Predicting FinTech innovation adoption in South Africa: the case of cryptocurrency

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Abstract

Purpose – Financial technology innovation within the developed world is driving financial markets, yet its adoption is lagging among consumers in emerging markets. At the same time, most African economies continue to be at the tail end of global financial innovations adoption. Given lagging consumer adoption of cryptocurrency in South Africa, the purpose of this paper is to apply the theory of planned behaviour (TPB) to predict behavioural intention to adopt cryptocurrency.

Design/methodology/approach – A survey instrument based on the TPB was used to collect quantitative data for predicting adoption from adult distance students at the Mancosa, Cape Town campus. For data analysis, the two-step structural equation modelling approach was used.

Findings – The findings indicate that attitude and perceived behavioural control positively impact the intention to adopt cryptocurrency. Subjective norm showed a negative non-significant influence. Overall, the results of the study show that the model has a good model fit and can be used to explain the theory.

Research limitations/implications – The results of this study may not be generalisable to the wider population as it is only based on a cross-sectional study of a sample of adult students at a single institute in South Africa.

Originality/value – The contribution of this paper is threefold: it is one of a few studies on the behavioural intention to adopt cryptocurrency in South Africa using the TPB model, it contributes towards the use of predictive behavioural economics models in understanding consumer behaviour critical to accelerating the adoption of financial innovations, and the results of the study also inform behaviour change strategies that can be applied by practitioners or policymakers to improve adoption. Studies of this nature may lead to the development of financial innovation in emerging markets through a nuanced understanding of consumer behaviour.

Keywords Theory of planned behaviour, South Africa, Blockchain, Cryptocurrency, Bitcoin, Financial technology innovation

Paper type Research paper

Introduction

Financial technology innovation applying blockchain technology and cryptocurrency tokens have taken the global financial markets by storm through creating a borderless financial system (Sonderegger, 2015). Blockchain refers to a decentralised technological platform for managing transactions and data without intermediation (Yli-Huumo et al., 2016). Cryptocurrency refers to tokens or digital currency based on cryptographic technology used to perform a range of financial transactions such as payments or store of value on the blockchain technology (Iwamura et al., 2014; Ha and Moon, 2018). The number of listed cryptocurrencies across countries is continuing to grow and their market capitalisation is estimated by Light (2019) to be heading towards $700bn. Recently, Arias-Oliva et al. (2019) noted that initial coin offering activities continue to increase and there are currently over 2,000 cryptocurrencies trading across the global market. Blockchain can be viewed as the back-end comprised of a distributed database that records all the transactions (Swan, 2015). On the other hand, cryptocurrency is the front-end used to perform monetary functions like sending value, investing or trading (Brito et al., 2015). While blockchain is the technology that makes cryptocurrency work (Dwyer, 2015), it should be understood that it is deep-seated with more applications beyond cryptocurrencies (Miraz and Ali, 2018; Dwyer, 2017). As a digital currency, cryptocurrencies can be used to complete transactions between persons and/or institutions (Liu et al., 2018).
Despite the fact that the adoption of cryptocurrency is advanced in the developed markets, policymakers and regulators in some emerging countries are still reluctant to accommodate it (Walton, 2014). In Africa, regulators in South Africa, a middle-income economy, have been in the forefront to allow the full execution of cryptocurrency (IFWG, 2018). The South African financial market continues to develop and innovate in line with global trends when most of its African counterparts blocked the development of cryptocurrency (Kshetri, 2017). South African banks and other specialized cryptocurrency boutiques have gone ahead to fully embrace blockchain in their infrastructure. They have adopted cryptocurrencies in their product portfolios and service delivery (Kshetri and Voas, 2018).

The future of cryptocurrency appears to be secure considering the global drive towards the Internet of Things (Mizra and Ali, 2018). As noted by Mizrahi (2016), institutional innovation and adoption of cryptocurrency are in overdrive as they predict increased use of digital currencies. There are glowing accounts that the widespread use of digital currencies can transform and democratise economies particularly those in developing economies (Kshetri, 2017; Coeckelbergh and Reijers, 2015). The development of cryptocurrency is increasing public choices while at the same time developing new economies (Davidson et al., 2016). It is also believed that development in cryptocurrencies will lead to further growth in the e-commerce market (Polasik et al., 2015). Transactions handled through cryptocurrencies are also observed to lower transaction costs and significantly reduce transaction time through disintermediation (Dwyer, 2015). However, as noted by De Filippi (2014), the full potential of cryptocurrency can be achieved when it is widely adoption by end-users without whom its impact will remain minimal. An increase in institutions investing in cryptocurrency is a reflection of positive prospects of demand (Cong et al., 2018). Nonetheless, such an investment could be futile without predicted consumer intention to adoption. The simultaneous adoption of cryptocurrency by users and merchants is crucial for the sustainability of these investments (Polasik et al., 2015). Online merchants, for example, have started to accept cryptocurrency as a medium of exchange yet its use by consumers is still limited (Berger, 2016). Thus, a thorough understanding of the drivers of the adoption of cryptocurrency is paramount as the survival of cryptocurrency technology is heavily dependent on the adoption by the wider market (Thomas, 2019). In South Africa, even though financial regulators have given the green light for financial technology innovation, the consumer adoption of cryptocurrency remains a mystery (Johnston and Walton, 2018). Worst still, even though cryptocurrency seems to be a suitable solution for conducting transactions, adoption and diffusion of technology are painfully slow in developing countries (Brick and Visser, 2015). The weak adoption of cryptocurrency in emerging countries is an issue that requires continued academic investigation (Darlington, 2014). There is a prominent reticence to the adoption of cryptocurrency in developing countries. Likewise, in South Africa, Gogo (2019) noted disappointment at the pace of public adoption to cryptocurrency. Apart from Johnston and Walton’s (2018) study that focused on online user adoption of Bitcoin, there is a dearth of cryptocurrency adoption literature in South Africa. Despite the apparent value in cryptocurrencies and recent interest and advancement in the field of behavioural finance, global research on cryptocurrency is still dominated by grey literature. Extant research is predominantly focused on financial technology design and features while neglecting the end-user adoption element (Risius and Spohrer, 2017). In most cases, the existent literature focuses on broad societal benefits with little studies focusing at the individual user level (Nguyen, 2016). In emerging markets like South Africa, empirical studies that unearth underlying factors that predict behavioural intention to adopt financial innovation are of increasing theoretical and practical interest (Yousafzai et al., 2010). While that is the case, there has not been any academic cryptocurrency adoption prediction study among adult distance students in South Africa. To predict the adoption of cryptocurrency, the planned behaviour theory is used in this study to assess factors that determine intention to use cryptocurrencies. The TPB is an established research framework that can advance our understanding of the individual consumer and
possibly propel the dissemination of cryptocurrency through evidenced-backed strategies. Specifically, the study aims to find the impact of attitude, perceived behavioural control and subjective norm on behavioural intention to adopt cryptocurrency.

