



# A Conceptual Model for the Digital Inclusion of SMMEs in the Informal Sector in South Africa - The Use of Blockchain Technology to Access Loans

Lebogang Mosupye-Semenya<sup>(✉)</sup> 

DSI/NRF/Newton Fund Trilateral Chair in Transformative Innovation, The 4IR and Sustainable Development, College of Business and Economics, Johannesburg Business School, 69 Kingsway Ave, Auckland Park, Johannesburg, South Africa  
lsemunya@uj.ac.za

**Abstract.** Small, Medium, and Micro Enterprises (SMMEs) in the informal sector are faced with a myriad of challenges, including access to loans. Because of its immutability, blockchain technology is said to be the solution to these types of challenges. Through blockchain-enabled Mobile Applications, informal SMMEs can record their financials, and give permission to external viewers such as banks to view when applying for a loan. However, there exists a possibility that these informal SMMEs may be digitally excluded from the use and benefits of Blockchain technology due to issues such as affordability, informality, and lack of skills. For this reason, this study aims to develop a model for the digital inclusion of SMMEs in the informal sector in South Africa, using Blockchain technology to solve their challenge of access to loans. This was achieved through a combination of the Digital Inclusion Model and the Theory of Planned Behaviour. A literature review was conducted, from which propositions were derived to develop the model. Based on the literature, we found that lack of access to and affordability of smartphones and the internet, lack of digital skills, and poor internet connection may have a negative impact on digital inclusion. We conclude that pre-conditions such as digital infrastructure need to be in place for digital inclusion of SMMEs in the informal sector. Furthermore, SMMEs should be educated on Blockchain technology and its benefits. This has the potential to greatly impact their view of the technology, which will in turn improve adoption and therefore digital inclusion.

**Keywords:** Informal Sector · Blockchain · Small Medium and Micro Enterprises (SMMEs)

## 1 Introduction

There is a plethora of academic research and interest in the Fourth Industrial Revolution (4IR) and the technologies it brings to solve social and economic challenges in many countries. Despite the growing interest, it appears that these technologies are not directed

towards the marginalized such as SMMEs in the informal sector in developing countries, who suffer from a myriad of socio-economic challenges that 4IR technologies have the potential to solve. This is perhaps due to the opinion of various researchers that suggests that the 4IR is incompatible with small businesses due to their underdeveloped capabilities, limitations of cost and personnel, business model, (Gumbi and Twinomurinzi 2020), technical skills and cognitive infrastructure (Adane 2018).

Nevertheless, this study aims to develop a model for the digital inclusion of SMMEs in the informal sector in South Africa, using Blockchain technology to solve their challenge of access to loans. Digital inclusion is about ensuring that everyone has access to and can benefit from digital technologies (Sharp 2022). In the context of this study, this means that for digital inclusion to take place, SMMEs must have access to Blockchain technology and its benefits. The benefits are various and include the opportunity to access loans, which various scholars have highlighted as the major challenge for SMMEs in the informal sector (Etim and Daramola 2020; Kelikume 2021; Tawodzera 2019; Wahome 2020; Aguera et al. 2020). Although used for various applications such as Bitcoin, Blockchain technology has the potential to solve the financial issues related to the lack of credit access in African countries (Mavilia and Pisani 2022), due to its immutability. With that said, there exists a possibility that these SMMEs may be excluded from the use and benefits of this technology due to issues such as affordability, informality and lack of skills.

In the literature, there exists a body of literature on Blockchain in SMEs, with a focus on various sectors such as ICT, manufacturing and agriculture (Molati et al. 2021; Mavilia and Pisani 2022; Saba 2021; Serumaga-Zake and van der Poll 2021), and transparency in the supply chain (Engström Roxendal and Westlund 2019). Furthermore, ICT-related innovations are said to be taking place in the informal sector, as highlighted by Kaplinsky and Kraemer-Mbula (2022), however, 4IR technologies such as Blockchain are receiving less attention, specifically in the context of the informal sector in South Africa.

To close this gap in the literature, this paper looks at how informal SMMEs can be included in the use and benefits of Blockchain technology. This is achieved by exploring the supply side as well as the Demand side (the SMMEs) of the technology through the Digital Inclusion Model and the Theory of Planned Behaviour. The aim of the study is to develop a model for the digital inclusion of informal SMMEs in South Africa, by determining the external factors that encourage or discourage SMMEs in the informal sector from using Blockchain Technology Apps/Platform as well as by examining the perception of Blockchain technology by SMMEs in the informal sector.

## 2 Literature Review

The Literature Review first gives a brief overview of the Informal Sector in South Africa, then discusses the sector's challenges (including access to loans) and then offers Blockchain as a solution.

