

Social cognitive factors affecting career choice in mobile app development: Comparing between employed and unemployed programming students

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Abstract

In Africa, there has been an explosion of mobile and an uncomfortable growth of graduate unemployment, including in the field of ICT. In this paper, we investigated the interest in a career in mobile app development between unemployed and employed students studying programming subjects at a distance-learning institution. Distance-learning offers individuals the ability to study while at the same time to work. The paper drew on social cognitive career theory. The key findings from the 236 responses suggest that unemployed students are more inclined to consider a career in app development. It was also noticeable that female students are as interested in app development as their male counterparts. The paper concludes that higher education institutions need to pay closer attention to unemployed students in order to grow the base of app developers producing locally relevant African apps.

Keywords: Mobile apps, app development, skills development, ICT4D, graduate unemployment, social cognitive career theory, distance-learning, programming students

1. INTRODUCTION

We are living in a world which is increasingly dependent on technology solutions, with many of these solutions having a form of mobile device and remote access capability. In Africa, mobile technology is the de facto technology solution as it leapfrogged over the expensive traditional wired infrastructure. Despite the rapid growth of mobile in Africa the creation of locally relevant mobile technology solutions is still lagging. There are some local mobile solutions that have become world famous such as mpesa from Kenya (Morawczynski, 2011), yet the

majority of mobile solutions used in Africa are non-African, or are funded by external sources (Zenawi, 2014). The demand for mobile solutions that address African contexts is growing, and with the demand comes the need for more specialised ICT and mobile application (app) skills. Although it would appear that graduates from higher education institutions would perceive the mobile trend and tap into the demand, it is not always the case.

In fact, graduate unemployment has been a burgeoning challenge in many African states (Mohamedbhai, 2015; Oluwajodu & Blaauw, 2015). One of the causes of

graduate unemployment is the choice the field of study (Naong, 2011). It is perceived that graduates from certain fields such as ICT will quickly find jobs before or as soon as they graduate (Alexander et al., 2011). The perception is not entirely well-founded in Africa. For example in Kenya, one of the reasons for the vibrancy of mobile app development is because of the failure of many ICT graduates to find employment hence turning to the next entrepreneurial opportunity, app development. The growth of mobile in Africa presents direct and indirect opportunities for employed, unemployed and soon-to-be-graduates, to create mobile solutions that address the local African context.

Purpose of study

Understanding the career interest in mobile app development between both the employed and unemployed can enable recommendations regarding how to integrate the opportunities presented by the growth of mobile in Africa within higher education institutions. In this paper, we limit the study to the interest among students studying ICT programming subjects at one of the large distance-learning institutions in Africa. We focus on the students' interest in a career in app development. In particular, we drew on three of the constructs from social cognitive career theory (R W Lent, Brown, & Hackett, 1996); self-efficacy, expected outcome and goal mechanisms. We sought to understand the career interest in app development between employed and unemployed ICT programming students. The research is therefore exploratory in nature and raises some questions for future investigation.

The remainder of the paper is structured as follows; the next section provides some

background literature on graduate unemployment, teaching programming students, mobile app development and social cognitive career theory. It is followed by the means of inquiry to conduct the research. The next chapter analyses the data and provides the findings. The paper ends with concluding thoughts and areas for further research.

2. LITERATURE REVIEW

Graduate unemployment in Africa

Human capital and economic studies have long drawn a direct and linear relationship between education and the socioeconomic development of any country (Schultz, 1961). The challenge of graduate unemployment in Africa is even more pressing since the continent has a critical need for greater social and economic development. Unemployed graduates moreover present a bigger political challenge as seen in the 'Arab spring' where the collective actions of the majority unemployed graduates in Egypt managed to unseat the government (Abou-Setta, 2014; Lim, 2012).

The causes of graduate unemployment have been attributed to quite a number of constructs. The most outstanding cause attributed to higher educational institutions is the lower quality of students coming out (Gefen, Ragowsky, & Miller, 2015; Mohamedbhai, 2015; Oluwajodu & Blaauw, 2015). It is argued that many institutions are under pressure to increase the student output using the same resources, and have inadvertently compromised on quality to focus on quantity.

Employers prefer graduates for their 'soft skills' over and above the technical skills,

and are therefore frustrated when they have to re-train the graduates to fit in with their organisational culture (ITWeb, 2015; Schofield, 2014). A number of higher education institutions are also not engaging enough with the community to understand the directions in which society is moving (Mohamedbhai, 2015). It is consequently cheaper and easier for employers to find an individual with the experience and necessary soft-skills set rather than take the risk of hiring a recent graduate, offer re-training and lose him/her to the next competitor (Gefen et al., 2015).