The paper is organised as follows. In the following section, literature on the planned behaviour theory will be reviewed. Next, the data collection method will be discussed followed by the presentation of results, discussion and conclusion.

**Literature review**

*Financial technology market context*

The financial technology market is a confluence of finance and technology in the creation and delivery of financial services (Kaur and Dogra, 2019). This new market segment is expected to grow exponentially in financially sophisticated markets with secure internet connection, high mobile telephony penetration rates and a highly skilled labour force (Haddad and Hornuf, 2019; Yermack, 2018). The adoption of financial innovation such as cryptocurrencies is not yet widespread but once adopted widely; it can redefine the future of the financial industry (Chuen and Teo, 2015). It is anticipated that improved adoption, particularly in emerging markets has the potential to serve the unbanked and increase e-commerce trade (D'Alfonso et al., 2016).

Financial innovation adoption refers to the consumer’s psychological state about their intention to use cryptocurrency as a means of exchange and store of value. Thus, adoption represents a common indicator of the degree of cryptocurrency acceptance (Arias-Oliva et al., 2019). Studies are required to support the large scale adoption of this technology especially in emerging markets that lack significant involvement in cryptocurrency (Al Shehhi et al., 2014). The TPB has demonstrated its validity as a model for the study of technology acceptance in many spheres. However, few studies investigate its application to cryptocurrency adoption. Given that, validating the TPB theory in the context of cryptocurrency consumption could help academics and practitioners better understand social and behavioural antecedents of consumer acceptance (Truong, 2009). It is critical for financial technology innovators and service providers to understand the processes involved in user adoption to design sound strategies that increase the viability of their services. Studying the antecedents of behavioural intention to adopt cryptocurrency can greatly help increase the pace of adoption as the value of any commercial innovation lies in driving its adoption (Wang et al., 2019).

In South Africa, cryptocurrencies have become popular as measured by awareness (Luno, 2018) and the volume of trade (Blenkinsop, 2019). South Africans top the list on the Google search engine searching for cryptocurrencies such as Bitcoin (Gogo, 2018). In a survey of 1,244 South Africans, it was estimated that 50 per cent of them were aware of and planned to invest in cryptocurrencies (MyBroadBand, 2018). South Africans were noted to lead many European countries in terms of familiarity and awareness of cryptocurrencies (Emem, 2018). In another study of 1,000 respondents, 70 per cent of South Africans were aware of cryptocurrencies while 29 per cent were already invested in virtual currencies (Luno, 2018). As South Africans are already planning to invest in cryptocurrency, it would appear that awareness is not the problem in cryptocurrency adoption (Karombo, 2018). While awareness will continuously remain a work in progress (BusinessTech, 2018), the main challenge ahead is to turn registered interest, familiarity and awareness into the adoption of cryptocurrencies. To effectuate that, there is a critical need to understand the behavioural aspects that drive adoption. The poor adoption of cryptocurrencies is still a global problem 10 years after the existence of cryptocurrencies (Thomas, 2019; Chuen and Teo, 2015). The industry remains in infancy and sluggish (Stewart and Jürjens, 2018) albeit with the potential to revolutionise the future industries (Wang et al., 2019; Lansky, 2018). Hence, the growth of cryptocurrencies may be hinged on understanding consumer behaviour and the ability to predict what drives them to adopt the innovation. As the most sophisticated financial hub in Africa, South Africa has the potential to lead in financial innovation development if scientific evidence-based strategies can
be developed to turn rising public interest into demand (Gogo, 2018). The TPB theory has proven to be effective in terms of its utility to predict consumer intention and supporting managerial decision making (Côté et al., 2012). Social attitude, personal traits and other concepts relating to behavioural disposition captured in the TPB theory are of theoretical and practical importance to predicting and explaining human behaviour (Yousafzai et al., 2010). Additionally, the TPB is suitable for consumer decisions that are complex and require a lot of thought before consideration. It also applies to an environment in which there are numerous but distinctive brands to choose from (East, 1993). Consumers engage in a lot of consideration before undertaking financial decisions in an intensely contested cryptocurrency market with unique brands (Al Shehhi et al., 2014) thereby making the TPB the most relevant framework for this study. Predicting intentions is relevant to financial decisions in the sense that decisions leading to investing or saving are all intentional. Financial decisions are typically the type of planned behaviour for which an intentional model like the TPB is ideal (Krueger et al., 2000).

