Individual cultural identity and technology adoption

by

Kgathane Paulina Mamogobo

10580183

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Supervisor: Prof. Louise Whittaker

Co-Supervisor: Prof. Helena Barnard

Plagiarism Declaration Page

I, Kgathane Paulina Mamogobo declare that the thesis/dissertation, which I hereby submit for the degree Doctor of Business Administration at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

Ethics Statement

The author, whose name appears on the title page of this thesis, has obtained research ethics approval for the research described in this work. The author certifies that she followed the ethical standards outlined in the University of Pretoria's Code of Ethics for Researchers and the Policy Guidelines for Responsible Research.

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Abstract

By recognizing that technology adoption is a social process, the sociotechnical literature has advanced from traditional models of technology. This perspective, however, disregards the individual and we, therefore, do not yet know how individual characteristics such as an individual's cultural identity affects how they use technology. I use the cultural contracts theory to bring in an individual-level perspective, and anchor technology adoption as a deeply individualized process.

Out of the thirty-eight South African urban farmers I identified for the research, I chose ten urban farmers, aiming for variation among them, to look at the ways in which they interact with and use technology. Primarily because urban farming has the potential to boost agricultural economic activity while also improving food security. Through ten phenomenographic interviews I identified four cultural identity archetypes of Strategist, Adaptavist, Innovationist, and Traditionalist that point to a continuum; and the dimensions of cultural identity that make up the archetypes. The archetypical continuum can be used by practitioners to plan interventions that span the technology adoption phases.

This work improves the cultural contracts theory by adding a non-signing cultural contract, and demonstrates that technology adoption is (re) negotiated on an on-going basis along a continuum.

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Chapter 1: Introduction

Africa provides a rich context to develop management scholarship from an emerging market perspective characterized by growth opportunities that are driven by rapidly increasing consumer markets, small yet incremental technological innovations that enable organizations to remain competitive, and the continuous opening up of new markets (George et al., 2016; Ibeh et al., 2022). The continent's cultural uniqueness offers a distinct context for businesses to consider, in understanding the practices and outcomes of organizations across Africa (Barnard et al., 2017; Ibeh et al., 2022). Adenle et al., (2019) highlight that several studies conducted on technology adoption in the agricultural sector have incorporated Africa's context. African nations are distinguished by their uniqueness and diversity and often confront difficult socioeconomic conditions. Although recent research has taken advantage of the opportunities that exist in the diversity of the African continent (Chigudu, 2018; Oyetunde-Usman, 2022), context alone cannot fully explain the phenomenon of technology adoption; there are consequential cultural nuances that further influence technology adoption (Forney & Dwiartama, 2022). Understanding the relationship between individual cultural identity and the decision to adopt technology appears to be a limitation of technology adoption literature, and few scholars are exploring the qualitative experiences of technology adoption at an individual level (Shin, 2019; Upham, Bögel, & Dütschke, 2020).

According to intercultural researchers, there is a complex relationship between a person's cultural identity and various social contexts, or more specifically, how people negotiate their cultural identity in various situations in order to act (Sartori & Theodorou, 2022). For this study, urban farming serves as a setting in which individual urban farmers negotiate their cultural identities in order to engage in urban farming as an economic activity; these farmers have to decide whether to adopt technology or stick with the traditional methods of farming. Currently, there is limited understanding of how individuals construct their individual cultural identity, and how this influences the decision to adopt or reject technology to farm in the urban space. Traditional technology adoption literature has been criticized for taking a deterministic and linear approach, which fails to consider social contexts and the distinct cultural characteristics of each culture (Gruber, 2020; Kristensson et al., 2020; Vargo et al., 2020).

Sociotechnical perspectives have been suggested for application in technology adoption to advance traditional technology adoption-diffusion perspectives (Gruber, 2020; Kristensson et al., 2020). The current study uses the cultural contracts theory to

understand the qualitatively different ways in which urban farmers experience technology adoption in South Africa.

In order to acknowledge social contexts and the uniqueness of individual cultures in technology adoption literature, I found using a methodology that concentrates on the lived experiences of urban farmers valuable. Phenomenography sheds light on the experience of technology adoption by individuals from an individual cultural identity perspective (Ashworth & Lucas, 1998, 2000). Although variations of descriptions, from individual experiences of technology, are expected, phenomenography affords a collective way of observing that experience (Åkerlind, 2012).

The product of a phenomenographic analysis represents the full range of possible ways in which the phenomenon of technology adoption can be experienced, in the urban farming context from a collective sample group of urban farmers (Åkerlind, 2012). South Africa's cultural diversity (Terblanché-Greeff, 2022) will also enable the capturing of variation to respond to the study's research question.

This enables practitioners to understand the multidimensional nature of technology adoption, and therefore consider tailored interventions which also consider the far-reaching nuances of identity, and to have a multidimensional view of urban farmers as development practitioners and not just beneficiaries. Practitioners can also consider the co-creation, adaptation, and modification of technologies to suit local contexts in an effort to promote the success of urban farming as an economic activity. Although the data gathered through a phenomenographic approach is contextual; the results can be decontextualized to be useful in contexts outside the one of the current study (Marton, 1986).

1.1   Research Problem

There is an increasing number of people that are migrating to cities thus joining the urban population, particularly in developing economies which places a demand for increased food supply and also puts pressure on innovative and efficient production measures to ensure food security, for the alleviation of poverty and hunger in and around urban cities (Barthel & Isendahl, 2013; Chihambakwe et al., 2018; Salomon & Cavagnaro, 2022). Urban farming is a subset of urban agriculture and focuses on the production of food within the city or town and peripheral areas with the potential to respond to this incremental challenge (O'Sullivan et al., 2019; Yuan et al., 2022). Urban agriculture initiatives further serve multiple purposes such as creating linkages between the city and nature, urban and rural ways of life to create new urban development models such as

re-establish natural and productive spaces in the city, to reinventing food production systems (López-Goyburu & García-Montero, 2018). For individual households, urban agriculture practices play a role in poverty reduction, food security, and the improvement of urban residents' livelihoods (Jonah & May, 2019; Tuholske et al., 2020).

The success of urban agricultural efforts is entrenched within the integration of technological advancements in urban agriculture (Adenle et al., 2019; Sinyolo, 2020). Individuals that form part of urban agriculture initiatives need technology to boost the success of urban farming (Lyle et al., 2013). In developing countries, urban agriculture initiatives still lag despite technology diffusion initiatives that have been rolled out throughout the years, and for most developing economies agriculture remains a fundamental primary economic activity (Lowenberg-Deboer & Erickson, 2019; Taguchi & Santini, 2019). I am therefore interested in understanding *why* this is the case.

Cultural identity literature makes one aware that soil and its qualities are necessary parts of a farmer's everyday life (Wahlhütter et al., 2016; Burton et al., 2020). Beyond its productive capabilities, the soil is an intrinsic and representational part of rural communities connected to a value system. When farmers practice agriculture, they are influenced to an extent by their internal beliefs, values, knowledge, and past experience; that is to say their individual cultural identity. The farmers' beliefs about their identity and how agriculture should be performed then translate into the types of practices that are used on-farm (De la Poterie et al., 2018; McGuire et al., 2012; McGuire et al., 2015).

Traditional technology adoption literature, theories, and models are predictive in trying to explain a variety of human behaviours in differing contexts. They assume that if a technology has capabilities, it will be adopted automatically when it is diffused. Most of these theories and models hold a unidirectional perspective toward technology adoption (Nysveen, Pedersen, & Skard, 2020; Taherdoost, 2018; Williams, Rana, & Dwivedi, 2015). This body of literature has been recognized and criticized for its limitation in being deterministic and linear, arguing that it obscures the importance of social and cultural factors that influence the decision to adopt or reject technology. The argument is that this perspective fails to acknowledge social contexts and the uniqueness of individual cultures (Kristensson et al., 2020), particularly in developing countries thus limiting understanding of why some technological implementations fail while others succeed in seemingly similar settings.

The study is interested in understanding the qualitatively different ways in which individuals experience technology adoption from an individual cultural identity perspective, in urban farming in South Africa. The research seeks to study technology

adoption in urban farming through the lens of cultural identity, and in particular, employing the Cultural contracts theory to answer the research questions:

RQ: How do individual cultural identities inform the differences in technology adoption among urban farmers in South Africa?

SRQ$_1$: What informs the individual cultural identities of urban farmers?

SRQ$_2$: How are the individual cultural identities negotiated for the adoption or rejection of technology?

1.2   Technology Adoption

Technology adoption is a dynamic and unpredictable process (Mamonov & Benbunan-Fich, 2020; Vargo et al., 2020). Because of this traditional technology adoption literature is criticized for providing an incomplete understanding of the phenomenon owing to its unidirectional perspective (Dwivedi et al., 2017; Lai et al., 2016; Taherdoost, 2018; Williams et al., 2015). Williams et al., (2015) posit that technology influences human behaviour, and that if a technology has useful characteristics, it will be automatically adopted when it is distributed. Based on this traditional technology adoption theories consider technology as static and factors influencing its adoption as static (Eze et al., 2019). The sociotechnical body of literature argues that technology adoption is influenced by social contexts, interactions between people and technology, and collective/social intervention/agency (Becker et al., 2017; Sartori & Theodorou, 2022). From this theoretical perspective, technology adoption is mostly considered a collective intervention and as a result, the assumption is that the shared meanings about a particular technology and the use thereof give rise to its adoption and further development (Forney & Dwiartama, 2022).

Despite the progress made in both theoretical fields, there is still a gap in understanding technology adoption at an individual level from a cultural identity perspective (Upham, Bögel, & Dütschke, 2020). Prokopy et al. (2019) found that individual experiences may well influence how technology is perceived, and consequently whether it will be adopted or rejected for the adoption of agricultural technologies. Shin (2019) also confirmed that individual-level technology adoption is what influences adoption at an organizational level. Given the evidence from the work done by Prokopy et al. (2019) and Shin (2019), in order to have a complete understanding of technology adoption, it becomes imperative to understand what informs individual cultural identities and how individual cultural identities influence the adoption or rejection of technology to advance technology

adoption-diffusion perspectives with sociotechnical theoretical perspectives (Kristensson et al., 2020).

Technology adoption is dynamic and relatively unpredictable instead of a once-off action (Eze et al., 2019; Vargo et al., 2020). Studies have shown that technology adoption is highly dependent on context, and point toward dynamic, inclusive, and integrative approaches to studying technology adoption (Gruber, 2020; Kristensson et al., 2020; Vargo et al., 2020).

Similarly, literature on personal identity (Erikson, 1950; 1968) confirms that identity is a dynamic concept that is formed over time through a variety of personal and social identity processes and is constantly evolving (Crocetti et al., 2018). The cultural identity theoretical perspective asserts that the intrinsic part of the self is able to negotiate and re-negotiate itself within different contexts, and determine actions (Altugan, 2015; Chen et al., 2016).

However, the field of technology adoption lacks sufficient understanding of how individual cultural identity influences technology adoption processes (S. Becker et al., 2021; Upham, Bögel, & Dütschke, 2020), with scholars calling for the advancement of traditional technology adoption literature (Kristensson et al., 2020; Vargo et al., 2020; Gruber, 2020); and correspondingly intercultural scholars calling to challenge the established focus of identity theories in the communications discipline by exploring the concept of cultural identities in business and management to provide an interpretation of identity interactions in complex systems (Dickens et al., 2019; Peltokorpi & Zhang, 2020).

1.3   Urban Farming

Despite the increased research on agriculture and technology adoption over the years, urban agriculture is a new phenomenon, providing many avenues for further exploration (Taguchi & Santini, 2019). Technology-driven agriculture research often focuses again on the unidirectional perspective of technology adoption (Yigezu et al., 2018). This happens at the expense of understanding the multidimensional perspectives of technology adoption, with little attempt to theorize social-cultural perspectives to understand how individual experiences influence technology adoption (Prokopy et al., 2019), which Shin (2019) argues is what in turn influences the collective level of technology adoption. There is a growing interest to understand the feasibility of urban agriculture initiatives in Africa in an effort to respond to the Sustainable Development Goals relating to food security, poverty alleviation, hunger, and environmental sustainability (Hardman et al., 2022; Simon, 2022; Rao et al., 2022).

