openness	Original	1.88	1.151
	Curious	1.36	.743
	Imaginative	1.34	.696
	Inventive	1.52	.740
	Reflect	1.64	.824
Extraversion	Talkative	2.26	1.342
	Energetic	1.72	1.074
	Enthusiasm	4.02	2.838
	Assertive	1.72	.760
	Outgoing	2.05	1.069
Neuroticism	Depressed	3.36	1.506
	Tense	2.58	1.473
	Worries	2.98	1.444
	Moody	2.91	1.547
	Nervous	2.55	1.445
Agreeableness	Helpful	1.95	.908
	Forgiving	1.75	.660
	Trusting	1.85	.780
	Considerate	1.85	.886
	Cooperate	1.82	.753

The Government of Kenya through the Ministry of Medical Services and/or Ministry of Public Health are in the process of implementing National Strategic Plan for Health Information System 2009-2014 and the National e-health strategies 2011-2014. These strategies require that the health institutions to adopt the health informatics in order to enhance performance. In relation to these policies the health workers were asked their opinion on the perceived change of task that may result from the adoption of health informatics, as displayed in Table 4.

Table 4 Healthcare perceived task changes

	Mean	Std. Deviation
Review Patients	2.36	1.323
Seek information	2.23	1.339
Track Test result	2.46	1.366
Get treatment procedure	2.44	1.447
Give referral	2.56	1.491
Order treatment	2.36	1.314
Prepare discharge	2.42	1.387
Obtain X-ray	2.66	1.316
Valid N (listwise)		

2.1. RELIABILITY ANALYSIS

The first characteristic that any good measure must possess is reliability. Reliability refers to the consistency or dependability of a measuring technique. The reliability test for conscientiousness (Table 4) shows the cronbach's alpha of 0.896. The inter item statistics are shown in Table 6.

Table 5 Cronbach Alpha for Conscientiousness

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.896	.891	5

Table 6 Conscientiousness item total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Thorough Job	7.51	16.363	.798	.813	.862
Reliable worker	7.53	16.473	.837	.809	.852
Perseveres	7.80	21.467	.448	.323	.928
Efficient	7.28	16.006	.852	.740	.848
Plans	7.49	17.017	.796	.669	.862

The openness component had 6 items whose cronbach's Alpha based on standardised item was 0.815 (Table 7 and Table 8).

Table 7 Openness Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.815	5

Table 8 Openness Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Original	5.85	5.729	.479	.325	.806
Curious	6.36	6.519	.679	.623	.716
Imaginative	6.39	6.550	.736	.702	.705
Inventive	6.20	6.511	.686	.521	.714
Reflect	6.08	7.230	.394	.246	.800

The reliability test for extraversion (Table 8 and Table 9) item was 0.038.

Table 9 Extraversion Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.329	.264	5

Table 10 Extraversion Item-Total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Talkative	7.72	3.720	.396	.356	-.018[a]
Energetic	8.22	5.050	.274	.291	.174
Enthusiasm	7.73	5.976	.118	.103	.315
Assertive	8.22	7.260	-.075	.070	.420
Outgoing	7.86	6.122	.067	.032	.357
a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions.					

For neuroticism reliability test using cronbach's Alpha (Table 10 and Table 11) is 0.782

Table 11 Neuroticism reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.782	.778	5

Table 12 Neuroticism item-total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Depressed	11.01	21.451	.390	.154	.790
Tense	11.48	19.091	.515	.406	.755
Worries	11.09	17.504	.687	.507	.696
Moody	11.16	16.900	.676	.504	.698
Nervous	11.53	19.177	.523	.431	.752

The agreeableness item reliability statistics are presented in Table 12 and Table 13.

Table 13 Agreeableness Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.690	.702	5

All internal consistency reliabilities based on Cronbach's alphas for measurement items (all interval scales) are fair. Some of them are considered to be good (greater than 0.80), only a few are just acceptable (in 0.7 ranges). Due to the fact that most reliability tests are quite high (0.80 up), they indicate the items in each set (concept) are positively correlated to one another [4]. This is to argue that the items in each set are independent measures of the same concept, and therefore, indicate accuracy in measurement in the main survey.