Studies predicting intention to adopt cryptocurrency within the South African context are lagging, considering that cryptocurrencies were introduced on the global financial market more than a decade ago (Nakamoto, 2008). Few of the only attempts to predict intention towards the adoption of cryptocurrency in South Africa are Johnston and Walton (2018). Unfortunately, Johnston and Walton (2018), like most studies (Shahzad et al., 2018), only explored enablers and barriers to the adoption of bitcoin, one of the many cryptocurrencies on the market. Their study is limited to bitcoin without broadening it to other cryptocurrencies in general. Thus, limited studies looked at the adoption of cryptocurrencies in general.

Overview of planned behaviour theory

The theory of planned behaviour (TPB) was moulded out of the theory of reason action which was based on volition behaviour (Ajzen and Fishbein, 1980). The TPB was developed to predict behaviours not entirely under volition control (Orbell et al., 1997). The TPB is one of the models commonly used to predict, understand and change human behaviour (Ajzen, 1988, 2011). The model has been applied in numerous correlational studies to predict intentions towards the adoption of new technology (Mahardika et al., 2019). The TPB is the most popular theoretical model used to study human behaviour (Ajzen, 2002; Qi and Ploeger, 2019) and has been frequently applied in studies related to the adoption of e-commerce, online services and mobile technologies, among others (Cheon et al., 2012). The theory is useful in over 150 different contexts (Armitage and Conner, 2001). Besides, Davis et al. (1989) noted that the TPB can be used to explore any human behaviour. According to Ajzen (2012), the TPB assumes that intention is an immediate antecedent of behaviour. At the same time, the intention is a function of attitude towards the behaviour, subjective norm and perceived behavioural control. Numerous correlational studies support the ability of the TPB to predict behavioural intentions, thereby confirming the predictive ability of the model (Sharma and Foropon, 2019). The TPB is an optimal starting point to analyse consumer behaviour towards the adoption of new technology.

The TPB framework is based on the assumption that intentions can predict human behaviour (Ajzen, 2002; Liobikiene et al., 2016). At the heart of the TPB is the assertion that intentions positively influence actual behaviour (Götze, 2011). The TPB further assumes that behavioural intention is predicated by three belief-based constructs of attitude, perceived behavioural control and subjective norm (Arnautovska et al., 2019). The influence of these antecedents on behavioural intention changes depending on target behaviour and circumstances. Combined, positive attitude towards target behaviour, favourable subjective norm and perceived behavioural control will strongly influence behavioural intention (Ajzen, 2012). In some quarters, the TPB has been critiqued for failure to account for unplanned behaviour (Bachrach and Morgan, 2011). The processes in the mind that constitute intentions do not always directly feed into observable actions (Barber, 2011). However, for high involving
goal-oriented decisions conceived after thorough and deliberate consideration such as the adoption of cryptocurrency, intentions remain the best predictor of actual behaviour (Ajzen, 2011). On the whole, there is abundant evidence that intention and behaviour are associated (Huang et al., 2019).

Attitude towards behavioural intention refers to the degree to which a person perceives the advantages or disadvantages attached to him or her performing the behaviour (Ajzen, 1991). Attitude towards behaviour entails the extent to which a person positively or negatively feels about the behaviour of interest. The attitude is informed by a consideration of possible outcomes from performing the behaviour (DeMarree et al., 2017). These perceived outcomes of behaviour form the underlying behavioural beliefs that determine attitude towards behaviour (Conner and Sparks, 2005). The major drawback of attitude as a predictor of behaviour intention is that they do not predict deliberate human behaviour. Attitudes have been observed to change with time and circumstances (Aassve et al., 2013) while the TPB is static (Sniehotta et al., 2014). On the other hand, proponents of the TPB argue that it can capture new or updated measures to predict contemporary attitudes (Klobas, 2011). Götze (2011) argued that the TPB is dynamic and can be extended to cover multiple behaviours which can improve its utility to new technology research. Even still, the classic TPB framework from McEachan et al.’s (2011) meta-analysis supports that the model has predictive power to explain behavioural intention. In fact, callous calls to retire the TPB framework (Sniehotta et al., 2014; Ogden, 2015) have been met with vehement rebuke for the continued use of the theory as a foundational understanding of behaviour when new products or environments emerge (Schwarzer, 2015; Conner, 2015; Ajzen, 2015; Montanaro et al., 2018).