Urban farming focuses on the technological production, processing, and marketing of food in the city or its peripheries (O'Sullivan et al., 2019; Blasch et al., 2020; Yuan et al., 2022). In developing economies, urban farming is seen as a developmental instrument and is proposed as a potential solution to urbanization (Gulyas & Edmondson, 2021; Magwaza et al., 2020). The increase in the urban population further places a demand for increased food supply, and consequently pressure for innovative and efficient food production measures to alleviate poverty and hunger in and around urban cities (Barthel & Isendahl, 2013; Chihambakwe et al., 2018).

Beyond the benefits of poverty reduction and food security, urban agriculture initiatives serve multiple purposes such as creating linkages between the city and nature, and urban and rural ways of life to create new urban development models. These linkages serve to re-establish natural and industrious spaces in the city and to reinvent food production systems (López-Goyburu & García-Montero, 2018).

Farming, in its essence, is a sentimental practice, and according to Wahlhütter, Vogl, & Eberhart (2016) soil and its productive qualities are crucial aspects of a farmer's daily life in arable farming. It is essentially part of the symbolic representation of rural communities and is connected to a value system, and therefore traditional methods of farming have to be understood within a particular cultural context. McGuire et al. (2015) mention that when farmers engage in agricultural practices, they are motivated by their internal beliefs, values, knowledge, past experience, and cultural identity (Burton et al., 2020). The farmers' beliefs about who they are, their connection with nature, and how agriculture should be performed then translate into the types of approaches they take on to farm (Lavoie & Wardropper, 2021; Burton et al., 2020). De la Poterie et al., (2018) found that even when it is in the farmers' best interests, individual farmers' cultural identities rarely stray from that of their communities when it comes to agriculture decisions.

An interesting unexplored aspect is how the adoption of technology is experienced from a cultural identity perspective, at an individual level in the urban farming context. Again, there has been little research exploring technology adoption employing qualitative methods (Kaushik & Verma, 2019). The key feature of urban farming is technology adoption (Azunre et al., 2019; Blasch et al., 2020; Glowa, 2019), but there are a limited number of scholars exploring technology adoption in urban farming. Kristensson et al., (2020) reasoned that the traditional technology adoption models were developed at a time when technologies were assumed to be new, markets and individuals were characterized by fairly stable behaviours, and control of the technologies was in the

hands of the developers. In the contemporary world, scholars have proposed focusing on advancing technology adoption-diffusion literature with sociotechnical perspectives (Vargo et al., 2020; Grober, 2020).

1.4　Cultural contracts theory

Individuals have and are influenced by a plethora of identities which are either ascribed through social categorization or ascribed based on self-reflection (Bennett, 2015; Straub, Loch, Evaristo, Karahanna, & Srite, 2002). The identities are negotiated in everyday interactions, (Bennett, 2015; Chen et al., 2016; Jackson & Hogg, 2010; Littlejohn & Foss, 2009; Sullivan & Goldzwig, 2004). Classifying identities as dynamic and fluid, constantly influenced during interaction with others (Littlejohn & Foss, 2009).

The current study takes on an individual cultural identity lens to focus on the dynamic process of identity negotiations, the dynamic and unpredictable nature of technology adoption (Eze et al., 2019), and the complex urban farming context; and employs the Cultural contracts theory as a lens to study the phenomenon of technology adoption.

The cultural contracts theory suggests that human experience is defined partially through three cultural contract typologies when identities interact. A shift in any one or any part of one of these aspects of identity such as values, perspectives, and world views in an individual constitutes the signing of a cultural contract (Jackson, 2002). The theory emphasizes the role of individual agency and acknowledges that cultural contracts are necessary for the definition, protection, and preservation of self (Sullivan & Goldzwig, 2004). The three contract typologies which Jackson (2002) suggests partially define human experience are (i) ready-to-sign which implies the coordination of aspects of identity grounded in assimilation, (ii) quasi-completed implying adaptation, or (iii) co-created which involves mutual valuation (Sullivan & Goldzwig, 2004).

The Cultural contracts theory inclines to be used in the communications discipline, however, recently scholars have encouraged the use of identity theories to explore the concept of cultural identities in business and management to provide an interpretation of identity interactions in complex systems (Dickens et al., 2019; Peltokorpi & Zhang, 2020). Using the Cultural contracts theory in the management discipline to understand how urban farmers experience technology adoption within urban farming provides a new context in which to study the theory and provides fresh insights into the phenomenon of technology adoption.

1.5   Phenomenography

Taking on an interpretivism paradigm, the current study used phenomenography as a research approach to draw out multiple and diverse interpretations of reality, as experienced by and narrated by individuals (Stenfors-Hayes et al., 2013). Making use of a methodology that focuses on the fullness of a lived experience is especially valuable in this context. Phenomenography embraces a second-order perspective and focused on drawing insights from individual urban farmers' experience of technology adoption in urban farming, instead of a first-order perspective where I would instead first make statements or propositions about experiences of technology adoption in urban farming (Marton, 1981).

In the current study, phenomenography was used to shed light on the qualitatively different ways in which urban farmers experience technology adoption in urban farming. Marton (1981) mentions that phenomenography integrates the conceptual and the experiential. It integrates what is culturally learned by being part of a collective with the individually developed ways of relating ourselves to the world around us. While the concept of individual cultural identity cannot be understood in isolation from the cultural identity of the collective, the self is the focal point of cultural identity (Taylor and Usborne (2010).

1.6   Research question

Despite the progress made in the field of cultural identity and its influence on behaviour (S. Becker et al., 2021; Bögel & Upham, 2018; Upham et al., 2020), and the maturity of the traditional technology adoption literature (Dwivedi et al., 2017; Williams et al., 2015) in predicting a variety of human behaviours in differing contexts (Dwivedi et al., 2019; Taherdoost, 2018; Williams, Rana, & Dwivedi, 2015); integrating the two areas shows a literature gap in understanding the outcomes of the bi-directional interaction between technology and target adopters from a cultural identity perspective at an individual level and how this relates to the ultimate decision to adopt or reject technology. It becomes important to understand how individual identities are framed in an urban farming context, and how these influence the decision to adopt or reject technology as this is going to help us understand how urban farming as an economic activity can be implemented effectively and sustainably.

Phenomenography, which is explained in the subsequent section, enabled me to take a second-order perspective of the world, that is, drawing insights from individual urban farmers' experience of technology adoption in urban farming, instead of a first-order

perspective where I would instead *first* make statements or propositions about the urban farming and technology adoption (Marton, 1981). For this reason, no propositions are made for the current study.

The study sought to understand the qualitatively different ways in which urban farmers experience technology adoption in urban farming. These insights will help shed light on why technology adoption in urban agriculture, as an economic activity, may result in failure or success in different contexts. The research studied technology adoption in urban farming through the cultural identity lens, and employed the Cultural contracts theory to answer the research questions:

RQ: How do individual cultural identities inform the differences in technology adoption among urban farmers in South Africa?

SRQ$_1$: What informs the individual cultural identities of urban farmers?

SRQ$_2$: How are the individual cultural identities negotiated for the adoption or rejection of technology?

1.7   Research contribution

Firstly, I introduce the cultural contracts theory in the management discipline to take on an individual-level perspective the phenomenon cultural identity and technology adoption. By adding an individual-level perspective I advance the sociotechnical body of literature. Second, by taking an individual-level perspective and theorizing the experiences of urban farmers on the use of technology from a cultural identity perspective in their urban farming environments, I advance the cultural contracts theory by showing that unlike the theory suggests, the findings show that it is possible to refuse to sign a cultural contract; therefore I add a non-signing cultural contract. I change how the theory is understood to point to a cultural identity continuum of technology adoption that emphasizes dynamic individual agency. Further, my work challenges the monolithic perspective on identity by first showing that the process of technology adoption is different when understood from individual, identity-related factors. Thus, foregrounding participants as agents of technology adoption, who choose actions that make sense to them (Adenle et al., 2019)

Applying the cultural contracts theory advances the sociotechnical theoretical perspectives, and provides a different theoretical lens with which to view the phenomenon of technology adoption.

Practically, this research contributes mainly to technology adoption-diffusion practitioners and suggests that organizations can benefit from considering multidimensional individual cultural identity factors when administering technology adoption-diffusion intervention. Practitioners can also consider tailored interventions to cater to the far-reaching nuances of identity, and consider positioning urban farmers as development practitioners and not just beneficiaries. Practitioners can in addition consider the co-creation, adaptation, and modification of technologies to suit local contexts in an effort to promote the success of urban farming as an economic activity.

1.8   Definition of key terms

This sub-section provides definitions of key terms as they are operationalized in the context of the study.

Table 1.1 Definition of Key Terms

Key term(s)	
Individual Cultural Identity	The integral and self-ascribed part of the self-constructed through the process of interaction, learning and sharing within unique cultural environments (Karjalainen, 2020; Mosanya & Kwiatkowska, 2021).
Cultural contracts theory	Theoretical lens that suggests that human experience is defined partially through three cultural contract typologies when identities interact: ready-to-sign, quasi-completed, and co-created (Jackson, 2002)
Urban Farming	The practice of using technology to cultivate, produce, process, and distribute food in and around the city and peripheral areas of growing cities (Blasch et al., 2020; O'Sullivan et al., 2019; Yan et al., 2022).
Technology	Machinery, equipment, artefact, and tools that improve and simplify agricultural production by reducing intensive soil-entrenched manual labour (Maucieri et al., 2019; Kannan et al., 2022)
Adoption	The extent of to which technology is utilized in the long-run when the farmer has full information about the technology and its potential (Yigezu et al., 2018).

1.9   Document Structure

The next chapter, Chapter two, outlines and frames the setting of the study, addressing the uniqueness of studying the phenomenon of technology adoption in the African context, enriched with cultural diversity, and with agriculture as its globally competitive industry. Chapter two further reaffirms the operationalization of the key concepts of the study, and introduces the literature review, Chapter three.

Chapter 2: Study Setting

This chapter is dedicated to outlining the context of the study owing to its uniqueness. Consistent with the argument that technology should be tailored to suit the contexts within which it is diffused (Suri & Udry, 2022; Taguchi & Santini, 2019), this chapter highlights the context of urban farming in South Africa, its importance as an economic activity and its relation to the use of technology to optimize production. It also aims to draw attention to how cultural identity plays a role in farming as an economic practice as I employ a cultural identity lens to explain how individuals come to the decision to adopt or reject technology for farming in urban spaces.

2.1   Africa

Africa is home to 1.2 billion people and it is predicted that Africa will account for the majority of global population growth over the next few decades, with a 26% increase by 2050 ("World Fertility and Family Planning 2020: Highlights," 2020). According to the World Food Programme (WFP) of the United Nations (UN), 20% of Africa's population faces a serious threat to food safety and security, as well as undernourishment that is projected to get worse (Gbashi et al., 2021). In the next 30 years, the urban population of Sub-Saharan Africa alone is expected to grow by nearly 800 million people, which is likely to put more pressure on the demand for affordable and accessible food, and have an impact on the food security of urban households (Jonah & May, 2019; Tuholske et al., 2020).

Forkuor et al. (2022) alluded that due to the predominance of rain-fed open-field production systems, worsening effects of climate change, environmentally unsustainable agronomic practices, and low productivity, Africa has not been able to achieve its goal of food security. The authors argue that these obstacles can be overcome and productivity raised in an environmentally responsible manner by the widespread adoption of production technologies. As a foundation for the improvement of food security and sustainable agriculture, numerous authors have emphasized the importance of new agricultural technologies, specialization, and commercialization in increasing farm productivity (Adenle et al., 2019; Sinyolo, 2020).