2.0. VALIDITY ANALYSIS

Validity refers to the extent to which a measurement procedure actually measures what it is intended to measure rather than measuring something else (or nothing at all) [3]. Validity is the degree to which variability in participants' scores on a particular measure reflects variability in the characteristic one want to measure. The big five personality traits and the technology items were correlated to test their validity as shown in Table 13.

Table 14 Personality traits and technology moderators inter-item correlation

	Conscientiousness	Neuroticism	Openness	Extraversion	Agreeableness	Pdusefulness	Pdeaseofuse	Actualusage	Behavioural
Conscientiousness	1.000	-.159	.513	.517	-.040	.482	.165	.241	-.150
Neuroticism	-.159	1.000	-.098	.035	-.217	-.386	-.081	.118	.278
Openness	.513	-.098	1.000	.291	.092	.244	.074	.002	.186
Extraversion	.517	.035	.291	1.000	-.006	.206	.126	-.005	-.199
Agreeableness	-.040	-.217	.092	-.006	1.000	.128	.094	-.144	-.236

Pdusefulness	.482	-.386	.244	.206	.128	1.000	.371	-.154	-.002
Pdeaseofuse	.165	-.081	.074	.126	.094	.371	1.000	.013	-.040
Actualusage	.241	.118	.002	-.005	-.144	-.154	.013	1.000	.282
Behavioural	-.150	.278	.186	-.199	-.236	-.002	-.040	.282	1.000

2.1 PRINCIPAL COMPONENT ANALYSIS

The main aim of this analysis was to identify patterns of personality traits effect on attitude and ease of use of health informatics by health professionals in Kisii and New Nyanza level 5 hospitals, but to achieve that, it is prudent to start by generating simple descriptive summaries for each of the trait variables. The researcher opted to analyse the Correlation matrix (table 14) since the variances of rates for different types of personality traits differ considerably. Working with the correlation matrix amounts to using the personality rates after standardizing each to have unit standard deviation. This seems sensible since without standardization the derived components are likely to be dominated by single variables with large variances.

Table 15 Personality Traits Correlation Matrix

		Positive attitude	Pdease ofuse	ScaleEx traversi on	ScaleOpe nness	ScaleConsci entiousne	ScaleNeurot icism	ScaleAgreabl eness
Correlatio n	Positive attitude	1.000	-.092	.119	.051	-.061	.001	-.125
	Pdeaseofuse	-.092	1.000	.030	.192	.323	-.138	.134
	ScaleExtraversion	.119	.030	1.000	.273	-.005	.337	.028
	ScaleOpenness	.051	.192	.273	1.000	.581	-.156	.109
	ScaleConscientious ne	-.061	.323	-.005	.581	1.000	-.320	-.001
	ScaleNeuroticism	.001	-.138	.337	-.156	-.320	1.000	-.205
	ScaleAgreableness	-.125	.134	.028	.109	-.001	-.205	1.000
a. Determinant = .351								

The coefficients in the component matrix (Table 15) specify the linear function of the observed variables that defined each component.

Table 16 Component Matrix

	Component						
	1	2	3	4	5	6	7
Positive attitude	-.104	.357	-.630	.561	.362	.134	.049
Pdeaseofuse	.563	-.017	.256	-.230	.745	-.020	-.091
ScaleExtraversion	.033	.841	.309	.134	-.027	-.406	.116
ScaleOpenness	.746	.433	-.080	.049	-.295	.156	-.368
ScaleConscientiousne	.833	.085	-.227	-.240	-.138	.128	.394
ScaleNeuroticism	-.536	.576	.288	-.293	.062	.453	.056
ScaleAgreableness	.293	-.228	.623	.649	-.044	.201	.100
Extraction Method: Principal Component Analysis.							
a. 7 components extracted.							

Total Variance Explained (Table 17) shows how much of the total variance of the observed variables is explained by each of the principal components. The first principal component (scaled eigenvector), by definition the one that explains the largest part of the total variance, has a variance (eigenvalue) of 1.9; this amounts to 27.8% of the total variance. The second principal component has a variance of 1.4 and accounts for a further 20% of the variance while the seventh principal components have variance of 0.3 and accounts for 4.6% of the variance.