Subjective norm is the second determinant of intention based on perceived social approval or disapproval from others. It refers to the belief about whether one’s social group or significant others think a person can perform the behaviour. Subjective norm relates to a person’s perception of the social environment surrounding the behaviour (Ajzen, 2005). Subjective norm is related to the perceived pressure from one’s reference group to perform target behaviour. These norms include descriptive and prescriptive norms of what is commonly done and approved by one’s social group. The construct assumes that intention to perform target behaviour will be strong if important people in an individual’s life approve of the target behaviour. Consequently, social disapproval of a particular behaviour will lead to weak intention to perform it (Krueger et al., 2000). Thus, social support or lack of it influences adoption intention. However, there are some exceptions with regard to some individuals who have a high internal locus of control or a high propensity to act (Ajzen, 1987; Bagozzi et al., 1992). There is strong evidence that people may perform certain behaviour such as accepting new technology to remain included in a social group (Sugar et al., 2004). In this study, subjective norm means the degree of perceived pressure on the respondents from their reference groups to adopt cryptocurrencies. This construct is essentially related to other people in one’s social networks hence a good understanding of such a construct is important for an industry in infancy pursuing mass adoption. The construct is used because it has the potential to bring about insights into social networks that can encourage more users to adopt cryptocurrencies (Choi and Chung, 2013). The social norm construct is important in socially connected communities such as those found in South Africa and African in general (Mbaya, 2010).

Perceived behavioural control is the third determinant of intention added by Ajzen (1991) to the TPB to explain circumstances where individuals lack total control of their behaviour. The inclusion of perceived behavioural control improved the predictive power of the TPB to explain behavioural intention (Yzer, 2012). Perceived behavioural control refers to an individual’s perception of the extent to which performance of the behaviour is easy or difficult. The perceived behavioural control takes into consideration facilitators and barriers to performing the behaviour. Facilitators increase confidence while barriers reduce the confidence to perform target behaviour. Perceived behavioural control increases when individuals perceive they have
more resources and confidence to perform. Perceived behavioural control is a complex multidimensional construct (Trafimow et al., 2002) comprised of interrelated sub-concepts of self-efficacy and controllability (Kraft et al., 2005). However, it can still be studied as a unitary construct but should be inclusive of measures relevant to its sub-concepts (Zolait, 2014). An individual's perceived behavioural control is influenced by their experience, cognitive abilities and anticipated easiness or difficulty of carrying out intended behaviour. Perceived control towards target behaviour improves when an individual has the cognitive resources to acquire information about the behaviour activity. Easy or difficulty of performing the behaviour in question, therefore, captures an individual's perception of presence or absence of required resources and opportunities to participate in the target behaviour. Past hands-on experience and anticipated future obstacles also influence participation in a particular behaviour. Perceived behavioural control reduces the consumer fear of undertaking target behaviour, thereby reducing barriers to the adoption of new technology. PBC is an effective determinant of predicting intention when an individual does not have total control over their behaviour (Doll and Ajzen, 1992). Overall, the greater the individual's perceived behavioural control, the stronger the intention to perform the target behaviour (Olgyai et al., 2005). It would be interesting to explore its influence on the adoption of financial technology in an emerging market where consumers are generally perceived to have limited control due to a lack of computer experience (Gupta et al., 2008; Janssen and Swinnen, 2019) and financial technology exposure or know-how (Schuetz and Venkatesh, in press; Sobhanifard and Sadatfarizani, 2019). The proposed model based on TPB has attitude, perceived behavioural control and subjective norm as the predictors of intention to adopt cryptocurrency. These three constructs have been found to influence the intention to adopt technology-based services (Weigel et al., 2014). The schematic presentation of the model and hypotheses is outlined in Figure 1:

\[ H1. \] Attitude has a positive relationship with intention to adopt cryptocurrency.

\[ H2. \] Perceived behavioural control has a positive relationship with intention to adopt cryptocurrency.

\[ H3. \] Subjective norm has a positive relationship with intention to adopt cryptocurrency.

The TPB theory was selected for its potential to shed light on the poor state of the adoption of cryptocurrency in South Africa. The adoption of cryptocurrency may help build inclusive financial systems that may serve markets more effectively (Zhang and Yang, 2019). Most people

![Figure 1. Theory of planned behaviour model](source: Ajzen (1991))
may neither have the capacity nor the motivation to act on their own as financial and technology education is still a challenge in developing markets (Jafri, 2019). Consumers may require motivation, encouragement and training on the use of cryptocurrency. In that regard, the TPB is useful as a tool for understanding antecedents to behaviour and subsequently developing effective interventions aimed at behavioural change (Hardeman et al., 2002). However, the TPB is not without criticism. A major drawback of the theory is the apparent disconnection between measured intention and later actual action. The TPB has been accused to capture imagined behaviour rather than actual behaviour. In that case, understanding consumer behaviour becomes a moving target (Gabor and Brooks, 2017). In an experimental study, attitude, social norms and perceived behavioural control were observed to shift after forming intention (Sussman and Gifford, 2019). It is also claimed that the relationship between attitude, social norm and perceived behavioural control on hand and behavioural is bi-directional rather than uni-directional (Sussman and Gifford, 2019). As a general criticism, behavioural economics models have been shot down for being one-sided. They only explore the behaviour of consumers and not service providers (World Bank, 2015).