### 2.1 A Brief Overview of the Informal Sector in South Africa

The informal sector is described by various scholars as the shadow economy or grey economy (Etim and Daramola 2020), where firms do not comply with business or labour

regulations (Nguimkeu and Okou 2021). It consists of economic activities that are legal, but are not formalized, registered or even regulated and therefore not taxed by the Government (Etim and Daramola 2020; Nguimkeu and Okou 2021). These activities include retail trade (such as street vendors), construction, community & personal services (such as hairdressing), manufacturing, financial services and transport (Etim and Daramola 2020, Stats SA, 2022).

The importance of the informal sector cannot be over-emphasized. The sector contributes to employment and economic growth (Tawodzera 2019). It absorbs those retrenched from the formal sector (SEDA 2021) and provides an alternative form of employment to the unemployed (Mathibe et al. 2021). In most low-income countries, more than half of the population earns their living in the informal sector, even outside of Agriculture (Kaplinsky and Kraemer-Mbula 2022). In South Africa, statistics show that two-thirds of SMMEs (67%) operate in the informal sector, providing 13% of employment (SEDA 2021).

## 2.2 Challenges in the Informal Sector: Lack of Credit Access

There are countless challenges that small businesses face in the informal sector. These are operating challenges (such as lack of infrastructure to run the business, storage problems and lack of training), social challenges (such as crime/theft and confiscation of goods by police, lack of social protection) and economic challenges (such as lack of credit access and competition from large stores/supermarkets) (Etim and Daramola 2020; Tawodzera 2019).

As many as the challenges are, this study will focus on the lack of credit access. A number of scholars have listed the lack of credit access as a challenge for businesses in the informal sector (Etim and Daramola 2020; Kelikume 2021; Tawodzera 2019; Wahome 2020; Aguera et al. 2020). Tawodzera (2019) found that for food street vendors in Cape Town, only 2% were able to access capital from government schemes, denoting a challenge of access to finance from the government.

Similarly, access to loans is a challenge. Aguera et al. (2020) pointed out that the poor performance of smallholder farmers compared to large-holder farmers is primarily driven by their lack of credit access. Tawodzera (2019) explained that informal businesses find it difficult to access capital because banks rarely lend money to such businesses, mainly due to the disproportionately higher transaction costs of managing small amounts of money (Kelikume 2021), as well as risk considerations. Other scholars suggest that these SMMEs rarely meet the criteria set by financial institutions to access loans, such as collateral and information asymmetry (Mavilia and Pisani 2022; Vries 2019).

Information asymmetry in terms of credit stems from the fact that the borrower (SMME) usually knows more about their own creditworthiness than the lender (Bank) does (Ortlepp 2019). Therefore, the bank requires documents such as audited financial records to bridge the creditworthiness information gap. These financial records are expensive to produce and costly to maintain as alluded to by Kilekume (2021). However, without these, the bank is unable to assess the creditworthiness of the business, creating difficulties in accessing loans.

The lack of financial records in the informal sector was further explored by Jonck and Nwosu (2022). Jonck and Nwosu (2022) defined financial record keeping as documenting

all financial transactions in a logical and systematic manner over a period of time. They found that the majority of small businesses in the informal sector do not practice record keeping, even though it is an effective financial tool that can assist with access to credit from financial institutions. Jonck and Nwosu (2022) cited a lack of knowledge and skills, focus on operations neglecting the administrative part of the business, and the avoidance of costs associated with financial record keeping as reasons why small businesses do not practice record keeping.

Based on the above, it is clear that a lack of recordkeeping leads to challenges in credit access for these small businesses. Access to credit is important in that it facilitates the entry of new companies into the market thereby increasing economic activity and reducing poverty (Kelikume 2021; Mavilia and Pisani 2022), which is one of South Africa's triple scourge.

The Fourth Industrial Revolution brings a myriad of choice technologies capable of solving most of South Africa's socio-economic challenges. These include AI, 3D printing, Blockchain, the Internet of things, machine learning and others. The challenge of recordkeeping could be possibly solved by two 4IR technologies namely Explainable AI and Blockchain. Explainable Artificial Intelligence (XAI) is put forth by recordkeeping professionals and scholars such as Bunn (2020), because of its characteristics of transparency which Bunn (2020) emphasizes is important in the context of recordkeeping. She exposes, however, the issue of trustworthiness, which in recordkeeping means the "accuracy" or "authenticity" of the record (pg. 149) while in AI the term means "respect for human autonomy" and "prevention of harm" (pg. 149). Therefore, it would appear that using XAI as a solution for recordkeeping increases transparency but lacks in the area of the authenticity of the record. The authenticity of a record is important in the context of a loan application. Blockchain, on the other hand, is well known for its immutability. In other words, it solves the issue of the authenticity of a record in that once a transaction is added to a block, it cannot be changed. Therefore, for authentic financial records of SMMEs for the purpose of loan applications, Blockchain is put forth as a solution in this paper.