Urban agriculture scholars promote urban farming as a potential source of food security, particularly in urban cities as urbanization is projected to take a quantum leap in increasing the urban population, particularly in developing economies (Barthel & Isendahl, 2013; Chihambakwe et al., 2018; Salomon & Cavagnaro, 2022). Urban agriculture is often discussed in conjunction with the widespread adoption of technology

to respond to the demand for food security (Azunre et al., 2019; Blasch et al., 2020; Glowa, 2019). This offers unique opportunities for African urban farmers, however, more research on technology adoption in urban farming in the African context needs to be done.

African nations are distinguished by the diversity of their social mechanisms and frequently confront difficult socioeconomic and demographic conditions (Barnard et al., 2017). Recent calls have been made to use Africa as a research setting by taking advantage of the opportunities that exist in the diversity of all forms for the continent's development (Chigudu, 2018; Oyetunde-Usman, 2022). Oyetunde-Usman (2022) mentioned that the importance of agricultural technology adoption in reducing poverty and food insecurity, particularly in African countries, necessitates a better understanding of the heterogeneity in popular key indicators in adoption studies.

2.1.1   Urban farming in Africa

Urban farming is defined as a subset of urban agriculture that focuses on the production, processing, and marketing of food in the city or its peripheries (O'Sullivan et al., 2019; Yuan et al., 2022). The use of technology to maximize production is emphasized as one of urban farming's key dimensions by scholars who study it (Azunre et al., 2019; Blasch et al., 2020; Glowa, 2019). Rooftop farming, hydroponics, and greenhouse farming are among the examples of urban farming practices and technologies (Suri & Udry, 2022; Maucieri et al., 2019; Kannan et al., 2022; Lennard & Goddek, 2019; Yuan et al., 2022).

In developing economies, urban farming is proposed as a potential solution to the rising number of people moving to cities to join the urban population (Gulyas & Edmondson, 2021; Magwaza et al., 2020). The increase in the urban population places a demand for increased food supply and also puts pressure on innovative and efficient production measures to ensure food security, for the alleviation of poverty and hunger in and around urban cities (Barthel & Isendahl, 2013; Chihambakwe et al., 2018). Although urban agriculture is practiced in both developed and developing economies, the practice often serves different purposes whereby in the developed world recreation and the creation of social ties within a community is often a focus, food security is the primary focus in the developing world (Rao et al., 2022; Yan et al., 2022).

Urban agriculture is recognized as a development tool, with early research focusing on food security and nutritional needs, particularly in developing countries (Glowa, 2019; Yan et al., 2022). Its potential to respond to several of the Sustainable Development Goals (SDG): reducing hunger through affordable and accessible food (SDG2),

provision of diverse, healthy, and nutritious food for good health (SDG3), equitable access to vulnerable communities (SDG5, SDG10), urban risk management and climate mitigation through reduced food miles (SDG11, SDG13), sustainable production and consumption benefits through minimizing synthetic inputs and recycling waste to produce food (SDG12), better water and nutrient recycling, improved soil health and biodiversity (SDG 15) and improved environmental awareness and pro-environmental values (possibly SDG 17) is acknowledged globally (Rao et al., 2022). Some of its additional benefits include the improvement of livelihoods and the creation of employment for the urban poor, environmental benefits, and of course food security (Hardman et al., 2022; Simon, 2022).

Beyond the benefits of poverty reduction and food security, urban agriculture initiatives serve multiple purposes such as creating linkages between the city and nature, and urban and rural ways of life to create new urban development models. These linkages serve to re-establish natural and industrious spaces in the city and to reinvent food production systems (López-Goyburu & García-Montero, 2018).

Peri-urban agriculture, which Opitz et al. (2016) define as an ongoing form of agriculture around expanding cities, is another aspect of urban agriculture. According to López-Goyburu and García-Montero (2018), peri-urban agriculture is viewed through the prism of the social forms and relationships from which the farming initiatives originate. The peri-urban agriculture initiatives function in part as a transition area between urban and rural areas. They are characterized by a lack of infrastructure compared to cities, which prevents them from being entirely urban and, conversely, prevents them from being entirely rural due to the limited amount of land (Fanfani et al. 2022; Opitz et al., 2016). Peri-urban agricultural activities, however, benefit from proximity to urban areas, markets, and cultures; which further results in consequential social and cultural shifts (López-Goyburu & García-Montero, 2018; Gweshengwe, & Matai, 2022).

2.1.2 Urban Farming and Technology Adoption

By the mid-1990s international research on urban agriculture paved the way for increased investment in the Global South. Central to this investment was the integration of technologies in an effort to promote the success of urban agriculture (Taguchi & Santini, 2019). The use of technology is aimed at facilitating the production of agricultural output in unconventional confined spaces and soil-less environments such as rooftops (Janneker, 2018). Although technology initiatives have been rolled out for urban agriculture by international organizations such as the Food and Agricultural Organization

(FAO) in various African countries, the uptake of technological systems for urban farming, particularly in developing countries, has been highly variable (Brinkley & Kingsley, 2017). The cases studied on urban farming in the Global South, and in Africa particularly widely used soil-based agricultural production.

In developed economies, urban agriculture has become popular with technological advancements such as rooftop agriculture and vertical farming constantly in the expansion (Reynolds, 2014). Fraser and Hodgins (2016) outline that these intensive urban food production systems can shorten supply chains and create linkages between consumers and producers, all while advancing the strength of food organizations. Findings of research conducted on urban agricultures potential in North America showed that city farmers performed more productively on small tracts of land to contribute to the urban food supply systems (Reynolds, 2014). They provide a further example from the Asian context that suggests that vertical farms and their high capital-intensive nature were able to cater high-end products for affluent urban consumers.

A Foodtank (2014) report on the use of technology in urban farming in Kenya saw farmers' outputs and profits increasing and small-scale farmers realizing the business potential of urban farming as a commercial activity, that way enhancing food security and income for marginalized population groups. Malawi experienced serious challenges in their agricultural sector as a result of climate change and soil degradation, this led to the adoption of agricultural technologies to enhance the production of food for nutrition and income security in the Kasungu District (Khonje, 2019). Khonje (2019) reports most farmers who adopted agricultural technologies benefitted immensely from them, although there are still farmers who still choose to cling to old ways of farming. Masiwa (2022) still found, however, that in the upper regions of Africa, less than three out of ten farmers use technology. Smallholder farmers in some parts of Africa have been slow to adopt the technologies. Although technological advancements have made incredible strides in recent years, just under 30% of farmers in the northern, upper eastern, and upper western parts of Africa are currently employing technology-driven agricultural practices (Masiwa, 2022).

2.1.3 Farming and Cultural Identity

According to Wahlhütter, Vogl, & Eberhart (2016) in arable farming, soil and its productive qualities are crucial aspects of a farmer's daily life. Beyond soil's productive capabilities it is essentially part of the symbolic representation of rural communities and is connected to a value system, and therefore soil has to be understood within a particular

cultural context. McGuire et al. (2015) mention when farmers engage in agricultural practices, they are motivated to an extent by their internal beliefs, values, knowledge, and past experience; that is, their cultural identity. These farmers' beliefs about who they are and how agriculture should be performed then translate into the types of practices that are employed on-farm (Lavoie & Wardropper, 2021; Burton et al., 2020). De la Poterie et al. (2018) found that the majority of farming decisions are made at the village level, and even when it is in the farmers' best interests, individual farmers' cultural identities rarely stray from that of their communities when it comes to agriculture decisions.

2.2 South Africa

According to Quantec (2020), agriculture plays a significant role in the economy of South Africa. This is especially true when one considers that the sector is profoundly intertwined and at the heart of the operations of numerous other industries. The agricultural industry in South Africa is diverse and a significant producer and exporter of agricultural goods (Sihlobo, 2021). Agriculture provides essential goods that provide daily sustenance for millions of people, contributing significantly to food security (Council of Scientific and Industrial Research, 2022). In order for South Africa to retain a high level of food security, the ability of the country's agricultural industry to produce a sufficient amount of food for the expanding population within the next ten years without having a significant detrimental impact on the environment will be put to the test (SA Government, 2022).

2.2.1 Agriculture and Identity in South Africa

South Africa, also known as the Rainbow Nation, is a melting pot of cultures where many different cultural groups are organized around the Ubuntu philosophy in the native cultures (Terblanché-Greeff, 2022). Ubuntu can be argued as a form of moderate collectivism because the individual is still able to maintain their own identity (Metz, 2011, 2016, 2019). Through engagement with others, however, the individual continues to cultivate their identity (Mnyaka & Motlhabi, 2005; Mokgoro, 1998; Shutte, 2001).

In South Africa land as a social space *also* bears a historical meaning and cultural identity (Vorster, 2019). As early as the 1990s, Molefe (1991) reported that as the black population of South African citizens migrated to join the urban populace, small-scale agricultural activities persisted in and around the cities arguing that this to be symbolic of the value and connection individuals have with soils, agricultural land, and farming as an activity. Rogerson (1993) subsequently found that in the urban peripheries' individuals continued to practice farming for subsistence in home gardens which have continued to

reproduce, in advanced models of urban farming, in and around the country's major urban areas. Trefry, Parkins, and Cundill (2014) found that gardening is a statement of cultural expression for those who participate in it and a way of connecting with what they feel is an element of identity for elderly women in the Eastern Cape, South Africa. Similarly, Shackleton & Hebinck (2018) found a strong link between agriculture and identity in a study on farming in the Wild Coast, South Africa. Demonstrably, agriculture remains a form of identity for many Africans.

2.2.2 Identities in Urban South Africa

According to Van Eldik et al. (2019) for a long time, cities have been strongly imprinted with heterogeneity, owing to the belief that all urban dwellers are part of the same community. Pieterse (2015) attributes this mix of culture, norms, and values within urban environments, to globalization.

During apartheid, the structure of South Africa's cities was based on isolation, and policy development ignored the socioeconomic issues that would affect the growing number of poor people living in the cities (Rogerson, 1993; Vorster, 2019). Rogerson (1993) mentioned the 1980s ushered in a shift in South Africa's urban policy climate which saw the recognition of the country's urban poor and an acceptance of the inevitability of expanded levels of black urbanization. The rural-urban mobility embodied a historical movement from a traditional rural society to a modern urban society; tradition and communality to an urban society of modernization and individualization (Lyle et al., 2013; Njwambe et al., 2019). South Africa's urban cities, therefore, grew to encompass multi-layered identities, and for the study, this presents a viable and rich context to study the phenomenon of technology adoption from a cultural identity perspective of individuals in urban farming (Lyle et al., 2013).

Extant literature shows that individuals are influenced by a plethora of cultures and sub-cultures–some ethnic, some national, and some organizational which form their identity (Straub et al., 2002; Van Eldik et al., 2019). As such individuals have multiple identities which from point to point overlap to shape experiences and behaviour in practice (Dickens et al., 2019; Wang, 2017). In the exposition, by McGuire et al. (2015) the identities intersect to create significances that describe who one is when one is an occupant of a particular role in society (Egerer et al., 2019; Usborne & de la Sablonnière, 2014). The modern world is further characterized by heightened individualism where individuals disconnect from their former communal bonds to choose who they want to be as occupants of a particular role in society (Terblanché-Greeff, 2022).

2.2.3 Urban Farming in South Africa

In South Africa, urban farming is still in its infancy, but the rising demand for locally grown food is accelerating development (Council of Scientific and Industrial Research, 2022; Pietersen, 2018). New technologies are enabling the viability of urban farming as a potential contributor to food systems. Undercover farming, which includes low-tech infrastructure such as shade netting to higher-tech controlled environment glass house systems, vertical farming, hydroponics (growing plants in nutrient-rich water), and aquaponics (raising aquatic animals such as fish, and crayfish, snails or prawns in tanks) are examples of urban regenerative farming and the technologies already available, and gaining traction in South Africa (Council of Scientific and Industrial Research, 2022; Mchunu et al., 2018; Zantanta et al., 2022).