Table 171 Traits Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.952	27.889	27.889	1.952	27.889	27.889
2	1.413	20.188	48.077	1.413	20.188	48.077
3	1.086	15.521	63.598	1.086	15.521	63.598
4	.952	13.595	77.193	.952	13.595	77.193
5	.799	11.413	88.606	.799	11.413	88.606
6	.470	6.714	95.320	.470	6.714	95.320
7	.328	4.680	100.000	.328	4.680	100.000
Extraction Method: Principal Component Analysis.						

III.   DISCUSSION

3.2 Effects of Big Five Personality Traits on Ease of Use and Attitude towards Health informatics

Although the "Big Five" model has been discussed a lot in behavioural fields, there has been little research on the impact of personality traits with regards to biometric-based health informatics. In reference to Technology Acceptance Model it is hypothesised that external factors such as personality traits may influence a user's perceptions of health informatics' ease of use and usefulness.   In turn, a user's perceived ease of use and perceived usefulness determine the user's attitude toward using the system. The user's attitude determines behavioural usage and actual usage of health informatics. Individual health worker's personality traits were studied to determine if certain user groups might be more accepting or resistant to adoption of technology than others. The main research question in this study related individual health workers' big five personality traits to the perceived ease of use of patients' records.

Research Question: Is the current usage of patients' records related health workers' personality traits mediated by perceived ease of use in the selected level 5 hospitals in Nyanza, Kenya?

Table 18 Type of Current System Used

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paper-based	87	53.4	53.7	53.7
	HIS	75	46.0	46.3	100.0
	Total	162	99.4	100.0	
Missing	System	1	.6		
Total		163	100.0		

The majority of the respondents (53.7%) are currently using paper-based health system while 46.3% have adopted the use of health informatics.

Table 19 Big Five personality and Technology Descriptive statistics

	Mean	Std. Deviation
Behavioural	1.48	.752
ScaleOpenness	1.55	.622
Pdusefulness	1.78	.864

ScaleAgreableness	1.86	.529
Actualusage	1.88	.499
ScaleConscientiousne	1.88	1.032
Pdeaseofuse	1.96	.727
ScaleExtraversion	1.99	.549
ScaleNeuroticism	2.81	1.056
Valid N (listwise)		

The factors in the Big Five model are meant to measure the underlying traits of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience by using personality markers to identify the degree of each of these factors that an individual possesses. Extraversion represents a preference to be around others. It is the trait that deals with a person's social behaviours, willingness to express opinions and leadership. Agreeableness describes how we relate to others including tolerance and acceptance. In addition, agreeableness represents an eagerness for communion. Conscientiousness refers to a tendency to push toward goals and act dutifully. It encompasses self-discipline and dependability. Neuroticism is the tendency to experience unpleasant emotions and often is referred to as the anxiety factor. Openness to experience describes the willingness to enjoy new experiences and ideas. It includes creativity, preference for the complex and willingness to accept change [5].

Extraversion can be defined as social, fun looking, and affectionate. The respondents were asked to the characteristics that best describe their personalities; this is displayed in Table 28. The extraversion personality trait had the mean of 1.99 which is a high score. It can be argued that individuals high in extraversion, who are enjoyable when interacting with others, will be more likely to accept biometric based health informatics.

The [6] study found that extraversion moderated the relationship between subjective norms and intentions to use technology such that the relationship is stronger for individuals with higher extraversion. This indicates that extraverted individuals spent more time texting.

Neuroticism with the mean 2.8 of is characterized by emotional instability, pessimism, and distrust. People high in neuroticism often think negatively and have less perceived control. People scoring high in openness 1.55 are more likely to make open-minded decisions and are willing to accept new technology. Neurotic personalities are likely to view technological advances in their work as threatening and stressful, and to have generally negative thought processes when considering technological advances [7]. This found that neurotic individuals spent more time text messaging and reported stronger mobile phone addictive tendencies.

3.2. Perceived Changes on Health Task Performance
The respondents were asked to compare the paper-based with the health informatics in relation to the performance of health tasks (Table 20). This frequency Table shows that the mean for all the variables is below 3 hence the tasks will be perceived to be difficult if health informatics is adopted.