In the next section, Blockchain technology as a plausible solution to the challenge of record keeping and therefore to that of access to loans is further discussed in more detail. As a solution, Blockchain is in the R&D phase in South Africa, with the availability of Apps such as CreditRegister (Ortlepp 2019) and Block Records (Saba 2021) that run on Blockchain technology to solve credit records issues for the unbanked and for rural farmers. In Kenya, the Blockchain run Twigga Foods App is commercialized and is being utilised to keep track of transactions made by clients and uses these to determine their ability to access loans (Nalubega and Uwizeyimana 2019).

### 2.3 Blockchain Technology

Although used for various applications such as Bitcoin, Blockchain technology has the potential to solve a myriad of challenges which include:

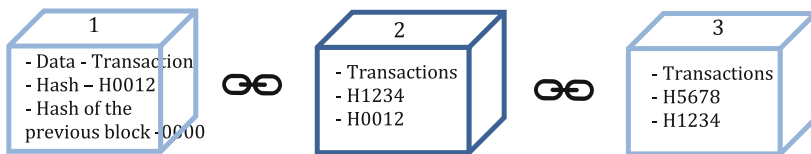
- a) financial issues related to lack of credit access in African countries: Mavilia and Pisani (2022) explain that because of Blockchain-based smart contracts, financial institutions such as Everex, are able to collect transaction data in real-time and thereby avail loans to borrowers in the agricultural sector in emerging economies.

b) elimination of intermediaries, such as auditors (Mavilia and Pisani 2022; Monrat et al. 2019). Auditing is meant to verify financial statements and render them true. Blockchain-based transactions or records do not need to be audited because of the immutability and decentralization associated with the technology.

Based on the above, Blockchain technology is explored as a solution to the credit access challenge of SMMEs in the informal sector in South Africa.

Blockchain is described as a distributed ledger that facilitates the process of recording transactions. It facilitates the reconciliation process of ledgers (Mavilia and Pisani 2022) and keeps a ledger of all transactions that occur in a particular Blockchain network for the purposes of traceability, thereby producing authentic transaction records (Saba 2021).

In its simplified form, Blockchain Technology is illustrated in Fig. 1.



**Fig. 1.** Blockchain technology (Illustrated by the author from multiple online sources, hash numbers are made up for illustrative purposes)

As the name suggests, Blockchain is a chain of blocks, where each block represents a batch of transaction data using a ledger (Monrat et al. 2019). Each Block contains Data, a Hash and the Hash of the previous block. The data in the block is the details of the transactions, as you would record them in a ledger (such as the sender, receiver and transaction amount). The hash is the identification of the block and all its contents, similar to a fingerprint. In other words, it is the unique fingerprint of the block and it is calculated by an algorithm. In Fig. 1, Block 2's hash is H1234. The block also contains the hash of the previous block in the chain. As shown in Fig. 1, Block 3 contains the hash of the previous block (Block 2), which is H1234.

The most significant characteristic of Blockchain is its immutability. If one block in the chain is tampered with (in an effort to change the details of the transaction for example), the hash of the block and that of the previous block (and every other block in the chain) would be recalculated and changed. However, measures have been put in place such as consensus between the peers in the network, and proof of work (which this paper will not address in detail) to make it impossible to change the transaction data in the blocks. In this way, the transaction data in Blockchain is immutable and therefore reliable, resulting in authentic transaction records. Monrat et al. (2019) further explain that the immutability of Blockchain eliminates the need for intermediaries (such as auditors) to validate and verify the data.

The elimination of intermediaries such as auditors should make the production and maintenance of financial records significantly cheaper. In the informal sector, this means that SMMEs could use Blockchain to create financial records, which do not necessarily need to be audited, thereby reducing the costs significantly. As previously mentioned, there are a few Apps in the conceptual stage that have been created in South Africa.

One example is CreditRegister designed by Ortlep (2019) specifically for the financially excluded such as the unbanked and those living in informal settlements, basically those who do not necessarily have payment history records. The App runs on Blockchain technology, and it allows the loading of transactions by small businesses thereby creating a transaction history, which they give permission to external viewers such as banks to view their profile when they apply for a loan (Ortlepp 2019). Another Blockchain run application called Block Records was developed by Saba (2021). This Blockchain Mobile App enables the unbanked rural farmers in Qunu, Eastern Cape in South Africa, to have databases of their transaction records and make them publicly accessible to funders for financial assistance in their farming activities. In other words, there is a possibility that small businesses, even in the informal sector, can create a financial or credit history report, which should be sufficient as a financial record to access a loan because of its authenticity.