Urban farming may not be able to completely replace rural agriculture, but it does a great job of enhancing the food system in the face of the mounting challenges caused by population increase and land scarcity (Council of Scientific and Industrial Research, 2022). The existence of urban farming projects in South Africa is relatively on a fairly small-to-medium scale, primarily for food production (Pietersen, 2018). The projects are run mainly as initiatives to respond to socioeconomic challenges such as food security and employment. Urban farming is becoming more and more viable and has the potential to play a role in food systems thanks to new technologies. In order to provide a regulated climate that enables year-round production, a lot of urban farming efforts in South Africa are being conducted in defunct industrial areas. Frequently, disused warehouses are used for this purpose (Janneker, 2018).

By 2050, it is predicted that 80 percent of all food will be consumed in cities. As a result, cities have a substantial impact on how food is cultivated, notably through interactions between peri-urban and rural farmers (Council of Scientific and Industrial Research, 2022). In South Africa, it is envisaged that an increase in urban farming will in addition contribute to the creation of urban jobs (Council of Scientific and Industrial Research, 2022; SA Government, 2022). Accordingly, urban farming allows for the production of healthy, inexpensive, and readily available food for all people while preserving land, lowering emissions, and reducing waste (Council of Scientific and Industrial Research, 2022; O'Sullivan et al., 2019; Yuan et al., 2022).

2.3   Operationalization of Key Concepts

2.3.1 Technology Adoption

For this study, technology adoption is operationalized as the use of machinery, equipment, artefacts, and tools that improve and simplify agricultural production by reducing intensive soil-entrenched manual labour. The research will concentrate on urban farming technologies that use little to no soil to produce food crops. These will include hydroponics defined as a method of farming in which plants are raised and grown in a water-and-nutrient solution, with the roots supported by an inert media like coco peat (Maucieri et al., 2019; Kannan et al., 2022), aquaponics which is a combination of aquaculture and hydroponic system and provides similar advantages to the hydroponics and but additionally, it enables the growing of plants and fish simultaneously without increasing the water consumption levels, organoponics, defined as raised-bed systems or containers in which the growth medium is typically a mixture of soil and composted organic matter of various origins (Hallett et al., 2016), and any other technologies and tools as conceptualized by the participants. Technology adoption will be operationalized as the use of these technologies to grow agricultural produce in the urban farming space.

2.3.2 Cultural Identity

Cultural identity is operationalized at an individual-level as the negotiated sense of self-constructed through the process of learning and sharing within a unique cultural environment (Karjalainen, 2020; Mosanya & Kwiatkowska, 2021). Cultural identity is the part of the self that indicates the connection to a culture (Mosanya & Kwiatkowska, 2021; Wan & Chew, 2013; Collier & Thomas, 1988); culture is understood as the collection of knowledge, traditions, ideas, and values, beliefs, norms, and practices shared or disseminated in a particular social group (Ting-Toomey & Chung, 2021).

2.3.3 Urban Farming

For this research study, urban farming will be operationalized as the practice of using technology to cultivate, produce, process, and distribute food in and around the city and peripheral areas of growing cities (Blasch et al., 2020; O'Sullivan et al., 2019; Yan et al., 2022).

2.4   Summary of Study Setting

Research on technology adoption in an African context can provide invaluable insights into advancing the adoption of agricultural technologies to address the majority of the Sustainable Development Goals (SDGs). South Africa, as a melting pot of cultures,

provides a unique setting to challenge the homogeneous perspective on technology adoption. The global scholarship also stands to gain from a study that is locally connected with a locally connected scholar examining the phenomenon of technology adoption from an individual cultural identity perspective. Due to these reasons, South Africa is ideally positioned as a context in which to conduct research on technology adoption in urban farming from an individual cultural identity perspective. The literature review to explore the phenomenon will be outlined in the following chapter.

Chapter 3: Literature review

3.1   Introduction

This chapter covers literature from two theoretical frameworks which led to individual cultural identity and technology adoption as the key concepts. The research studies technology adoption from a cultural identity lens and in particular employing the cultural contracts theory as a theoretical anchor. Research prospects to expand existing knowledge on these concepts are highlighted and used to frame the research questions that the study intends to answer. The literature review is centred on technology adoption for urban farming as an economic activity and therefore technology adoption is for the study's intents and purposes the dominant theme for the overall study, from an individual cultural identity perspective.

3.2   Technology Adoption

Traditional technology adoption-diffusion literature, theories, and models seek to predict a variety of human behaviours in different contexts. The theories rely on a linear and unidirectional flow of technology, that is, from the technology as the object to end-users as the subject (Migliore et al., 2022; Patil et al., 2020). This body of literature regards technology as an independent variable, having an independent influence on the behaviour of human beings, and is regarded to exert unidirectional and causal influences over humans and organizations (Nysveen et a., 2020; Taherdoost, 2018; Williams, Rana, & Dwivedi, 2015). The theories and models used in the traditional technology adoption body of literature focus on explaining the behaviour of individuals, whilst others concentrate on adoption decisions in which organizational characteristics play a key role (Taherdoost, 2018). Prokopy et al. (2019) found that individual experiences may well influence how technology is perceived, and consequently whether it will be adopted or rejected.

Lyle et al. (2013) argues the unidirectional perspective of technology limits empowerment on the part of those receiving the technologies, suggesting a dependency system that continues to serve the disseminators of the technology whilst disempowering on-the-ground participants. It also entreats an image of dependency which could undermine farmers, also in the context of the study, in developing countries as dependent on external knowledge and techniques to solve their development challenges. This may in turn result in low participation from communities, despite the potential and economics of technology in urban agriculture.

Kristensson et al. (2020) reasoned that the traditional technology adoption models were developed at a time when technologies were assumed to be new, markets and individuals were characterized by fairly stable behaviours, and control of the technologies was in the hands of the developers. The technology adoption theories and models assume that if a technology has capabilities, it will be automatically adopted when it is diffused (Dwivedi et al., 2017; Taherdoost, 2018; Williams et al., 2015).

Eze et al. (2019) challenged the predictive nature of the traditional technology adoption models to consider the adoption of technology as dynamic and unpredictable, and not static arguing that factors influencing the adoption of technology vary over time. Further, Nysveen et al., (2020) argued that modern technologies are objects of workings of improved practice that is adopted, and these practices happen through interactions among those that use the technologies in an ecosystem, and therefore the technologies keep evolving overtime suggesting their temporality. Kristensson et al. (2020) put forward that in modern-day markets technologies are often co-created with those that use them, and suggest that traditional technology adoption perspectives can be advanced with sociotechnical theoretical perspectives to provide an inclusive understanding of technology adoption.

In a recent study on technology adoption, Mamonov and Benbunan-Fich (2020) found that traditional technology adoption models are silent on prominent beliefs that may influence the adoption of cutting-edge smart home technology. Recommendations of the study also suggested the need for gendered models to provide a complete explanation of the adoption of technology in settings where it traverses gender roles.

Kristensson et al. (2020) argued that while providing understanding into the often-causal characteristics of technology over humans, the traditional technology adoption body of research largely ignores that both human beings and technologies have some power, ability, and influence and can act in a given situation. The actions between humans and technology are not deterministic but are rather dependent on other elements such as influences of complex processes of development, adaptation, adoption, the use of new technologies, social groups, and contexts in individuals' everyday lives (S. Becker et al., 2021; Bögel & Upham, 2018; Kristensson et al., 2020), and as a result, provide an incomplete interpretation of technology and its interaction with individuals.

Traditional technology adoption-diffusion literature is criticized for its limitation in being deterministic and linear in enabling a complete understanding of technology adoption (Gruber, 2020; Vargo et al., 2020). It obscures the social contexts and structures at play

when people interact with technology in their on-going practices (Kristensson et al., 2020).

Individual Agency

Socio-technical studies perspective on technology adoption focuses on the reciprocal relationship between people and technologies by paying attention to how technology use is influenced by social contexts, interactions between people and technology, and collective agency (S. Becker et al., 2021; Bögel & Upham, 2018; Sartori & Theodorou, 2022). Socio-technical studies also pay attention to how shared meanings about a particular technology and the use thereof arise and affect the development of and interaction with that technology (Forney & Dwiartama, 2022). While practically demonstrating how meanings around a technology emerge and are maintained for adoption through a collective agency, these studies do not adequately deal with individual agency and choice (Bögel & Upham, 2018; Upham et al., 2020). Prokopy et al. (2019) found that individual experiences may well influence how technology is perceived, and consequently whether it will be adopted or rejected for the adoption of agricultural technologies.

Contextual View

The sociotechnical perspective submits that technology is entrenched in social contexts to which it adapts, and likewise reshapes and develops the contexts to which it is deployed (S. Becker et al., 2021; Bögel & Upham, 2018; Upham et al., 2020). Barnard et al., (2017) confirm that Africa is a region with a diversity of cultures that influence the entrepreneurial essence of individuals and organizations operating in the area. The nuances of the uniqueness of individuals' cultures which are prevalent in African communities' form part of the social contexts within which the technologies are situated, and are necessarsawyy to bring to light the different ways in which technology is experienced by individuals, and the different ways in which this variation influences the sustained adoption or rejection of technology. A lack of understanding of this perspective restricts understanding of why some technological implementations fail while others succeed in settings that appear to be similar.

The current study seeks to introduce an alternative conceptualization of technology and its relationship with individuals from an individual cultural identity perspective. I employ the tenets of the cultural contracts theory to conceptualize the concept of technology adoption. I limit the scope of technology in my operationalization to material artefacts (Nysveen et al., 2020), and focus on the mutual interaction between technology and

human beings as target adopters, and agents (Upham et a., 2020); and henceforth suggest the interaction between technology and target adopters in urban farming suggests some form of communication between farmers' cultural identities in the urban context and technology used for urban farming.

My proposal for a cultural identity lens to technology adoption makes no claims to completeness in understanding the phenomenon of technology adoption and is therefore presented as an alternative to thinking about technology adoption. This perspective too, unavoidably, is limited by my interests as a researcher; however, it can help overcome the limitations and criticisms inherent in traditional technology adoption-diffusion literature and shed a light on the interaction of technology and individuals from an individual cultural identity lens.

3.2.1 A Cultural Identity Lens of Technology Adoption

Individual Agency

Recent work in identity theory has challenged the established focus of identity theories in the communications discipline and proposes the further exploration of the concept of cultural identities in business and management to provide an interpretation of identity interactions in complex systems and different social environments (Dickens et al., 2019; Peltokorpi & Zhang, 2020).

The cultural contracts theory inclines to be used by communication scholars seeking to explain the possible tensions that emerge as a result of individual cultural differences and to examine how cultural identity is negotiated when a part of one's identity or worldview interacts with different identities (Bennett, 2015; Jackson & Hogg, 2010; Littlejohn & Foss, 2009; Sullivan & Goldzwig, 2004).

In some early work the theory was used to study the interaction of racial relationships and how individual identities were negotiated to foster co-existence (Drummond & Orbe, 2010; Harris, 2007; Jackson & Crawley, 2003). Recent work has also applied the theory to explore how individuals living with disabilities experienced (mis)fitting owing to disruptions caused by COVID-19 in the classroom environments (Parsloe & Smith, 2022). In the study, COVID-19 catalyzed the negotiation of identities between professors and students, and the interactions with individual students living with disabilities negotiated a shift from ready-to-sign contracts to quasi-complete and co-created contracts in how teaching was conducted during the pandemic.

The theory was also used to investigate the connection between self-identity and work engagement for Indian American women (Daulat & Wadhwa, 2023). The study showed that Indian American women would have better mental health and be fully engaged in their work if they negotiated their individual identities to be authentic in both their personal and professional lives.

In an inquiry on identity negotiation factors influencing Black teachers in urban schools, Gabbadon (2022) found that Black teachers' professional experiences in urban schools were moderated by racial and gender identities, and the teachers had to individually negotiate their identities to ensure the sustained diversity of teachers in urban schools to counter structural inequalities in education.