Notwithstanding its criticism, the TPB remains an insightful and sound theory within the discipline of behavioural economics. The TPB as a behavioural model is important to understand consumers and can lead to the development of incisive business strategies. The TPB is also credited for improving the predictability of intention. The TPB is a versatile theory that has been successfully utilised in far-ranging subjects in finance, economics, management and medical studies (Yousafzai et al., 2010). The inclusion of the perceived behavioural control construct significantly improved the prediction power of the model (Shanmugham and Ramya, 2012). Hence, an attempt is made in this study to predict the behavioural intention to adopt cryptocurrency in South Africa by applying the TPB theory. Financial technological innovation like any other recent innovation needs to be explored to establish the determinants of adoption using proven models like the TPB (Weigel et al., 2014; Ajzen, 2011). This phenomenon applies to the adoption and acceptance of cryptocurrency or digital currencies. This becomes more important as most African economies continue to be at the tail end of global financial innovations. Though it is difficult to have outright total control of a borderless digital currency (Sushko and Kaznin, 2019), in some African countries digital currency innovations are legally restricted (Thomson Reuters, 2017). However, the South African financial market as one of the most advanced in Africa took a laisser-faire approach to cryptocurrency transactions by allowing the market to trade at own risk as there is no substantive regulatory framework yet (SARB, 2014; Chudinovskikh and Sevryugin, 2019). The resilience and adaptive of the South African financial market makes it more liberal from a regulatory perspective as it continues to look for a policy position to fully embrace cryptocurrency (IFWG, 2018). Even though the legal environment in South Africa positively influences the development of financial technology innovations (Yermack, 2018) and consumers are highly aware of the existence of cryptocurrency (Luno, 2018), it remains unknown whether or not ordinary citizens will widely adopt them.

**Research methodology**

**Study instrument**

The study questionnaire included two sections. Section A collected the demographic characteristics of the respondents, while Section B evaluated the respondents’ perception on items related to attitude, perceived behavioural control, subjective norm and behavioural intention. A five-point Likert scale was used to assess the items where 1 = strongly disagree and 5 = strongly agree. The items used to measure the TPB constructs were mainly adapted from Lee (2009). Table I shows the various sources of the individual items used to measure the constructs for the TPB theory. The items were adopted from Lee (2009), Gu et al. (2009), Venkatesh and Davis (2000), Cheon et al. (2012),
Armitage et al. (1999), Venkatesh et al. (2003) and Arias-Oliva et al. (2019) but were reworded to align them to cryptocurrency. Attitude was assessed using four items, subjective norm three items, perceived behavioural control five items and behavioural using four items. The instrument used in the study has been validated by checking validity and reliability in several prior studies (Lee, 2009; Ajzen, 2011). Nonetheless, discriminant, construct and convergent validity of the instrument was still confirmed and validated. Cronbach’s α and composite reliability were also checked. Data analysis was performed using SPSS version 25 and SPSS AMOS version 25. Descriptive statistics, exploratory factor analysis and confirmatory factor analysis were used to prepare data for structural equation modelling to test the proposed TPB model. Indices of goodness-of-fit were used to evaluate the structural model.

Sample and data collection
The study was carried out in Cape Town, South Africa from 1 October to 31 November 2018 at a distance learning institution called Mancosa. The college offers degree programmes in commerce, education, information technology and public administration. The sample was drawn from adult part-time students enrolled at the college’s Cape Town campus. Students were generally selected because of their propensity and likelihood to adopt new innovation (Tucker, 2011). Students are likely to be innovative, knowledgeable and opinion leaders in the adoption of new technology (Thakur et al., 2016). Higher education students have also been found to be early adopters and heavy users of internet-based services (Quan-Haase and Young, 2010). However, the demographics of part-time adult distance students are different from fulltime students who are likely to be predominantly young and dependent. The use of student samples in TPB studies has been criticised (Hooghe et al., 2010). However, in this