Although these Applications are in the Research & Development phase, there are more companies that have commercialized apps that run on Blockchain for credit access purposes. These include MyBank in South Africa, which uses Blockchain and AI to determine the creditworthiness of customers, while Twigga Foods in Kenya utilises Blockchain to keep track of transactions made my clients and uses these to determine their ability to access loans (Nalubega and Uwizeyimana 2019).

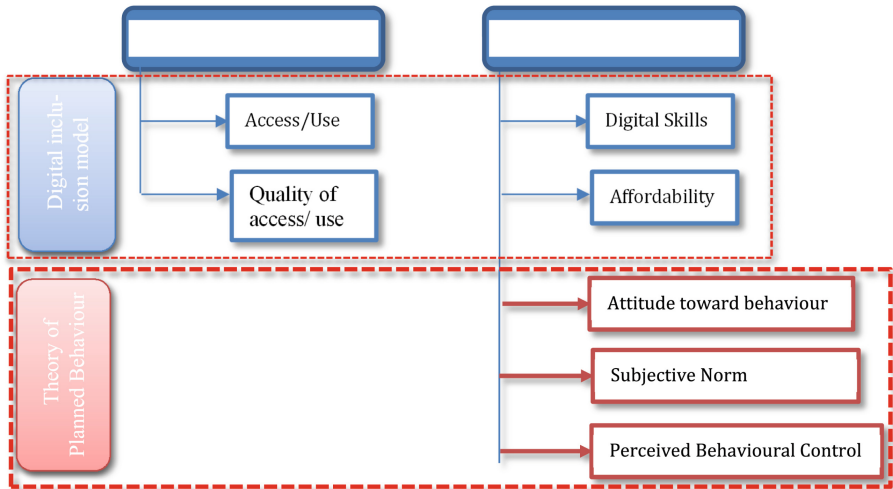
Therefore, it appears that the use of Blockchain to solve the financial record keeping issues in SMMEs in the informal sector is a plausible solution.

### 3 Theoretical Framework

In this section, the theoretical framework for this study is developed from two theories, which are then discussed in detail in the next sub-sections. The Digital Inclusion Model and the Theory of Planned Behaviour will be used. The proposed Conceptual Theoretical Framework is shown in Fig. 2:

The Digital Inclusion Model is illustrated in Fig. 2 (in blue). Although related to the internet and ICT technology, the Digital Inclusion Model was developed by Sharp (2022) after surveying digital inclusion literature. He found that the existing literature strongly focused on access to the technology exclusively, ignoring other factors that cause exclusion such as digital skills and affordability, especially in developing Sub-Saharan countries (Sharp 2022). He then developed the Digital inclusion model, in an attempt to create a multifaceted framework. The importance and relevance of this theory is that it separates the supply challenges from the demand side challenges of digital inclusion. It is suggested in the Gillwald et al. (2018) report that interventions that are only focused on the supply side, which fail to address the demand side challenges, will only perpetuate the existing digital inequalities. On that basis, it is of utmost importance in this study to holistically explore digital inclusion from both the supply and demand side, which is why this model is relevant.

In the Digital inclusion model, two key dimensions are put forth to consider on the demand side namely digital skills and affordability. In other words, this model states that a person is digitally excluded because they can't use technology and/or they can't afford it. Therein lies the limitation of this model. It is the author's opinion that there are more



**Fig. 2.** Conceptual Theoretical Framework (Adapted from Sharp (2022) and Ajzen (1991))

dimensions to explore on the demand side, especially in the context of South Africa. Sharp (2022) admits that “of course, there are many other possible dimensions of digital inclusion” (pg. 6) in developing countries such as “lack of electricity, online safety/trust and content relevance”(pg. 6). In “The State of ICT in South Africa” conducted by Research ICT Africa (Gillwald et al. 2018), it is pointed out that South Africans are digitally excluded because of various issues such as locational inequalities, income levels and education levels. What is interesting about the report is that in studying the demand side, Gillwald et al. (2018) first identify those aspects that generally affect the population, and then move to those that affect the individual. The author borrows this perspective in this paper. In other words, she looks at the demand side from two lenses: 1. The general population aspects of exclusion (skills and affordability) and 2. Aspects on an individual level. For this reason, it is envisaged that a behavioural model such as the Theory of Planned Behaviour (TBP) is suitable to complement the above Digital Inclusion model. TBP has a specific focus on the individual, on their participation in and perception of behaviour, which Sharp’s (2022) model lacks. It is therefore proposed that Sharp’s (2022) model be complemented by the Theory of Planned Behaviour.