For intercultural scholars, the cultural identity lens has shown that a multifaceted relationship exists between cultural identity and different kinds of social environments and for (Dickens et al., 2019), applying the cultural contract theory provided insights into how Black women navigate the workplace context through identity shifting strategies in the American context. Similarly, for Gabbadon (2022) applying the cultural contracts theory provided insights into the professional experiences, identity negotiation, and decision-making of Black female teachers in African American communities' urban schools. Most of the intercultural studies were carried out in America followed by Europe, and indicate inadequate research on identity negotiation in Africa.

The cultural contracts theory perspective focuses on individuals as the centre of agency from a cultural identity perspective, without discounting technological intervention (Jackson, 2002; Sullivan & Goldzwig, 2004). The emphasis, however, is on the individual's role which is different from the role played by the technology (Nysveen et al., 2020). Identity is defined by the individual and the role played by the individual comes with the ability to negotiate and renegotiate identity (Hecht, Jackson, & Ribeau, 2003), to the adoption or rejection of technology, which is an aspect that appears to have received little application in the socio-technical and emergent perspectives to technology adoption literature and can explain why some technological implementations fail whilst others succeed in similar settings (Gruber, 2020). The theory's inductive nature enables drawing out the richness of individuals lived experiences of technology adoption. The theory will bring an identity lens to the relationship between individuals and the use of technology which is a fundamental one in the information systems literature.

This thesis introduces the theory to the field of management, and cultural contracts theory is used as a lens to study the relationship between individual cultural identity and technology adoption in urban farming, in South Africa, and also respond to the call for

future qualitative research on individual influences such as the role of farmer identity in enabling or constraining technology adoption (Prokopy et al., 2019).

Kaushik and Verma (2019) found that most of the studies that have used the traditional technology adoption-diffusion models were quantitative with inadequate research employing qualitative approaches. The current study will use a qualitative approach to study technology adoption from a cultural identity perspective.

3.3   The Concept of Identity

Social Identity

Social identity is defined as the aspect of an individual that derives its meaning from being a part of a social group and the emotional significance that comes with it (Crocetti et al., 2018; Tajfel, 1978). The central tenet of Social Identity Theory is that groups to which individuals belong are a key source of esteem and prestige as they give a sense of social identity (Tajfel, 1978). While the Social Identity Theory argues that identity is understood through group membership, Turner, et al. (1987) and Turner and Reynolds (2011) using the Self-Categorization theory argue that the self can define itself at multiple levels. The theory of Self-Categorization suggests that individuals can define themselves at the level where individual identity becomes prominent in comparison to other species; where social identity becomes prominent in terms of social circle association in comparison to out-groups; and where individual identity becomes prominent in comparison to in-groups (Crocetti et al., 2018).

Individual Identity

Literature on individual identity, otherwise coined as personal identity stems from the psychosocial theory (Erikson 1950; 1968) according to which identity is an evolving phenomenon and developed over time, and experiences continuous review and change (Crocetti et al., 2018). Becker et al., (2017) alludes that the development of both social and individual identity advances on corresponding paths. Similarly, Crocetti et al., (2018) reason that although personal and social identity emanates from different theoretical backgrounds (Turner, Oakes, Haslam, & McGarty, 1994), both phenomenons are influenced by the social contexts in which individuals are embedded (Burke & Stets, 2009; Stets & Burke, 2014). Most importantly, the self continually strives to adapt to the many demands of the social contexts with which individuals interact, resulting in the convergence and interaction of personal and social identities (Crocetti et al., 2018).

Bringing the above into context, when individuals take on a particular role in society they take on that role from the understanding and meanings ascribed to the role by common culture or the collective to which they belong. In the context of the current study, an individual would define themselves as a farmer based on what the collective society has defined and understood to be a farmer (Burton et al., 2020). In this common culture, people collectively recognize what it means to be or to take on a particular role in society and it is these meanings that link persons to the social structure and shared culture (Stets & Burke, 2014). The primary goal of identity theory was to define how different identities' meanings are negotiated and managed in interaction (Erikson, 1950; 1968); however, the individual is the one who decides how they will act in a social setting because of the definition they give themselves. This would then explain why an individual would choose one role over the other, as invoked by the overriding identity (Stets & Burke, 2014).

Cultural Identity

Social identity theory informs the interpretive cultural approaches to cultural identity, defining cultural identity as the self an individual takes on which includes the experiences, and enactment of beliefs, values, and knowledge systems, through (co-) creation, and (re)negotiation within environments and contexts they find themselves (Altugan, 2015; Chen et al., 2016). Drawing on the Social Identity Theory, Chang, Jetten, Cruwys, and Haslam (2017) argue that identification with a cultural group is associated with endorsement of the norms, values, and/or principles expected by the cultural group, and in turn, this will guide an individual's conduct in social contexts (Chang et al., 2016). Chang, et al. (2017) found that cultural identity only has the ability to influence behaviour when it is internalized as a critical and significant appraisal of oneself, with the support of cultural expectations.

Drawing on the work of Tajfel (1978) and Erikson (1950; 1968) my interest is in the uniqueness of an individual's self-concept, as (co-)created, and (re)negotiated in different social contexts, and is demonstrated when one is an occupant of a role in society. For the study, I am taking on an individual experiences' lens of technology from a cultural identity negotiation perspective.

3.4 Individual Cultural Identity

3.4.1 Definition

Cultural identity is the part of the self that indicates the connection to a culture (Mosanya & Kwiatkowska, 2021; Wan & Chew, 2013; Collier & Thomas, 1988), and culture refers to the knowledge, traditions, ideas, values, beliefs, norms, and practices that are shared

or disseminated within a particular social group (Ting-Toomey & Chung, 2021). Collier and Thomas (1988) define cultural identity as a negotiated sense of self with a perceived acceptance into a group. They argue, the individual self-negotiates itself amidst multi-layered, complex, and yet dynamic components of one's self to arrive at a principal sense of self. In other words, cultural identity is an essential component of the self-concept developed via the process of learning from and alongside others in a particular cultural setting (Karjalainen, 2020; Mosanya & Kwiatkowska, 2021).

Wan and Chew (2013) described the process of cultural identity development as how individuals acquire knowledge of values, beliefs, norms, and practices and ascribe to themselves individualistic labels associated with membership in particular cultural communities. Similarly, Collier (2015) alluded that the individual form of identity is a feature of cultural identity, where individual identity is an individual's personal interpretation of his/her own cultural identity. Horowitz (2012) references this as self-identity which is dynamic at different times, and in different social and cultural settings. The selection of self is fed by competing stimuli which may be of personal or social origin.

Jackson (1999) in his cultural contract theory, considered cultural identity as a sense of fitting-in to a cultural community that endorses self for the individual, as the individual interacts with people in varying contexts. It is this cultural community that bears beliefs, meanings, values, and norms that are used to relate to the world. Giddens' (1994) work on the reflexive self, highlights that *self* can construct its own identity outside of the boundaries of tradition and culture through conscious choices (Adams, 2003). That is, even though the social world as is, is far beyond the control of human beings, individuals still possess agency, are behavioural and strategic, reflective and introspective by nature; and the social world as is an outcome of previous and continuing agency, strategies, and behaviours of individuals (Fairclough, 2006; Becker et al., 2017).

Individual cultural identity is accentuated more in modern society where the reflexivity of modern life presents the individual with a sense of independence and control in choosing who to be and how to act (Karjalainen, 2020; Mosanya & Kwiatkowska, 2021). Holliday (2010) found that while national identity is of importance to the formation of cultural identities if it does not resonate with how individuals identify themselves, it remains in conflict with the layered cultural realities which accumulate around an individual's life and constitute how the individual defines oneself.

Interpretive Phenomenography

I used phenomenography as a research approach to draw out multiple and diverse interpretations of reality, as experienced by and narrated by individuals, and will take on an interpretivism paradigm (Stenfors-Hayes et al., 2013).

Interpretive cultural approaches view cultural identity as a product of the individual that is co-created, negotiated, and reinforced through interactions due to its dynamic nature (Chen et al., 2016). They do not seek to understand the concept of individual cultural identity in isolation from the cultural identity of the collective, however, scholars like Taylor and Usborne (2010) maintain that the self is the focal point of cultural identity. This particular scholarly orientation argues that the individual can determine the integral part of the self which in turn guides and regulates behaviour. A person's identity is formed by the variety of social stimuli from their cultural, religious, social-class, gender, professional, or even leisure group (Ashmore et al., 2004; Taylor & Usborne, 2010; Wan & Chew, 2013); and when an individual becomes aware of *self*, they can define themselves in terms of cohesion or distinction (Becker et al., 2017). Individuals as cultural group members experience and can construct, negotiate and renegotiate and even act out their individual cultural identities (Chen et al., 2016; Mosanya & Kwiatkowska, 2021).

Other-oriented behaviour in role identity negotiation tends to play out in relationships between women on farms and how their identities shift as more women enter into the farming space and identify as farmers (Brasier et al., 2014). There has also been a call for future research on gendered models to provide a complete explanation of adoption of technology in settings where it traverses gender roles (Mamonov & Benbunan-Fich, 2020).

The research study investigates the relationship between individual cultural identity and technology adoption in the urban farming context. As in the definitions above, this particular research study examines the phenomenon through a phenomemonography approach, from the perspectives of individual lives. This interpretive approach allows for the generation of rich, contextual data from individual accounts. Individual cultural identity is operationalized as an integral part of self-concept that becomes as an individual makes a selection of social stimuli; sets of knowledge, beliefs, values, and norms (Taylor & Usborne, 2010) from a person's cultural, religious, social-class, gender, professional, or even leisure group (Ashmore et al., 2004); and internalize these to form an important part of the self which guides and regulates behaviour as one takes on a role in society (Mosanya & Kwiatkowska, 2021; Wan & Chew, 2013).

3.4.2 Cultural Identity in Context

Cultural Identity in a Changing World

In the wake of globalization, the modern world is characterized by distance and detached social relations (Nguyen & Do, 2020). The communal organization of society has progressively been replaced by social influences that lie beyond community boundaries. Globalization has played an important role in the dismantling of social relations from local contexts of interaction, and influenced cultures of nations, especially those in developing economies – values are defined by international norms of urban culture (Nguyen & Do, 2020). Individual psychological processes are influenced by sociocultural contexts that are more dynamic and complicated than ever as a result of globalization's increased connectivity, which challenges one's sense of self, identity, and belonging (Ozer, 2019). That is, during times of rapid social and cultural change, how individuals develop a consistent and ongoing sense of self is especially dependent on how they respond to the interaction between personal identity processes and globalized cultural influences (Ozer & Schwartz, 2020). This creates new bases for the individual to maintain his or her core identity.

According to Ozer (2019), individuals form their identities through interactions with their sociocultural environment. The individual is free to choose the kind of lifestyle they want to live, an instinctive choice that comes from the 'self' being in a situation where there are many choices (Erikson, 1968).

In the modern context, identities have evolved into instinctively organized endeavours, and individuals express the autonomy to do, act, and be (Ozer, 2019; Giddens, 1991). Ozer (2019) shadows a comparable perspective that there is a multiplicity of contexts within which individuals in modern society find themselves, and are said to be able to make identity selections. He argues, the multiplicity of contexts, encompasses a plethora of competing cultural discourses which contend with each other over individuals' definition of self, particularly in developing societies, where individuals are negotiating and integrating multicultural identities through the proliferation of intercultural connectivity. Individuals' reflexive identification of themselves emphasizes the dynamic nature of identity in the modern world, making individual identity constantly subject to revision by the individual (Becker et al., 2017).

According to Brablec (2020), culture is the stronghold of the process of "becoming" more or less in one context or otherwise adopting a hybrid identity, that is, the process of "being" in the traditional versus the urban city context is influenced by culture. According

to Brablec (2020), cultural identities are fluid, and individuals can consider the environment beyond its physical dimension, which is typically shaped by various forms of cultural representation, in the construction or reconstruction of identities. This is despite the fact that new environments, such as the urban setting, can gain symbolic meaning (Becerra et al., 2017).