Table 20 Perceived Health tasks Changes

	Review Patients	Seek information	Track Test result	Get treatment procedure	Give referral	Order treatment	Prepare discharge	Obtain X-ray
Mean	2.36	2.23	2.46	2.43	2.56	2.36	2.42	2.66
Std. Error of Mean	.104	.105	.107	.115	.117	.103	.109	.103
Std. Deviation	1.323	1.339	1.366	1.442	1.491	1.314	1.387	1.316

The unsuccessful implementation of health informatics in health centres was likely due to various factors. According to a study by [1] health personnel's intentions to use it are an important factor for successful implementation, together with support, time, cost, and technology. Based on the Theory of Reasoned Action (TRA), an individual's behavioural intention is determined by the individual's attitude towards this behaviour and subjective norms with regard to the performance of this behaviour.

According to the study by [7] used the means, standard deviations, minimum and maximum values, and the skew for the independent variable. An inspection of the independent variables [7] revealed that agreeableness and conscientiousness were negatively skewed. Consequently, these scales were inverted by subtracting them from their maximum value plus one before transformation, this contradict this study. A square root transformation was then used on the inverted scales.

IV. CONCLUSION

The shift of human interactions, socialisation and communication activities towards technology acceptance means managing the impression of one on the technologies are important. According to [2] technologies are tools used by individuals in carrying out their tasks. In the context of health informatics, technology refers to computer systems (hardware, software and data) and user support services (training, help lines etc.) provided to assist users in their tasks Although most institutions are adopting information technology in their day to day operation there are a number of hindrances one being personality trails. Literature review reveals that this adoption is hindered by user characteristics. This study examined the relationship between big five personality trail and the TAM (ease of use and usefulness) elements.

The majority of the respondents were male 58.9%. This showed that most of the health workers in the Nyanza level 5 hospitals are male. This finding may be attributed to a number of factors such as need for career progression, need to pursue higher studies, family responsibility and self-motivation.

From this study 39.1% of the respondents were aged between 30-39 years and probably the reason why have the desire for technology. The acceptance may also be affected by the level of education. This study found out that 50.9% have or are pursuing first degree while 41.1% have diploma qualifications. This result shows that the respondent are literate hence the reason why majority are willing to accept the introduction of new technology.

It was also found that 43.6% had worked or are working in the health sector are for a period of 1-5years. These are probably the newly employed health workers in the health professions, hence feeling much pressure to adopt the new technology in their day to day operation. However 77.9% of the respondents felt satisfied with the work they are doing in the health institution.

The respondents' opinion was sought about view of their tasks in relation to the introduction of health informatics compared with the paper-based patients record currently in used in the health institution. The 5 point likert scale was used with 1being very difficult and 5 being very ease. Task according to [2] is the action carried out by the institution in turning input into outputs. Task characteristics of interest include those that might move a user to rely more heavily on certain aspects of health informatics. On the review of patients' problems, the respondents felt that the process will be difficult. Similar response was expressed on seeking specific information, following patients' particular test, obtaining information on treatment procedure, referring a patient to the specialist, getting order treatment, getting patients information for discharge. Ironically these are regular tasked performed by health professionals and are expected to be made ease with the introduction of health informatics.

This finding contradicts the pursued benefits attributed to the introduction to the information in the health institutions. However this doesn't mean that the adoption of health informatics is an exercise in futility. These findings may be attributed to the nature of the profession and personality traits of the individual health workers, fear of technology, fear of the unknown and getting used with the paper-based what can be called working comfort zone. Another reason may be According to [5] myopic policies result in systems with little patient usefulness. Policies driven by techno centric bias & enacted in entrenched power structures responsible for system failure. This was based on evidence on patients' perception and critical examination of the social realities of healthcare.

The remedy to this is user training and awareness campaign amongst the health professional in the level 5 hospitals in Nyanza Kenya. This will neutralise the stigma associated with the introduction with the adoption of health information. From the findings, most of the respondents are using paper-based patients' records. This may be attributed to the pursued difficult in using health informatics.

Personality research, like any science, relies on quantifiable concrete data which can be used to examine what people are like and why people behave as they do. The correlation matrix of the personality traits and TAM element (attitude and ease of use) shows that attitude is negatively correlated with perceived ease of use, conscientiousness and agreeableness. Attitude is also positively correlated with extraversions, openness and neuroticism personality traits. Individuals high in openness are more likely to hold positive attitudes and cognitions toward accepting job-related technology in part because of their predisposition to embrace new approaches to work; they are less threatened by change implied in adopting technology [7].

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