There are various other behavioural theories, especially in technology (which is the focus of this study) that can explain the demand side. These are generally referred to as Technology Accepted models. Li (2010) conducted a critical review of Technology Acceptances literature. She found that there is a wide variety and number of these models such as the Technology Acceptance Model (TAM) (Davis 1989), TAM2 (Venkatesh and Davis 2000), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003) and the Motivational Model (Davis and Warshaw 1992). However, a critical review showed that these models have consistently failed to predict as they purported to in many empirical studies, delivering inconsistent results (Li 2010). For example, concerning the construct Social/ Subjective Norm, she found that some studies such as Karahanna et al. (1999) reported empirical evidence to prove the construct to be

significant, while other studies such as Chau and Hu (2002) reported evidence to prove the construct to be non-significant.

Ajzen (2020) reported similar in his evaluation of the widely used Technology Acceptance Model. The model borrows constructs from the Theory of Planned Behavior. Ajzen (2020) adds that TAM fails to include certain important constructs of the Theory of Planned Behaviour namely Attitude and Perceived Behavioural Control, thereby failing to take into account factors that holistically predict behaviour. He explains that this has resulted in subsequent extended versions of the model (Ajzen 2020) such as TAM2 by Venkatesh and Davis (2000). In her critical review, Li (2020) found the extended models of TAM to be inadequate in predicting behavior as well.

It is for these reasons that the original theory these models are based on, namely The Theory of Planned Behaviour, will be used for this study to understand (comprehensively and holistically) the response to and behaviour of informal SMMEs in South Africa towards Blockchain technology. It is important to understand the SMMEs' perception of the technology, as a positive perception can ensure their inclusion in the use of the technology and a negative one can point policymakers in the direction of demand stimulation.

The proposed conceptual framework in Fig. 2 will be used to understand the supply side and demand side of digital inclusion as discussed next.

### 3.1 Supply Side of Digital Inclusion

#### 3.1.1 Access/use

Sharp (2022) explained that this construct determines whether a person has access to or uses a technology. Lack of access to Blockchain technology can exclude informal SMME from its use and benefits. However, it must be stated here that for a business to access a Blockchain Application such as CreditRegister or Block Report, they must first have access to the internet, through a smart device such as a smartphone.

Gillwald et al. (2018) showed that 53% of South Africans have access to the internet. This suggests that access to the internet is only accessible to half the country. However, even with these challenges, some scholars found that lack of access to the internet is not necessarily a hindrance to using technology. Mabulele (2020) indicated that although there are barriers to gaining access to technology, such as infrastructure and internet connection, there is generally a positive attitude from SMME owners about access to technology. In other words, although access and connection to the internet may be a challenge, SMME owners have indicated that they have access to the technology tools they need to run their businesses. On the contrary, other scholars found a positive relationship between the internet and technology. In their study of e-commerce adoption by SMEs, Twi-Brempong et al. (2019) explained that the positive relationship is because, by definition, commercial activities are carried out online. The internet is necessary to download Blockchain Applications such as MyBank and to load receipts onto CreditRegister. The use of Blockchain-enabled Apps will in turn improve record keeping and therefore increased chances of accessing a loan. Thus, we state the following proposition:

*P1a: Access to the internet increases the digital inclusion of SMMEs in the informal sector, resulting in increased chances of access to a loan.*

Sharp (2022) further cited that access to a device is the reason why many in Africa do not use the technology. It appears from the literature that cellphones are important to SMMEs in running their businesses. Thabela et al. (2019) showed that most SMME owners in rural areas use cellphones as their primary ICT to access information. For a tailor, using WhatsApp enables them to get measurements from their client (Thabela et al. 2019). For a farmer, checking the prices of products similar to theirs helps them with a pricing strategy for their own products (Bhattacharya 2019). However, advanced digital technologies such as Blockchain App require a smartphone. Aguera et al. (2020) pointed out that although 85% of South Africans own cellphones, only 47% own smartphones. Therefore, it is possible that in the South African context, SMME owners do not necessarily have access to smartphones for various reasons including cost. Thus, we state the following proposition:

*P1b: Access to a smartphone increases the digital inclusion of SMMEs in the informal sector, resulting in increased chances of access to a loan.*

### 3.1.2 Quality of Access/Use

In his model, Sharp (2022) explains that the technical quality of the connection to the technology will determine potential use. He found that in developing countries, 2G mobile network is still in use even though it only offers limited speeds of less than 256 kbps (0.2 Mbps). It must be noted that although this is the case in other developing countries, it is not so in South Africa. In South Africa, the average speed is 4.36 Mbps, even though the country ranks 80<sup>th</sup> out of 189 in terms of download speeds in the world with an average download speed of 10 Mbps (Gillwald et al. 2018).