Peters (2011) mentioned that urban settings are regarded as areas of alleged cultural loss, and argued that traditional cultural identities would eventually be abandoned as individuals succeed in the urban environments. As a result, the rural-to-urban migration has been interpreted as an abandonment of cultural identity and integration into urban society. In contrast to the assumed exclusive urban environment identities of urban cities, traditional individuals and groups migrate to urban cities, where modern cultures dominate, and these cities become symbols for identity hybridization processes (Zhao, 2022). According to Becker et al., (2017), there are a plethora of espoused identities from which individuals can choose to influence their behaviour (Mosanya & Kwiatkowska, 2021).

The current study is therefore, interested in the negotiation of cultural identity on an individual level among urban farmers in South Africa and how this influences the different ways urban farmers use technology.

Cultural Identity as a Context-Dependent Phenomenon

Ozer et al., (2020) state identity as a concept is dependent on the context and is adaptable and inconsistent across different social settings (Smaldino, 2019; Gómez-Estern et al., 2010). How one experiences their cultural identity fluctuates in different contexts depending on the environment, the activities at play, the people involved, and other related factors (Chen et al., 2016; Ozer, 2019). The context within which identity interactions take place dictates the content of how individuals will define themselves (Becker et al., 2017; Nguyen & Do, 2020; Ozer & Schwartz, 2020).

The cultural contract theory acknowledges context as a stimulus for the reaffirmation of self or personhood (Jackson, 2002). The evolving, dynamic, and contextual nature of cultural identity within the 'self' as a result of interactions within a particular cultural group and/or with others is emphasized in interpretive approaches to cultural identity. According to this viewpoint social character is culturally and socially constructed, by the individual through connections with others that are part of the community, from outside the community, and in sociocultural contexts (Ozer, 2019). Therefore, interactions play

a role in the co-creation, negotiation, and consolidation of an individual's cultural identity (Chen, Lin, Chen, & Lin, 2016).

3.5   Cultural Contracts Theory

Cultural identity is posited as a principal, multi-layered, complex, and yet a dynamic component of one's self-concept; one's cultural identity is therefore a negotiated person's sense of self (Collier & Thomas, 1988; Lustig, 2013). Proposed by Jackson (2002) the cultural contracts theory suggests that human experience is defined partially through three cultural contract typologies when identities interact. A shift in any one or any part of one of these aspects of identity such as values, perspectives, and world views in an individual constitutes the signing of a cultural contract.

The Cultural contracts theory emphasizes the role of individual agency. It is acknowledged that cultural contracts are necessary for the definition, protection, and preservation of self; as a result, everyone possesses one, and there is no such thing as a lack of one. However, individuals may not be fully aware that their cultural contract assists them in navigating contexts (Sullivan & Goldzwig, 2004). Ting Toomey (1999) argued that human beings cannot exist without culture, as culture is the basic organizing unit of social processes. The cultural contracts emerge from individually espoused cultural identities based on self-reflection and other self-categorization social constructionist processes that influence individuals (Bennett, 2015; Straub, Loch, Evaristo, Karahanna, & Srite, 2002). Individually espoused cultural identities encompass unique attributes that are associated with one's sense of self in comparison with others (Bennett, 2015; Usborne & de la Sablonnière, 2014). These identities are negotiated in everyday interactions, the process of which Sullivan and Goldzwig (2004) allude to as the conscious exchange and shifting of one's values, perspectives, beliefs, norms, and worldviews. A shift in any one or any part of one of these aspects of identity such as values, perspectives, and world views in an individual constitutes the signing of a cultural contract. Cultural identities are dynamic and fluid, constantly influenced during interaction with others (Littlejohn & Foss, 2009).

The cultural contracts theory is premised on the idea that the dynamics of power, boundaries, cultural loyalty, group identification, and interactions between different cultures may or may not harmonize (Jackson, 2002). Most importantly, it is individuals that negotiate their identities and/or worldviews when interacting with others (Drummond & Orbe, 2010). The three contract typologies which Jackson (2002) suggests partially define human experience are (i) ready-to-sign which implies the coordination of aspects

of identity grounded in assimilation, (ii) quasi-completed implying adaptation, or (iii) co-created which involves mutual valuation (Sullivan & Goldzwig, 2004).

3.5.1 Ready-to-sign

In context, the *ready-to-sign* cultural contract would imply farmers' identities are shifted by the urban farming practice, that is, farmers automatically use technology for farming when in an urban context. Drummond and Orbe (2010) highlight three interesting perspectives within this cultural contract, which I bring into the context of urban farming.

The first perspective that speaks to signing the *ready-to-sign* cultural contract is that of *adapting to the system* which suggests that although participants may hold different worldviews regarding modern and conventional forms of farming with regards to the use of technology based on their individual cultural identity categorizations, in this instance black or white or even rural or urban; they may feel compelled to adopt the use of technology for farming in urban spaces for the underlying benefits of assimilation.

Alternatively, farmers in the urban environments may sign the ready-to-sign cultural contract for *status quo benefits*. In this instance, participants may refuse to be explicitly categorized in terms of their individual cultural identities. This speaks to the privilege proposition of the theory that suggests that there is a direct and proportionate relationship between power and self-efficacy (Moon, 1999; Orbe, 1994, 1998; Ting Toomey, 1999). Participants who are in the position of privilege would rather not be thought of as assimilating because of privilege. To bring it into context, privilege in this instance may be observed as being white and urban from a cultural perspective, and presumably from access to resources such as capital and land (Reynolds, 2014).

The third perspective for signing the *ready-to-sign* cultural contract is outlined by Drummond and Orbe (2010) as the normalization of race. Bringing it into context this suggests normalization of the urban farming and the use of technology therein as a main food production system for the urban population. In this instance, the managers of urban farming initiatives as well as those with access to urban farming technologies and training initiatives would promote the *ready-to-sign* cultural contract with regard to the adoption of technology for urban farming, and urban farming as a desirable economic activity without placing too much thought on the steeped divide in society, that is, the inequalities that may be at play. For individual participants in the urban environment, a *ready-to-sign* cultural contract may be signed in this instance for the psychological benefits of being associated with a modern trend in an environment that presents it as essential (Drummond & Orbe, 2010).

3.5.2 Quasi-completed

The *quasi-completed* cultural contract would imply individual farmer identities are partly open for negotiation when it come to maintaining the status quo of their current farming practice and establishing one's identity within established frameworks; in this instance, the individual farmer will still be given the opportunity to maintain his/her worldview of what farming as a practice should be and what it means to them although in an urban context (Drummond & Orbe, 2010).

Drummond and Orbe (2010) posit the *quasi-completed* cultural contract has two objectives which again I bring into the context of urban farming. The first objective is that of altering interpersonal or racial landscapes which suggests an example of technology being altered and changed to fit the specific local contexts (Ramadani, Kurnia, & Breidbach, 2018; Taguchi & Santini, 2019) by dominant groups which may be international organizations like the Food and Agriculture Organization of the United Nations (FAO) and the World Bank (Brinkley & Kingsley, 2017). Under this objective, individual farmers may temporarily settle for the use of technology for urban farming by virtue of being in the urban context, and for the recognition and benefits it yields; this is despite how they may not be fully understanding the *modernized* practice, particularly for those farmers that are used to conventional forms of farming. In this instance when the dominant groups realize the signing of this cultural contract, in the form of the adoption of technology for urban farming, they will continue to roll-out urban farming initiatives and seek to recruit individual farmers' participation therein. Technology adoption for urban farming will therefore continue for as long as there are no communicated differences in worldviews on the use of technology for urban farming. Supposedly, farmers who subscribe to conventional methods of farming, given the chance to explore new technologies, would modify the technologies and innovate the methods of urban farming.

The second objective is the objection to mis-categorizations which suggests a situation where individual farmers that esteem conventional farming methods refuse to accept the use of technology for urban farming under the reasoning that this particular mode of farming fails to describe them accurately. The objections to mis-categorizations represent attempts to resist the essentialization of technology for farming in urban spaces, such as rooftops and confined spaces (Drummond & Orbe, 2010).

3.5.3 Co-created

The *co-created* cultural contract implies that farmers' worldview of how farming is done in the urban context would be based on personal preferences or requirements. Both the use of technology for urban farming and the individual farmer's view on how farming should be done based on their individual cultural identities, will both be acknowledged and validated resulting in *co-created* cultural contracts. Initial understanding of participants' worldviews about individual cultural identity and their worldview on how farming should be practiced would be outlined from the onset in anticipation of a fruitful negotiation (Drummond & Orbe, 2010).

Farmers' automatic use of technology for farming when in an urban context, the openness for negotiation around the use of technology for farming in urban farming, and the mutual respect for personal preferences or requirements is based on the individual farmer's negotiation of identity.

The cultural contracts theory acknowledges variation of individual experiences of phenomenon as a result of dynamic individual cultural identities and is therefore used, in the current study, as a theoretical lens to answer the research questions:

RQ: How do individual cultural identities inform the differences in technology adoption among urban farmers in South Africa?

SRQ$_1$: What informs the individual cultural identities of urban farmers?

SRQ$_2$: How are the individual cultural identities negotiated for the adoption or rejection of technology?

3.6 Research Gap

Despite being successful in predicting human behaviour (Dwivedi et al., 2017; Taherdoost, 2018; Williams et al., 2015), the technicists' perspective on technology adoption has been challenged by the sociotechnical perspective which holds a social and collective viewpoint to technology adoption. A thorough knowledge of the interaction between individuals and technology, however, remains deficient in sociotechnical perspectives, which tried to bridge the gap between social and technical perspectives on technology adoption (Gruber, 2020). As a result, this body of research gives the impression that individual agency in the adoption of technology has not been considered (Bögel & Upham, 2018; Upham et al., 2020). Thus it offers an incomplete view of how technology adoption works on an individual level.

In particular, what has not been studied is how individual characteristics, such as an individual's cultural identity, influence technological adoption. I employ the cultural contracts theory to establish technology adoption as a highly individualized process.

Through a rare application of the cultural contracts theory in the management discipline, and the area of technology adoption in particular, the current study provides an alternative conception of technology adoption and its relationship with individuals from individual cultural identity perspective. The demands of the environment in which people interact compel individuals to continually negotiate and adapt their identities (Smaldino, 2019). According to Jackson (2002) the everyday experiences are defined through cultural contracts typologies, as individuals occupy roles in society.

Drawing inspiration from the theory, I, therefore, proposed an individual cultural identity lens to technology adoption. The cultural identity lens has demonstrated for intercultural scholars that there is a complex connection between cultural identity and various social environments. For Dickens et al. (2019) applying the cultural contract theory provided insights into how Black women navigate the workplace context through identity shifting strategies. Similarly applying the cultural contracts theory Peltokorpi and Zhang (2020) explained how corporate expatriates shape their new environments to their preferences, instead of adjusting to it in host countries. Although these perspectives too, inevitably, may be limited, they serve helpful in replacing the technicists' perspective to technology adoption, and provide an opportunity to overcome the limitations of the sociotechnical perspectives, to which I submit an individual level lens to cultural identity. To this effect I set out on examining the relationship between individual cultural identity and technology adoption to show the interrelationships between the two concepts and show why the phenomenon occurs, thus contributing to theory.

Case studies of how technology is being utilized in urban farming demonstrate how technology may improve urban farming projects while also enhancing income and food security (Council of Scientific and Industrial Research, 2022; Khonje & Qaim, 2019; "Urban and Peri-urban Agriculture Sourcebook," 2022). The incorporation of technological improvements into urban agriculture is critical to its success ("Urban and Peri-urban Agriculture Sourcebook," 2022); however, despite technological dissemination attempts done over time, urban agriculture projects in developing countries continue to lag, and agriculture remains a crucial primary economic activity for the majority of emerging economies (Taguchi & Santini, 2019). The current literature on urban farming and the use of technology is largely silent as to an understanding of *why* this is the case and while, through sociotechnical theoretical perspectives we have

started to recognize that technology adoption is a social process, we do not yet know how an individual's distinct identity will affect how they utilize technology and consequently *how* individual cultural identities inform the differences in technology adoption among urban farmers.