The demand for ICT graduates who are able to quickly adjust to the fast-paced societal demand for locally relevant mobile solutions is therefore no longer dependent on educational proficiency alone but is increasingly affected by soft-skills and experience. Distance education offers a flexible solution by allowing students to study while at the same time gain experience within a working environment.

Teaching programming by distance learning

Distance education is the method of conveying instruction and teaching to students who are not physically available in a classroom (Rao & Krishnan, 2015). Distance learning students often work alone. For technical subjects which require a great deal of practice and a degree of apprenticeship such as in programming subjects, physical access to adequate technology plays an important role in the learning experience (McGill & Hobbs, 1996). The little research that has investigated the nature of teaching programming in distance learning environments suggests the importance of using collaborative and packaged tools (Cavus, Uzunboylu, & Ibrahim, 2007; Patil

& Sawant, 2010) and using e-tutors and interactive visual web-based systems (Choy & Ng, 2004; Domingue & Mulholland, 1997; Ng, Choy, Kwan, & Chan, 2005). In terms of assessment, the little research suggests the superiority of using ipsative assessment as the primary means for feedback (Pilkington & Staden, 2012). Ipsative assessment is a type of assessment in which current results are compared with previous results (Hughes, 2011).

Mobile app development

Mobile app development has some unique audience and platform subtleties that differentiate it from traditional programming. Mobile devices are ubiquitous and are constantly being used. Mobile app developers consequently need a high understanding of consumer behaviour in order to make a relevant app.

Consumer behaviour changes constantly and is a reason for the rapid change in mobile app platforms. Mobile devices are also smaller than conventional computers and run on a number of platforms. App developers as such have to make a choice of mobile device platform (Joorabchi, Mesbah, & Kruchten, 2013).

The internet further levels the competitive field meaning that mobile apps are accessible from any location. Geographic availability means that app developers in Africa will have to compete globally. The local advantage for app developers is that they ought to understand their local consumers better, and if their apps are globally desirable could export them a global audience. We therefore drew from psychosocial cognitive theory to understand aspects of the nature of distance learning students who are

studying mobile app development in Africa.

Social cognitive career theory

The social cognitive career theory of Lent, Brown and Hackett (1994) focused on three areas of Bandura's (1986) social cognitive theory to understand how individuals exercise personal agency in their career choices. Lent et al (1996) considered the interrelationships between how career and academic interests develop, how career relevant interests are forged and developed, and how performance outcomes are achieved. They posited that the career choices that individuals make have a mutual and reciprocal effect on their behavioural and cognitive selections. The psychosocial theory of career development has at its core the following social cognitive mechanisms; self-efficacy beliefs, outcome expectations and goal representations.

Self-efficacy refers to an individual's judgement of their capabilities to organise and execute a course of action required to attain designated types of performances. Bandura (in Evans 1989) propositions that self-efficacy has the greatest influence on the choices of behaviour in answer to the question, 'Can I do this?'. The answer determines the choice of activities and environments, effort expenditure, persistence, thought patterns, and reactions when faced with obstacles. Self-efficacy has been used as a measure of academic and career-related choices in ICT in Africa and around the world (Alexander et al., 2011). We therefore hypothesised that:

H₁: Employed and unemployed distance-learning programming students have no

similarities in their self-efficacy beliefs about a career in ICT.

Outcome expectations are the individual's personal beliefs about probable response outcomes to a set of actions in answer to the question, 'If I do this, what will happen?'. The beliefs include an anticipation of physical outcomes such as money, social outcomes such as societal approval and self-evaluative perceptions such as self-satisfaction. We therefore hypothesised that:

H₂: Employed and unemployed distance-learning programming students have no similarities in their outcome expectations from developing mobile apps.

Goals symbolise a desired future outcome and represent the determination to engage in certain activities to achieve the future outcome. Individuals are more than mechanical responders to deterministic forces and by setting goals, attempt to organise and guide their behaviour. Goals help to sustain behaviour over a long period of time even in the face of external reinforcements such as failure (Evans 1989). We therefore hypothesised that:

H₃: Employed and unemployed distance-learning programming students have no similarities in their perceptions about a career path in mobile app development.

In the next section, we explain the means of inquiry to investigate the hypotheses.

3. RESEARCH METHODOLOGY

This paper adopted a qualitative approach to understand some of the social cognitive factors that influence distance-learning students towards a career in mobile app development. The qualitative approach in its fundamental quest to explain the contextual and lived experiences of

individuals is accepting of multiple research designs. In this research, we used a survey design to collect data from distance learning students studying programming. The results were analysed statistically.