In using high digital technologies such as Blockchain, good quality access to the internet is important and may encourage the use thereof. The literature reports that poor internet connectivity acts as a barrier to technology adoption by SMMEs (Fortuin 2021). Twi-Brempong et al. (2019) also found that there was discouragement among Ghanaian SMEs to adopting e-commerce because of the poor quality and slow speed of available internet. Therefore, it appears that the poor quality of available internet discourages the use of technology amongst SMEs. In that regard, we state the following proposition:

*P2: Poor internet connection decreases the digital inclusion of SMMEs in the informal sector, resulting in decreased chances of access to a loan.*

## 3.2 Demand Side of Digital Inclusion

To ensure the participation of SMMEs in the use of Blockchain Technology, it is imperative that they have a positive perception of the technology. According to Ajzen (2020), understanding the responses of people toward emerging technologies will lead to the implementation of effective interventions to facilitate behavioural change. In other words, understanding the perception and response of SMMEs to Blockchain technology will lead to relevant and effective interventions to facilitate the use of Blockchain in the informal sector.

This section will address this through different constructs from the Digital Inclusion Model (skill and affordability) and the Theory of Planned Behaviour (Attitude, Social Norm and Perceived Behavioural Control).

### 3.2.1 Digital Skill

Skill is defined as the competency to use a technology (Farjona et al., 2019). One of the obstacles to using technology is skills (Bhattacharya 2019). Vrontis et al. (2022) also reported skills deficiency as a barrier to technology adoption. According to Thabela et al. (2019), digital skills lack among SMME owners in the Western Cape. Thabela et al. (2019) discovered that SME owners do not acquire the digital skills needed for their business because making money takes precedence. On the contrary, Fortuin (2021) found that SMMEs in the informal sector in Cape Town have the digital skills necessary to operate mobile cloud financial accounting tools, with only 14% reporting their lack of digital skills as an impediment to using the technology. Nevertheless, she recommends more digital skills training for these SMMEs. For an SMME owner to use a Blockchain Technology App or Platform, it is necessary that they have the necessary skills for such. A closer look at the user flow diagram of the CreditRegister App reveals that a business owner would need to be able to upload documents such as receipts and invoices onto the App, and that they would need to have the skills necessary to allow “viewing” of their profile and credit history by a bank for example (Ortlepp 2019). Although the App is simplified and user-friendly, it appears that some digital skills are necessary. Therefore, we state the following proposition:

*P3: Lack of digital skills decreases the digital inclusion of SMMEs in the informal sector, resulting in decreased chances of access to a loan.*

### 3.2.2 Affordability

Affordability could act as a factor of exclusion to the use of technology. One of the obstacles cited by Bhattacharya (2019) to the use of technology in SMMEs in the informal economy is the lack of capital. Thabela et al. (2019) found that SMMEs in rural areas were not keen on using technology because of its cost. The SMME owners explained that Yoco for example (a point-of-sale card machine) was still too expensive for them, as it costs R3000 with activation fees of R600 (Thabela et al. 2019). Therefore, this discourages and excludes SMMEs from using the technology.

Nevertheless, Ortlepp (2019) described the cost of the Blockchain App CreditRegister as affordable, including the cost of adding documents and the costs of loading the information onto a Block in Blockchain. He warned that although it is cheap to do so, these expenses are incurred every time a transaction is loaded which could make the process expensive, although not prohibitively costly (Ortlepp 2019). However, since the platform is a prototype, cheaper Blockchain with less flexibility could be used to make the use of the platform cheaper. It is envisaged that if using the App is affordable to SMMEs, then they are more likely to use it.

In the literature, affordability is not only perceived from the point of view of the technology itself. The cost of devices to access technology is also shown to be a barrier to digital inclusion. Gillwald et al. (2018) revealed that 36% of South Africans cited the cost of smart devices as the primary reason they are not online. Statistics further show that 15% of South Africans reported the internet to be too expensive while 47% said data limited their use of technology (Gillwald et al. 2018). This clearly indicates that the lack

of affordability of devices, internet and data are causing digital exclusion. Therefore, we state the following proposition:

*P4: Lack of affordability of technology (smartphone and internet) decreases the digital inclusion of SMMEs in the informal sector, resulting in decreased chances of access to a loan.*

### 3.2.3 Attitude Towards the Use of Blockchain Technology

According to the Theory of Planned Behaviour, attitude refers to the degree to which a person has a favourable or unfavourable evaluation of a behaviour (Ajzen 1991). The more favourable the attitude, the stronger the intention to perform a behaviour (Ajzen 1991). In this study, this means that the more favourable the attitude toward the use of Blockchain technology, the stronger the intention to use it.