Studies by McGuire et al. (2015) and Burton et al. (2020) on the construction of farmer identities come close in trying to explain *how* framer identities are moulded and how this translates into the type of practice used on-farm. The focus of the studies, however, is on the socially constructed farmer identity versus the self-ascribed individual identity.

Phenomenography enabled me, as the researcher, to adopt a second-order perspective of the world to document how urban farmers experience technology adoption in a socially entrenched environment like urban farming. Therefore, I make no propositions to the study.

Chapter 4: Research design and methodology

This chapter outlines the research design and methodology used for the current study to understand how individual cultural identities inform decisions to adopt or reject technology in the urban farming context. The chapter unpacks the chosen research design, paradigm, approach, and methodology.

I take on a subjectivist approach viewing the reality of technology adoption as a product of the individual's perspective, believing that individuals are autonomous, independent, and creative to give meaning to their surroundings. Knowledge is a product of the individual as a result of personal experiences, making it important to explore individual understandings, and personal experiences of the world (Creswell et al., 2007). Such a choice influenced me to take on an interpretive focus that views phenomena as better understood through the meanings assigned by individuals who experience them and therefore implying that there can be multiple interpretations of the same phenomena.

4.1   Research Design and Paradigm

The study aims to gather an understanding of how individual cultural identities inform decisions to adopt or reject technology in the urban farming context. To this effect, qualitative research was adopted to explore the differences in urban farmers lived experiences and technology adoption in the urban farming context (Hajar, 2020; Marton, 2014). A phenomenographic research approach was used in the study to draw out multiple and diverse interpretations of reality, as experienced by individual urban farmers, and afforded me an exploratory opportunity to gather rich data and wide-ranging understandings of how people conceptualize a phenomenon. As a qualitative methodology, phenomenography seeks to solicit the descriptions of things from the perspectives of the individuals who experience them (Hajar, 2020) and lends itself to an interpretative paradigm (Åkerlind, 2012).

While phenomenography shares certain similarities with grounded theory as a qualitative research approach, exploring an in-depth understanding, employing an iterative process, and taking on an inductive approach, it is a distinct methodology with its own unique objectives (Stenfors-Hayes, Hult, & Dahlgren, 2013). Unlike grounded theory, which aims for theory generation, phenomenography focuses on identifying essential characteristics and variations of a phenomenon from individuals' experiences (Creswell & Poth, 2017; Kennedy & Lingard, 2006). As such phenomenographic analysis produces an outcome space (Åkerlind, 2012; Röing et al., 2018; Stenfors-Hayes et al., 2013;

Svensson, 1997), making the development of archetypes a logical output of the approach.

The researcher's beliefs about the world in which they exist or wish to exist are typically revealed by a research paradigm. A research paradigm establishes the intellectual assumptions and tenets that guide a researcher's worldview, and how the researcher as a result acts within that world (Kivunja & Kuyini, 2017). It is the theoretical lens through which a researcher considers the methodological aspects of their research project to determine the research methods that will be used and how the data will be analyzed. It is also the lens through which a researcher interprets the world (Kivunja & Kuyini, 2017).

I took on an interpretivist paradigm to study the phenomenon of technology adoption from an individual cultural identity perspective (Stenfors-Hayes et al., 2013); and consider reality as the individual urban farmers' experience of technology adoption in the urban farming context. The object of research is the variation in meanings the individual urban farmers bring to the phenomenon of technology adoption from their individual cultural identity perspectives (Marton, 2014).

The basis of phenomenography in the current study is that the individual urban farmer and the use of technology are not viewed separately. The individual urban farmers interviewed as participants in the study needed to have experienced the use of technology in their urban farming spaces, to convey their conceptions and understandings (Hajar, 2020) which depict the intrinsic relationship between the individual urban farmer and the use of technology as experienced in the urban farming context (Marton & Booth, 1997). For this reason, in phenomenography, reality and cognition take place through a person's comprehension (Hajar, 2020).

4.2   Research approach: Phenomenography

Phenomenography was first used as an empirical methodological approach in the education discipline (Marton, 1981; Pang, 2003) and later developed to be a theoretical-methodological approach (Åkerlind, 2012) aimed to study the difference in human meaning, and understanding of how individuals experience diverse phenomena in the world around them (Marton, 1981). Accordingly, phenomenography concerns itself with the descriptions of things as they appear to individuals.

4.2.1 Ontological assumptions in phenomenography

Phenomenography takes a relational, non-dualist view of nature. The internal sense-making of an individual and the external world within which the individual finds

him/herself are not posited as isolated entities (Säljö, 1997). The two worlds find their relation internally through the individual's perception of the world (Hajar, 2020). That is, "the only world about which individuals can communicate is the world they experience, and therefore, if a phenomenon is outside of their experience or awareness, then they do not know of its existence" (Hajar, 2020). In this study, the conception of technology adoption in the urban farming context is the internal relationship between the individual urban farmer and the use of technology as experienced in the urban farming context. The ongoing experiences and relationships of individual urban farmers with their urban farming world are what socially construct and reassemble their understandings of technology adoption from an individual cultural identity perspective (Lamb et al., 2011).

4.2.2 Epistemological assumptions in phenomenography

In phenomenography what counts as knowledge are the explanations of the experiences of phenomena as revealed by individuals (Prosser & Trigwell, 1999). Experiences of a given phenomenon change over time, and each one is unique to the individual (Hajar, 2020). To recognize the comprehensive picture of technology adoption in the urban farming context from an individual cultural identity perspective, the analysis will focus on the collective rather than the individual urban farmer's experience (Åkerlind, 2012). Phenomenography looks for differences in experiences and takes into account the fact that the same phenomenon may be conceptualized differently by different people and in different environments and settings (Hajar, 2020). The focus on the collective human experience helps create greater awareness of how the difference in individual experiences fit together to generate knowledge on the phenomenon.

Phenomenography adopts a second-order perspective that emphasizes the individual's understanding and ability to make sense of their environment, without having to make statements or assumptions (Marton, 1981). Phenomenography enabled me to enter into the urban farming spaces of the individual participants, explore their lived experiences with technology adoption, and draw out insights into how urban farmers perceive, experience, and conceptualize technology adoption from an individual cultural identity perspective (Hajar, 2020).

In the context of this study, phenomenography was used to shed light on the qualitatively different ways in which urban farmers experience technology adoption in urban farming. Marton (1981) mentions that phenomenography integrates the conceptual and the experiential. It integrates what is culturally learned by being part of a collective with the individually developed ways of relating ourselves to the world around us. Taylor and Usborne (2010) echoed that while the concept of individual cultural identity cannot be

understood in isolation from the cultural identity of the collective, the self is the focal point of cultural identity. Utilizing an approach that emphasizes the depth of a lived experience is extremely beneficial in this instance.

4.3   Unit of analysis

In phenomenography, a conception or way of experiencing phenomena is the unit of analysis (Collier-Reed & Ingerman, 2013; Pang, 2003). Phenomenography focuses not on the phenomenon itself but rather on the various ways in which people experience it (Pang, 2003). Studying the diverse ways in which people experience a phenomenon suggests paying attention to and capturing numerous elements of a phenomenon as it appears to and is experienced by individuals. How something is experienced institutes the research unit in phenomenography, therefore implying that phenomenographic research takes its point of departure in individuals (Limberg, 2012). The research study sought to focus on the individual urban farmer's experience of technology adoption in urban farming from an individual cultural identity perspective, to pay attention to how the use of technology in urban farming appears to and is experienced by individual farmers engaging in farming in urban areas, and further how the experiences further influence the decision to adopt or reject technology.

For the current study, data were collected through interviews from individual urban farmers as described in section 4.5.1 and transcribed verbatim and coded inductively for data analysis. The conceptions represent the qualitatively different ways individual urban farmers experience technology adoption in the urban farming space, and the analysis is done at a collective level (Åkerlind, 2012; Collier-Reed & Ingerman, 2013; Limberg, 2012) to answer the research questions:

RQ: How do individual cultural identities inform the differences in technology adoption among urban farmers in South Africa?

SRQ$_1$: What informs the individual cultural identities of urban farmers?

SRQ$_2$: How are the individual cultural identities negotiated for the adoption or rejection of technology?

Table 4.1 Summary Research Design and Methodology

Topical research context	Understanding how individual cultural identity informs decisions on technology adoption in urban farming
Research paradigm	Interpretivist
Nature of research	Exploratory
Research underlying theory	Cultural contracts theory
Research approach	Phenomenography
Data gathering strategies	Semi-structured interviews, document analysis (written accounts, images, social media posts)
Data analysis	Inductive

4.4   Population and sample

Collier-Reed and Ingerman (2013) and Svensson (1997) allude that phenomenography focuses on differences in experiences to maximize variation; and thus, encourage selecting participants who may experience the same phenomenon differently. Participants selected for a study should have experienced the phenomenon under investigation, which is essential to a phenomenographic approach (Svensson, 2016; Yates et al., 2012). Purposive sampling enabled me to identify and choose participants who have experienced technology adoption in the urban farming space (Collier-Reed & Ingerman, 2013; Starks & Trinidad, 2007).

4.4.1 Population: Urban Farmers

For the current research study, urban farming is operationalized as the practice of using technology to cultivate, produce, process, and distribute food in and around the city and peripheral areas of growing cities (Blasch et al., 2020; O'Sullivan et al., 2019; Yan et al., 2022). Urban farming projects in South Africa exist on a relatively small-to-medium scale (Pietersen, 2018), and are run mainly as initiatives of the government, non-government organizations, and/or the private sector to respond to socio-economic challenges such as inadequate food security and employment, particularly in urban spaces bearing in mind urban population density. Globally, urban agriculture has been recognized as a development instrument in developed countries and has since gained recognition as a development tool in developing countries ("Urban and Peri-urban Agriculture Sourcebook," 2022) for the improvement of livelihoods and the creation of employment for the urban population, food security, and environmental benefits (Brinkley & Kingsley, 2017).

4.4.2 Sampling criteria

Boon et al. (2007) mention that phenomenography employs purposive sampling to specifically seek out participants who have experienced a particular phenomenon to gather appropriate data to make up and give the full range of possible experiences of a phenomenon (Collier-Reed, 2006). To ensure the collection of the most varied and wide-ranging perspectives, a researcher using phenomenography and a purposive sample approach should have a precise criterion when choosing their participants. Trigwell (2000) and Dunkin (2000) recommend a sample size of 15 to 20 for phenomenographic studies so that variations in experience and perceptions can be discovered without creating an excessive amount of data to analyze, considering that phenomenographic interviews are quite detailed and lengthy. In support Åkerlind (2012), Stenfors-Hayes et al. (2013), and Limberg (2012) mentions that for a phenomenographic study a sample of between 10 and 30 participants is deemed sufficient.

The current study used purposive sampling, augmented by tapping into my personal networks, to identify a total of 38 potential participants over two phases of data collection (Annexure A). Participants were checked to ensure that they fit the definition of an urban farmer as operationalized in the study. Out of the 38 participants initially identified, 36 expressed interest in participating in the study. Six of these individuals did not consider themselves urban farmers, resulting in a total of 30 participants who fit the criteria. However, three of the 30 were unavailable for interview appointments, leaving 27 participants with whom interview appointments were scheduled. Eight participants out of the 27 did not show up for the interviews, reducing the number of available participants to 19, who were successfully interviewed for the study. Additionally, nine participants were excluded from the study as they failed to provide the required additional data sources, such as follow-up interviews, written accounts, images, and social media posts (Figure 4.1). Only ten participants provided comprehensive *rich* data in the form of initial and follow-up interviews, images, written accounts, social media posts, and in-person and virtual site visits. For that reason, the accounts of those ten respondents will be used for analysis (Table 4.2).