<table>
<thead>
<tr>
<th>Constructs and measures</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioural intention to adopt cryptocurrency</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>I expect to buy and sell using cryptocurrency in the future</td>
<td>Gu et al. (2009)</td>
</tr>
<tr>
<td>I will recommend others to use cryptocurrency</td>
<td>Venkatesh and Davis (2000), Schaupp and Festa (2018)</td>
</tr>
<tr>
<td>I plan to use cryptocurrency if they are made available</td>
<td>Arias-Oliva et al. (2019)</td>
</tr>
<tr>
<td>I intend to use cryptocurrency</td>
<td></td>
</tr>
<tr>
<td>Attitude (Lee, 2009)</td>
<td></td>
</tr>
<tr>
<td>Using cryptocurrency as a currency would be a good idea</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>Using cryptocurrency as a currency would be a pleasant experience</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>I would like to conduct my financial transactions using cryptocurrency</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>I like the idea of using cryptocurrency</td>
<td></td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>Armitage et al. (1999)</td>
</tr>
<tr>
<td>I will be able to use cryptocurrency</td>
<td>Cheon et al. (2012)</td>
</tr>
<tr>
<td>I have sufficient knowledge to use cryptocurrency</td>
<td>Cheon et al. (2012)</td>
</tr>
<tr>
<td>I have sufficient extent of self-confidence to make a decision to adopt cryptocurrency</td>
<td></td>
</tr>
<tr>
<td>Using cryptocurrency is entirely within my control</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>I have the resources, knowledge and ability to use cryptocurrency</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>Lee (2009), Venkatesh et al. (2003)</td>
</tr>
<tr>
<td>People important to me think that it would be fine to use cryptocurrency</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>People whose opinions are valuable to me would prefer that I use cryptocurrency</td>
<td>Lee (2009)</td>
</tr>
<tr>
<td>People who are important to me would be in favour of using cryptocurrency</td>
<td>Lee (2009)</td>
</tr>
</tbody>
</table>
study respondent demographics are representative of all ages atypical of financial services consumers as represented in Table II. In particular, adult distance students were chosen for the study because they were likely to be older and be in fulltime employment that gives them financial independence. They are also capable of making independent decisions around their financial affairs such as adopting cryptocurrency (Etherington, 2018). Collecting responses from economically active part-time students is expected to increase the proportion of middle- and upper-income respondents who are likely to be consumers of cryptocurrency (Gulamhuseinwala et al., 2015). These are potentially valuable users of cryptocurrency with knowledge of the internet who merit market and academic attention (Arias-Oliva et al., 2019). Additionally, students are highly aware of the existence of the cryptocurrency market (Doblas, 2019). The campus has a student enrolment of around 3,000 students and a sample of 900 students was randomly selected to participate in the study. A print self-administered questionnaire was distributed to the selected students during workshops. Completed questionnaires were returned before the workshop started. Applying this strategy, the returned questionnaire amounted to 283. Of those 14 questionnaires were rejected while 269 were usable. This represented a response rate of 30 per cent. The collected data were captured in SPSS version 25 for analysis.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Items</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>132</td>
<td>49.1</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>137</td>
<td>50.9</td>
</tr>
<tr>
<td>Age</td>
<td>Under 21</td>
<td>25</td>
<td>9.3</td>
</tr>
<tr>
<td></td>
<td>21–30</td>
<td>69</td>
<td>25.7</td>
</tr>
<tr>
<td></td>
<td>31–40</td>
<td>116</td>
<td>43.1</td>
</tr>
<tr>
<td></td>
<td>41–50</td>
<td>47</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>51–60</td>
<td>10</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>Over 60</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Race</td>
<td>Black</td>
<td>87</td>
<td>32.3</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>8</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Indian or Asian</td>
<td>9</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td>Coloured</td>
<td>165</td>
<td>61.3</td>
</tr>
<tr>
<td>Completed education</td>
<td>Lower than matric</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Matric</td>
<td>112</td>
<td>41.6</td>
</tr>
<tr>
<td></td>
<td>National certificate</td>
<td>52</td>
<td>19.3</td>
</tr>
<tr>
<td></td>
<td>National diploma</td>
<td>57</td>
<td>21.2</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s degree</td>
<td>30</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td>Postgraduate diploma</td>
<td>11</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>Masters’ degree</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Occupation</td>
<td>Unemployed</td>
<td>43</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>Self-employed</td>
<td>39</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Private sector</td>
<td>75</td>
<td>27.9</td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>112</td>
<td>41.6</td>
</tr>
<tr>
<td>Monthly income</td>
<td>Not applicable</td>
<td>102</td>
<td>37.9</td>
</tr>
<tr>
<td></td>
<td>Up to R15,000</td>
<td>66</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td>15,001–25,000</td>
<td>54</td>
<td>20.1</td>
</tr>
<tr>
<td></td>
<td>25,001–35,000</td>
<td>21</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>35,001–45,000</td>
<td>14</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>45,001–55,000</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>55,001–65,000</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>65,001–75,000</td>
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</tr>
<tr>
<td></td>
<td>Over 75,001</td>
<td>5</td>
<td>1.9</td>
</tr>
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</table>

Table II.
Respondents’ demographic profiles
Results
The two-step approach by Anderson and Gerbing (1988) was applied in this study, confirmatory factor analysis was used to develop the measurement model and test validity. Second, the structural model was constructed for hypothesis testing. The maximum likelihood estimation method in AMOS version 25 was used to evaluate both the measurement and structural models. The two models were assessed using prominent absolute and comparative fit indices. Specifically, $\chi^2$ and the goodness-of-fit index (GFI) were the absolute indices used. Comparative indices used include comparative fit index (CFI), incremental fit index (IFI), relative fit index (RFI), normed fit index (NFI), non-normed fit index (NNFI) and root mean square error of approximation (RMSEA). The model is said to fit the data when these model fit indices are greater than 0.90 and RMSEA less than 0.08 (Hooper et al., 2008). However, it is not unusual to find models that have been accepted with goodness-of-fit indices less than 0.90 but greater than 0.80 (Yuan and Hayashi, 2010). The results of the measurement model and structural model are presented separately.

Measurement model
The $\chi^2$ of the measurement model in Figure 2 was estimated at 194.662 with 98 degrees of freedom at $p < 0.001$ indicates a significant model lacking goodness of fit. $\chi^2$ is, however, bound to be influenced by sample size, hence it is recommended to use other indices (Barrett, 2007). As an alternative, $\chi^2$ to degree-of-freedom ratio can be used to assess model fit. A ratio less than 2 indicates model fitness. The measurement model has a $\chi^2$ to degree-of-freedom ratio of 1.986. The GFI at 0.920 was above the acceptable threshold. All the relative indices assessed were above the 0.90 cut-off (CFI = 0.968; IFI = 0.968; RFI + 0.924; NFI = 0.938; NNFI = 0.961 and RMSEA = 0.061).

Construct reliability (CR) and validity of the model were tested with the results shown in Table III. CR of the four constructs exceeded 0.8 confirming reliability. The average variance extracted (AVE) was greater than 0.5 ranging from 0.58 to 0.78 as recommended by Fornell.
and Larker (1981). Thus, convergent validity was satisfied. The condition for discriminant validity was met as the inter-correlations between all constructs is less than the square root of the AVE in italic along the diagonal of Table I.