Vrontis et al. (2022) explain attitude with regard to entrepreneurship as an important factor that influences desirability which in turn influence intention. They found that the entrepreneurs' start-up attitude significantly and positively affects their intentions. In other studies, Farjona et al. (2019) found that teachers who had a positive attitude toward teaching technology were more likely to implement it in the classroom. For Blockchain technology, it is envisaged that a favourable attitude to the technology will increase the chances of its use. Therefore, according to the Theory of Planned Behaviour, we state the following proposition:

*P5a: A favourable attitude toward Blockchain technology increases the digital inclusion of SMMEs in the informal sector, resulting in increased chances of access to a loan.*

Furthermore, Ajzen (2020) adds that the attitude toward a behaviour is a function of a belief towards the behaviour's consequences. In other words, it is a belief that performing the behaviour will lead to a certain outcome or experience. In the literature, Bhattacharya (2019) points out that the issue with using technology is not only in its adoption but also in the purpose of adoption. In other words, what will the adoption of the technology help with, in the business? Based on the above, the SMME owner must perceive the usefulness or purpose of the technology in his business. Fortuin (2021) reported that 28% of the informal SMMEs in her sample indicated that they do not use financial accounting mobile cloud technologies because they do not find it relevant to their business. Some based the irrelevance on the point that the book (black journal) system satisfies their needs and others, to the point that their businesses were illegal, and they do not want to record their activities (Fortuin 2021). Nevertheless, for SMMEs who would like to access loans by proving accurate and reliable credit history and transactions, Blockchain seems viable. In this study, if the SMME believes that using Blockchain Technology will lead to access to loans, then they are more likely to use it. Therefore, according to the Theory of Planned Behaviour, we state the following proposition:

*P5b: A positive perception of the purpose of Blockchain technology increases the digital inclusion of SMMEs in the informal sector, resulting in increased chances of access to a loan.*

### 3.2.4 Subjective (Social) Norm

According to the Theory of Planned Behavior, Subjective Norm refers to the perceived social pressure to perform or not to perform the behavior in question (Ajzen 1991). It is the belief that a given referent group of people approve or disapprove of performing the behavior as well as the belief that the group itself performs or does not perform the behavior (Ajzen 2020). Put differently, it assesses an individual's behaviour in response to opinions or support from peers (Vrontis et al. 2022). The theory states that the more favourable the subjective norm with respect to the behaviour, the stronger should be an individual's intention to perform the behaviour under consideration (Ajzen 1991). In this study, this means that SMME owner's use of Blockchain technology Apps or Platform depends on the social pressure from their peers. The owner is more likely to use the technology if he perceives that other SMMEs at large approve of the technology and even use it themselves. Consistent with the Theory of Planned behaviour, Vrontis et al. (2022) found that subjective norms positively and significantly impacted on the entrepreneur's start-up intentions. The findings of other scholars are also in line with the Theory of Planned behaviour and suggest that subjective norms have a positive impact on technology adoption (Saeedi et al. 2020; Fauzi et al. 2021). Therefore, we state the following proposition:

*P6: A positive social norm increases the digital inclusion of SMMEs in the informal sector, resulting in increased chances of access to a loan.*

### 3.2.5 Perceived Behavioural Control

In the Theory of Planned Behaviour, perceived behavioural control refers to the perceived ease or difficulty of performing a behaviour (Ajzen 1991). This construct is based on the belief that facilitating or impeding factors are present such as skill, knowledge, money, time and so on (Ajzen 2020). The theory states that the greater the perceived behavioural control, the stronger the individual's intention to perform the behaviour under consideration (Ajzen 1991). In this study, this means that for an SMME to use Blockchain technology, the owner must perceive that it will be easy to do to so and that facilitating factors such as skill, money and time are available. Digital skills and Affordability are covered in this paper in Sects. 3.2.1 and 3.2.2 respectively. Therefore, in this subsection, only available time will be considered.

According to Muteti et al. (2018) and Jonck and Nwosu (2022), one of the main justifications for not keeping financial records is time management. Muteti et al. (2018) explained that SMEs in the informal sector lack time to do financial record keeping as the business goal of selling products takes precedence. However, there are SMMEs that keep a record using traditional methods such as writing in a book, but these also take time. Fortuin's (2021) findings reveal that 43% of her sample of SMMEs in the informal sector in Cape Town recorded their transactions in a book, while 33% said they kept a mental note. These methods are not accurate or reliable for the purpose of accessing a loan from a bank. She recommended the use of mobile cloud accounting tools, because 50% of her respondents who use it, pointed out that "it saves time that would have been incurred if traditional methods of recording financial transactions were used" (Fortuin 2021).