Population, data collection and sample

The survey consisting of 43 questions was posted online using Google Forms®. Invitations to complete the survey were distributed by email to three different groups of programming students representing a total of 398 programming students. The survey preserved anonymity except for where contact information was voluntarily requested. The questions related to ethical and informed consent, demographics, self-efficacy, app development, and a career in ICT. No incentives were offered as part of the survey.

Data was collected over a five month period between January-May 2015. 238 responses were received representing a response rate of 59.2%. Two of the 238 responses were deleted because they were inadequate. A non-probability convenient sample size was used to differentiate between employed and unemployed students.

Validity and reliability

The questions used in the survey were derived mainly from social cognitive theory, which questions were equally distributed to all the students to ensure validity. The collected data was analysed using the statistical tool SPSS and Chi-square values were measured to ensure reliability.

Ethical clearance

The research received ethical clearance from the distance-learning institution to conduct the research. The students voluntarily signed off informed consent electronically as part of the survey.

In the next section, we analyse the data collected using descriptive and inferential statistics and discuss the findings.

4. DATA ANALYSIS

Descriptive statistical analysis

Tables 1-2 below present the descriptive statistics of the data collected.

Table 3 is placed in the Appendix A because of size restrictions.

	Frequency	Percent
Female	76	32.20%
Male	160	67.80%
Total	236	100%

Table 1: Sex

Table 2: Age ranges

		Frequency	Percent
Valid	<= 25	59	25.0
	26 - 27	36	15.3
	28 - 31	49	20.8
	32 - 36	54	22.9
	37+	38	16.1

32.2% and 67.8% of the respondents were respectively females and males. The largest age group was of students below 25 years of age and 83.9% below the age of 37. 66.1% were employed and 33.9% unemployed. It was surprising that 1.7% responded as not having an interest in a career in ICT seeing that they are taking ICT specialist subjects. 37.7% of the students said they already knew how to develop mobile apps. 80.1% believe that

mobile app development is a career path for their future, and 90.3% believe they can make a decent entrepreneurial living out of app development.

Inferential statistical analysis

All inferential analyses were done using the Crosstabulation function in SPSS. Pearson Chi-square values were used to determine the significance, and the Phi and Cramer V values to determine the strength of the significance (Hair, Black, Babin, & Anderson, 2010, p. 630). The tables with the significance and p-values are placed in Appendix A for size reasons.

Employment status by gender

Distance-learning students have the ability to work while at the same time carry on their studies. This is an option that can be exercised. The p-value of 0.341 (>0.05) is statistically not significant indicating no association between employment and gender. The choice (or inability) to work while studying a degree in ICT is not dependent on gender (Table 4).

Table 3: Employment status by gender

			Are you employed?		Total
			No	Yes	
What is your sex?	Female	Count	29	47	76
		Expected Count	25.8	50.2	76.0
	Male	Count	51	109	160
		Expected Count	54.2	105.8	160.0

Self-efficacy beliefs

The beliefs that an individual has about their ability in a career field has the strongest effect on making a choice in that field (Bandura, 1986). The question considered was, "Which do you consider as the biggest motivator for a career in

IT?" Four options were offered (Table 5). The p-value of 0.072 (>0.05) is statistically not significant indicating no association between employment status and self-efficacy beliefs. We therefore accept the null hypothesis to suggest that unemployed and employed students are as likely to believe in their ability to successfully pursue a career in ICT.

The results are a little more complex when looking at the percentages. Table 5 below shows that 10.2% of all the students are primarily motivated to pursue a career in ICT primarily because believe they are good at it (self-efficacy beliefs). Almost half (49.6%) enjoy ICT (also self-efficacy beliefs). Overall, 59.8% of all the students have positive self-efficacy beliefs as their primary motivation for a career in ICT. 40.3% are primarily driven by desired future outcomes at 25% (goals) and an anticipation of physical outcomes at 15.3% (performance outcomes).

Table 4: Primary self-efficacy beliefs about a career in ICT

		Are you employed?		Total
		No	Yes	
A career in IT can enable me achieve my goals	Count	26	33	59
	Expected Count	20.0	39.0	59.0
	% within Are you employed?	32.5%	21.2%	25.0%
A career in IT has better employment, financial, social and personal prospects	Count	7	29	36
	Expected Count	12.2	23.8	36.0
	% within Are you employed?	8.8%	18.6%	15.3%
I am good at IT	Count	10	14	24
	Expected Count	8.1	15.9	24.0
	% within Are you employed?	12.5%	9.0%	10.2%

I enjoy IT	Count	37	80	117
	Expected Count	39.7	77.3	117.0
	% within Are you employed?	46.3%	51.3%	49.6%

Outcome expectations

The belief about a taking up a career in app development was presented using the following question, *"Is mobile applications development a career path for your future?"*

A p-value of 0.006 (less than 0.05) indicates that there a significant association. We therefore reject the null hypothesis. There is an association between employment status and a choice of a career in app development. Particularly, students who are unemployed are more inclined to choose a career path in mobile app development.