**Structural model**

Once the measurement model was confirmed through confirmatory factor analysis and conditions for reliability and validity were satisfied, the next step is to test the structural model. The model fit indices discussed above were used to evaluate the goodness of fit of the structural model. $\chi^2$ at 99.522 with 86 degrees of freedom with a $p = 0.151$ was found to be fit to the data. The $\chi^2$ to degree-of-freedom ratio was 1.157 below the cut-off of 2. The GFI was equal to 0.958 while the relative indices showed an almost perfect model fit (CFI = 0.996; IFI = 0.996; NFI = 0.968; NNFI = 0.994 and RMSEA = 0.024). The structural model depicting the relationship between the latent variables is shown in Figure 3 with the standardized path coefficients results of the analysis.

The model fit indices indicate that the data supported the specified model with a satisfactory explanatory power (adjusted $R^2 = 0.59$ or 59 per cent) in predicting behavioural intention to adopt cryptocurrency. Except for the path from subjective norm to intention to adopt cryptocurrency, the other standardized path coefficients of the TPB structural model are significant. The results of the tested hypotheses in Table IV indicate that $H1$ and $H2$ are positive and significant, while $H3$ is negative and non-significant. $H1$ predicted that attitude has

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>AVE</th>
<th>MSV</th>
<th>MaxRH</th>
<th>Intention</th>
<th>Attitude</th>
<th>PBC</th>
<th>SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>0.846</td>
<td>0.585</td>
<td>0.576</td>
<td>0.880</td>
<td>0.765</td>
<td></td>
<td></td>
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<tr>
<td>Attitude</td>
<td>0.936</td>
<td>0.785</td>
<td>0.576</td>
<td>0.936</td>
<td>0.759</td>
<td>0.886</td>
<td></td>
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<tr>
<td>PBC</td>
<td>0.883</td>
<td>0.604</td>
<td>0.348</td>
<td>0.896</td>
<td>0.510</td>
<td>0.590</td>
<td>0.777</td>
<td></td>
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<tr>
<td>SN</td>
<td>0.889</td>
<td>0.728</td>
<td>0.419</td>
<td>0.895</td>
<td>0.466</td>
<td>0.647</td>
<td>0.587</td>
<td>0.853</td>
</tr>
</tbody>
</table>

**Figure 3.**

Structural model
a positive influence on intention to adopt cryptocurrency. Data support that the respondents’ attitude with a standardized path coefficient of $\beta = 0.74$ ($p < 0.05$) indicates a positive and significant influence on their behavioural intention to adopt cryptocurrency. $H2$ predicted that perceived behavioural control has a positive influence on the intention to adopt cryptocurrency. Data support that the respondents’ perceived behavioural control with a standardized path coefficient of $\beta = 0.14$ ($p < 0.05$) indicates a positive and significant influence on their behavioural intention to adopt cryptocurrency. $H3$ was, however, not supported as the data show that there is a negative and insignificant relationship between subjective norm and intention to adopt cryptocurrency. Overall, the findings show the usefulness of the TPB model in predicting behavioural intention to adopt cryptocurrency.

Discussion
In this study, the TPB model was applied to understand the determinants of behavioural intention to adopt cryptocurrency. The results of the study show that the proposed model has a sufficient explanatory power of 59 per cent to predict behavioural intention to adopt cryptocurrency. Notable highlights of the study are discussed. In line with Ajzen (1991), attitude was found to be the strongest antecedent to behavioural intention followed by perceived behavioural control. The results show that attitude as a construct of the TPB model had the greatest significant influence ($\beta = 0.74, p < 0.001$) on behavioural intention to adopt cryptocurrency. This may indicate that surveyed respondents showed a high positive attitude towards cryptocurrency as a one-unit increase in attitude is associated with a 74 per cent increase in behavioural intention to adopt cryptocurrency. In line with Akhtar and Das’ (2019) findings, the results may imply that attitude is of great concern when deciding to adopt cryptocurrency. Perceived behavioural control had a moderate positive and significant influence ($\beta = 0.14, p < 0.05$) on behavioural intention to adopt cryptocurrency. Surveyed respondents were less confident about their behavioural control on the adoption of the digital currencies. This implies that participants were moderately concerned about their capabilities to perform the target behaviour of adopting cryptocurrency. As a result, an increase of one-unit in perceived behavioural control is associated with a 14 per cent increase in behavioural intention to adopt cryptocurrency. Subjective norm had a non-significant negative relationship with intention to adopt cryptocurrency. In some studies, subjective norm is insignificant but positive (Lee, 2009). In this study, subjective norm could be negative because most respondents may treat financial matters with secrecy and privacy (Akhtar and Das, 2019), which may negate their reliance on others to influence their behavioural intention. Additionally, in closed societies and countries prone to electronic scams, there is a general scepticism of financial transactions and information that is not from traditional financial institutions or government agencies (Ham et al., 2015). The South African financial market has been hit by numerous internet-based referral financial scams which may dissuade participants to succumb to social pressure on financial matters (Business Report Online, 2018; Steyn, 2018). Overall, this negates the effect of subjective norm as a predictor of behavioural intention. The development of secure transactions platforms may drive adoption (Haddad and Hornuf, 2019). Although we found no evidence of the impact of subjective norm on behavioural intention to adopt cryptocurrency, we would like to suggest that individual-based financial product innovations are unlikely to

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Path</th>
<th>Estimate</th>
<th>SE</th>
<th>t-value</th>
<th>p</th>
<th>Supported</th>
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</thead>
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<tr>
<td>$H1$</td>
<td>Intention ← Attitude</td>
<td>0.739</td>
<td>0.090</td>
<td>7.917</td>
<td>***</td>
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<tr>
<td>$H2$</td>
<td>Intention ← PBC</td>
<td>0.145</td>
<td>0.071</td>
<td>2.150</td>
<td>0.032</td>
<td>Yes</td>
</tr>
<tr>
<td>$H3$</td>
<td>Intention ← SN</td>
<td>-0.100</td>
<td>0.080</td>
<td>-1.341</td>
<td>0.180</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: ***p < 0.001
spread quickly through spontaneous adoption based on the basis of social pressure in the context of African markets than group-based financial innovations with communal benefits. It would be worthwhile for innovators to explore social norms of the South African market in order to develop products that capture common behaviour.