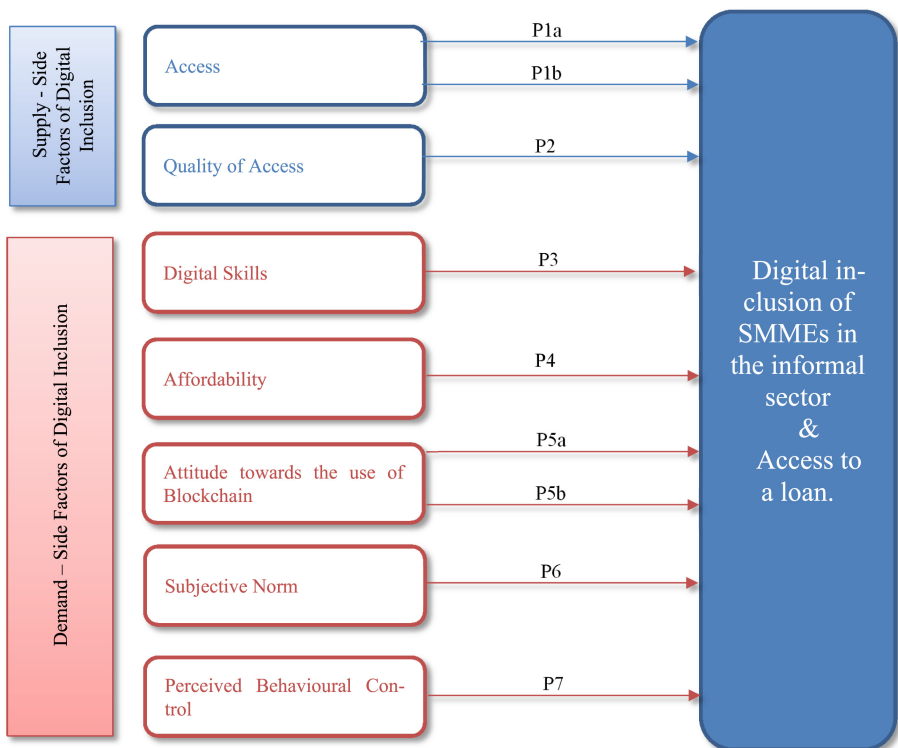
In that regard, Ortlepp (2019) stated that on his Blockchain-enabled prototype, CreditRegister, transactions take a few seconds to be added onto a block in Blockchain. However, the point is not to process the transaction but to keep a record of it after it has happened, as the business will collect the payment in cash most of the time, then upload the necessary documents (invoice or receipt) onto the Credit Register Platform. This is believed to be a fair amount of time necessary to record transactions and would be more accurate and reliable than recording in a book or keeping a mental note.

Therefore, it is envisaged that if the SMME owner perceives that using Blockchain technology will not take time from his business goals of selling products, then he is more likely to use the technology. On that basis, we state the following proposition:

*P7: A positive perceived behavioural control increases the digital inclusion of SMMEs in the informal sector, resulting in increased chances of access to a loan.*

## 4 Conceptual Model

With the input from the preceding sections, the conceptual model in Fig. 3 is proposed.



**Fig. 3.** Conceptual Model of The Digital Inclusion of SMMEs in the informal sector in South Africa

## 5 Conclusion, Limitations and Contribution of Study

It is evident from the framework that there are factors that may have a possible negative impact on the digital inclusion of informal SMMEs. These factors are access and affordability of smartphones and the internet, digital skills and poor internet connection. These are largely on the supply side of Blockchain technology. It is therefore the conclusion of this study that there are preconditions that exist in South Africa, that need to be in place for digital inclusion to take place, for example, the digital infrastructure that can improve internet access and speed, specifically 5G connectivity infrastructure. This appears to be well underway in South Africa, as the Independent Communications Authority of South Africa (ICASA) completed the radio frequency auction in March 2022, which will assist many South African individuals and businesses to access the internet, faster. We believe this will improve the digital inclusion of informal SMMEs.

Digital skills and attitudes toward technology are largely demand-side based. In this regard, it is the conclusion of this study that SMMEs should be educated on Blockchain technology and its benefits. This has the potential to greatly impact their view of the technology, which will in turn improve adoption and therefore digital inclusion.

As with all research, there are limitations to this study. The propositions were based entirely on the literature. Nevertheless, our study contributes to the narrative of 4IR technologies, in the context of the marginalized informal sector SMMEs. Although based on the literature, it paves the way for future empirical testing.

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