Table 5: Career in app development by employment status

		Are you employed?		Total
		No	Yes	
No	Count	8	39	47
	Expected Count	15.9	31.1	47.0
	% within Are you employed?	10.0%	25.0%	19.9%
Yes	Count	72	117	189
	Expected Count	64.1	124.9	189.0
	% within Are you employed?	90.0%	75.0%	80.1%

Goals

The social cognitive beliefs linked to a desired future outcome, goals, was based on the question, *"Do you think you can make a decent entrepreneurial living out of the development of mobile applications?"*.

A p-value of 0.195 (>0.05) indicates that there is no significant association. We therefore accept the null hypothesis. There is no association between employment status and a future in a career in app development. Both unemployed and employed students have similarly high beliefs that a career in app development can result in a decent entrepreneurial living.

Table 6: Goals by employment status

		Are you employed?		Total
		No	Yes	
No	Count	5	18	23
	Expected Count	7.8	15.2	23.0
	% within Are you employed?	6.3%	11.5%	9.7%
Yes	Count	75	138	213
	Expected Count	72.2	140.8	213.0
	% within Are you employed?	93.8%	88.5%	90.3%

5. CONCLUSIONS

The exploratory study sought to compare between unemployed and employed distance-learning students who are studying a programming language, regarding their interest in a career in app development. The three constructs of self-efficacy beliefs, outcome expectations and goals by Lent at al (1996) were drawn upon to guide research. The study contributes local and practical strategies for attracting distance-learning students to a career in app development, and to the factors that influence such a choice.

As the growth of mobile and unemployment continue to grow in Africa, higher learning institutions have a

responsibility to prepare their ICT graduates for a possible career in app development. With app development being consumer oriented, the similarity in self-efficacy beliefs about a career in ICT between unemployed and employed males and females, is encouraging. Women bring a unique dimension to consumer behaviour which is needed in app development. The result is in contrast to previous results that suggested that not enough women are considering app development as a career option (Twinomurinzi & Dajee, 2014).

The higher interest by unemployed students in a career in app development, whether entrepreneurial and otherwise, can be expected. Those who have jobs are probably too comfortable to try something different. Higher education institutions should target the unemployed programmers in order to improve the supply of locally relevant solutions. Particularly, higher institutions need to prepare programming students for the tough option of an entrepreneurial career and provide mobile solutions that will meet the personalised demands of an increasingly technology oriented generation.

The research was limited to distance-learning students studying different programming languages in one university. Future research would benefit from considering the effect within traditional campus universities.

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7. APPENDIX A

Table 7: Descriptive statistics

	Employment status		Interest in a career in IT		Know how to develop mobile apps		Decent entrepreneurial living from app development		App development a career path	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
No	80	33.90%	4	1.69%	147	62.29%	23	9.75%	47	19.92%
Yes	156	66.10%	232	98.31%	89	37.71%	213	90.25%	189	80.08%
Total	236	100.00%	236	100.00%	236	100.00%	236	100.00%	236	100.00%

Table 3b. Employment status by gender (Chi-Square Tests^c)

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.908 ^a	1	.341	.378	.210
N of Valid Cases	236				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.76.					
c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.					

Table 3c. Employment status by gender (Symmetric Measures)

		Value	Approximate Significance
Nominal by Nominal	Phi	.062	.341
	Cramer's V	.062	.341
N of Valid Cases		236	

Table 4b. Primary self-efficacy beliefs about a career in ICT (Chi-Square Tests^c)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.996 ^a	3	.072
N of Valid Cases	236		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.14.			

Table 4c. Primary self-efficacy beliefs about a career in ICT (Symmetric Measures)

		Value	Approximate Significance
Nominal by Nominal	Phi	.172	.072
	Cramer's V	.172	.072
N of Valid Cases		236	

Table 5b. Career in app development by employment status (Chi-Square Tests^c)

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.460 ^a	1	.006		
N of Valid Cases	236				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.93.					
b. Computed only for a 2x2 table					

Table 5c. Career in app development by employment status (Symmetric Measures)

		Value	Approximate Significance
Nominal by Nominal	Phi	-.178	.006
	Cramer's V	.178	.006
N of Valid Cases		236	

Table 6b. Goals by employment status (Chi-Square Tests^c)

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.681 ^a	1	.195		
N of Valid Cases	236				
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.80.					
b. Computed only for a 2x2 table					

Table 6c. Career in app development by employment status (Symmetric Measures)

		Value	Approximate Significance

Nominal by Nominal	Phi	-.084	.195
	Cramer's V	.084	.195
N of Valid Cases		236	