Conclusion

Financial technology innovation is of great interest to emerging markets as it comes with developmental benefits (Marszk et al., 2019). This makes a study on the adoption of financial innovation like cryptocurrency important. In this context, the adoption of financial innovation is important to the development of financial markets. Based on the TPB model participants' attitude, perceived behavioural control and subjective norm were used to predict intention to adopt cryptocurrency. The objective of the study is to develop a model for predicting behavioural intention to adopt cryptocurrency that could be used to develop responsive strategies. Confirmatory factor analysis showed that the measurement was sufficiently reliable and valid while the structural model almost perfectly fit the data. In summary, the three predictors of intention were found to predict the adoption of cryptocurrency with a 59 per cent explanatory power. The study has shown that consumer attitude is the key driver of behavioural intention to adopt cryptocurrency followed by perceived behavioural control. There was no evidence to suggest any impact of subjective on behavioural intention to adopt cryptocurrency.

The study contributes towards behavioural finance or economics by interrogating the determinants of the adoption of financial technology in the form of cryptocurrency in South Africa. The findings of the study inform policymakers and financial technology developers on which factors to consider on behavioural interventions and when developing financial technology. Karp and Fletcher (2014) noted that the widespread adoption of technology requires users to be acquainted about how the technology works. Perhaps policymakers and cryptocurrency providers might need to visibly engage in consumer finance and technology education that promote the widespread adoption of cryptocurrency. Maybe further studies that explore more determinants of intention to adopt cryptocurrency such as financial education, literacy and technology knowledge could be more insightful.

The results of this study provide insight on the variables on which intervention should focus. Policy and business strategies should focus on influencing attitude and perceived behavioural control to accelerate intention to adopt cryptocurrency. There is a need to capitalise on the positive attitude and perceived behavioural control through strategies that improve the perception of cryptocurrency and work on improving the confidence of consumers in the application of cryptocurrency. Cryptocurrencies have been perceived as too technical and complicated products, perhaps there is a need to demystify such perception through visibility and simplification of processes. Local financial institutions and regulators with consumer collateral will have to take a leading role to demonstrate benefits in the introduction of cryptocurrencies. Currently, the cryptocurrency industry is fragmented and dominated by international institutions with no relationships with local South African consumers. There is a need to agglomerate and coordinate the industry in a way that reduces risk and improves consumer confidence. The involvement of local stable financial institutions in digital currency investments may improve consumer perceived control and drive adoption. Additionally, financial innovators may need to facilitate adoption by taking a step-by-step introduction of their services starting with basic applications that prepare consumers to function effectively in transacting with cryptocurrency and then introduce advanced functions when consumers are comfortable. Any strategy that improves consumer attitude and increases perceived behavioural control will positively influence the intention to adopt.

Consumers in low-income markets are idiosyncratic different and do not always behave as financial innovators from developed markets anticipate. The key to that is to develop a
culture of evidence-led financial innovations that are based on understanding the nuanced behaviour of the local market through consumer facing studies like this study. The application of evidence-based strategies or policies becomes paramount in developing a culture of new technology acceptance in emerging markets. Because of that, Salimon et al. (2017) urged practitioners of financial technology innovation to know which aspects of cryptocurrency to improve and which aspects to escalate towards policy improvement that will enhance adoption when serving low-income markets. While subjective norm was observed to have no significant influence on intention in this study, the construct has been instrumental in the wildfire adoption of technologies in African markets based on referral or group conformity. There is a need to increase the visibility of the currency platforms through local personalities to endorse the benefits of cryptocurrencies in local media. Similarly, the design of the cryptocurrency services should be customised to the South African market context with services that allow consumers to participate in groups. This may drive social influence and escalate adoption. Alternatively, digital currencies could be bundled with successful products of social importance to the local market.

Financial technology as one of today’s hottest topics among financial and technology experts is driven by advancement in technology, consumer access to technology and pressure for inclusive sustainable markets. This kind of development creates important interest for regulators to protect consumer, drive social impact and promote adoption. It should be noted that recent financial technology developments have created positive social impacts which are of interest to regulators. Financial technology has extended markets by attracting new consumers and previously excluded people at a fraction of the cost than traditional financial institutions. Such development needs full support from regulators by providing a legal framework that promotes consumer adoption. Regulators may also provide evidence to show current and future benefits of widespread adoption.

There are some inherent limitations in this study. The sample used for the study was drawn from adult students at a campus of a single institute in Cape Town, South Africa. The participants may not be representative of the general population across South African, thereby limiting generalisation. The use of quantitative cross-sectional methodology may also miss important texts from respondents. Additional studies that try to be representative of the South African population and using mixed method approaches may solve some of these deficiencies.

References


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