Data Funnelling
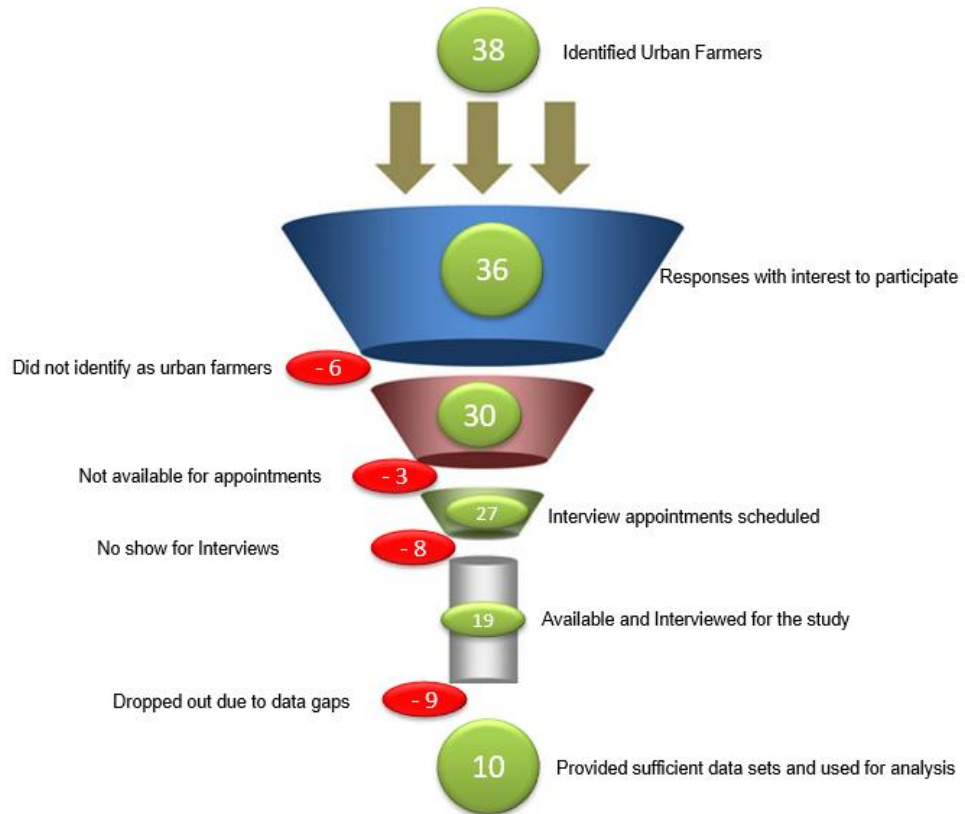
Figure 4.1: Data Funnelling

Table 4.2 Participant Profile

	Participant	Gender	Age	Technology	Farm Location	Urban Farm Practice		Initial Interview	Follow-up Interview	Additional Data Sources				
						Non-Independent	Independent			Images	Written Accounts	Social Media	Site Visits In-Person	Virtual
1	Participant **I**	Female	25-30	Bottles, Buckets, Unused Tubs, Tyres etc.	Western Cape, Khayelitsha	X		X	X	X	X	X		X
2	Participant **J**	Male	25-30	Hydroponics	KwaZulu-Natal, Northdale	X		X	X	X	X	X	X	
3	Participant **K**	Male	25-30	Aquaponics	Mpumalanga, Mkhuhlu		X	X	X	X	X	X		X
4	Participant **L**	Male	25-30	Shade netting and drip irrigation	Gauteng, Soweto		X	X	X	X	X	X	X	
5	Participant **AG**	Female	25-30	Shade tunnels, hydroponics	Gauteng, Braamfontein	X		X	X	X	X		X	
6	Participant **AF**	Male	25-30	Greenhouse tunnels, hydroponics	Gauteng, Braamfontein		X	X	X	X	X	X	X	
7	Participant **AH**	Male	30-35	Shade tunnels, hydroponics and open field	Gauteng, Randfontein		X	X	X	X	X	X	X	
8	Participant **P**	Female	30-35	Shade tunnels, hydroponics	KwaZulu-Natal, New Hanover		X	X	X	X	X	X	X	
9	Participant **M**	Male	25-30	Aquaponics	Gauteng, Midrand	X		X	X	X	X	X	X	
10	Participant **N**	Female	25-30	Aquaponics	Hekpoort, Gauteng	X		X	X	X	X	X		X

4.4.2.1   Sample variation: Technology

The sample which will be used for analysis in the current study represents ten urban farmers employing different technologies in the urban farming space for agricultural produce. The sample comprises urban farmers who are employed in private and/or community urban farming initiatives; independent urban farmers, the majority of whom received some form of financial support for technology upgrades and/or installation of new technologies to improve efficiencies in their urban farms; and independent urban farmers who self-funded their farming practice and sought for funding to supplement their investment along the way. Participants also varied in terms of the technology used, as defined by the individual urban farmers, in their urban farming practices. Hydroponic farming dominated the technology used by the participants, followed by greenhouses and other forms of technology farming such as aquaponics, tunnels, irrigation, shade netting, and bottles, tubs, tyres, buckets used as tools used in urban farming.

4.4.2.2   Sample variation: Cultural Identity

Location

The participants originate from six of South Africa's provinces, both inland and coastal: North West, Gauteng, Mpumalanga, KwaZulu-Natal, Free State, and the Eastern Cape province respectively. There was an equitable representation of participant origin between the Gauteng, KwaZulu-Natal, and Mpumalanga province respectively. The urban farm locations where the urban farmers are operating are spread across four of South Africa's provinces: Western Cape, KwaZulu-Natal, Mpumalanga, and Gauteng respectively near the provinces' cities and/or towns. Gauteng, as South Africa's economic hub, dominates in terms of farm locations, followed by KwaZulu-Natal. It is important to highlight that the study focuses on urban farming and not city farming and therefore to classify the farming activity as urban considers South African cities and towns.

The final sample comprised five males and five females, from six different cultural backgrounds: Xhosa, Zulu, Swati, Setswana, Ndebele, and Sesotho with one of the participants bearing a blend of two cultural backgrounds. The cultural backgrounds were drawn using the demographic questions. The Xhosa cultural background led the participant representation, followed by Zulu and Setswana, then Sesotho, Ndebele, and Swati respectively. The Xhosa, Zulu, and Ndebele cultures are closely related Bantu languages spoken in South Africa, and are categorized as Nguni by similarity of cultural practices. As an example, The Nguni follow patterns of patrilineal descent and rename married women with a clan name, recognizing chiefly lineages, which is not done across

any other cultural tribes. Nguni women were historically associated with hoe cultivation, while Nguni men were associated with cattle husbandry (Jimenez, 2020; Kotze, 2021). The Setswana and Sesotho cultures form part of the Sotho tribe, and share related cultural practices. The majority of Sotho groups have traditionally relied on both agriculture and animal husbandry, placing no particular emphasis on labour division (Krige & Krige, 2018). Participants' ages varied from twenty to thirty-five and it is safe to say the sample was predominantly youth.

Education

The educational background of the participants was somewhat similar with the majority of the participants in possession of a degree in agriculture-related studies followed by those with degrees in the engineering and built environment field. One participant was still busy with a degree in agriculture at the time of the interview and two participants only had the highest qualification as high school at the time of the interview.

4.5   Data collection

According to Collier-Reed and Ingerman (2013), the method used in phenomenography to collect data must provide in-depth information from the reflections of the sample participants' experience with the phenomenon. Interviews are the primary method of data collection in phenomenography (Creswell et al., 2012), although Limberg (2012) includes observations and document analysis as additional methods for data collection. For the current study, I used site visits for observations, participant written accounts, and images for document analysis.

4.5.1 Interviews

In phenomenography, interviews are the primary method of data collection (Åkerlind, 2012; Creswell et al., 2007; Stenfors-Hayes et al., 2013) and have equally been used commonly in qualitative studies taking on a cultural identity perspective (Gómez-Estern & de la Mata Benítez, 2013). Mincyte and Dobernig (2016), Trefry et al., (2014) and Yagi and Kleinberg (2011) used interviews to collect qualitative data in their studies on urban farming, and culture to draw individual perspectives on the phenomenon. Mincyte and Dobernig (2016) relied on semi-structured interviews to uncover how both employed farmers and volunteers in urban farming practices in the North American metropolis experienced their work and how this connects them to their authentic inner self, their community, the city, and nature. To understand urban agriculture's social benefits, Olivier and Heinecken (2016) used both structured and unstructured in-depth interviews

to record cultivators' real-world experiences on Cape Town's Cape Flats. The study findings revealed urban agriculture's contribution to food security and the building of social capital. When Roberts and Shackleton (2018) used interviews to investigate the dynamics and motivations behind urban community food gardens in medium-sized towns in the Eastern Cape, South Africa. Trefry, Parkins, and Cundill (2014), in addition, incorporated the use of a translator when conducting interviews with community members to provide support and ensure that participants can fully and comfortably express their individual experiences of the phenomenon clearly.

For the current study to explore and gain insights into the lived experiences of the urban farmers and their use of technology, semi-structured interviews were used for individual in-depth data gathering (Hajar, 2020). The interviews were in-depth, open-ended, and conversational allowing a flow such that no perspectives from the respondents are hampered, and I can draw insights into the dimensions of the phenomenon (Limberg, 2012; Stenfors-Hayes et al., 2013). Felix (2009) alludes to the nature of phenomenographic interviews being more in the form of dialogue. Hajar (2020) adds that phenomenographic interviews typically used semi-structured research questions with only a very few predetermined questions for follow-up, as most follow-up questions emanate from what the respondents say.

4.5.1.1   Phase One

One of the main challenges was conducting my research study during the COVID-19 global pandemic. Initial interviews took place virtually, via Zoom, and the interviews were automatically recorded on the laptop and stored on Google Drive as a backup; on other occasions, I had to use my mobile device to augment the Zoom recordings due to technical or connectivity challenges. Due to challenges in connectivity, the majority of the interviews were recorded in audio versus audio-visual format. For purposes of being present in the conversations, I made brief notes during the interview to aid with follow-up questions. The interviews were conducted in English although participants were also encouraged to express themselves in their language provided they felt comfortable doing so.

I provided an introductory context and allowed participants to freely describe their lived experiences in detail. The purpose was so to ensure that there is a shared topic between myself and the participants (Felix, 2009; Hajar, 2020). The introduction focused on the purpose of the interview and was comprehensive to ensure that participants understood the purpose of their participation and could communicate their lived experiences on the

phenomenon freely and honestly. I also allowed the participants to ask questions of clarity post the introduction to ensure that there is a joint understanding between myself and the participants, ensuring that participants were clear with what is asked of them without limiting the expression of their experience of the phenomenon (Lamb, Sandberg, & Liesch, 2011).

Each participant was asked to confirm if they were comfortable with a virtual interview, and were also allowed to choose the time that best suited them to participate in the interview.

I ensured that the interview questions were open-ended to allow the participants to reflect on their understanding of technology and its adoption from their lived experience in the urban farming space. Follow-up questions were used to gain clarity and to delve deeper into understanding the participants' experience of the phenomenon, particularly at the time of the research interview (Åkerlind, 2012; Lamb et al., 2011). The focus was on the participant's experience of technology in the urban farming context rather than the focus being on the individuals, the technologies, or technology adoption itself. The interview questions used to provide structure to the interview conversation and guide the current study are included as part of Appendix B and the interviews were recorded and transcribed verbatim (Collier-Reed & Ingerman, 2013; Cope, 2004).

There was no planned pilot interview as such, however, I undertook the first four research interviews following the questions as outlined in the interview schedule. The interviews were recorded and transcribed verbatim. After the first four interviews, I consulted my supervisors and faculty professor specializing in qualitative techniques, with the first transcribed transcripts, to assess whether I was soliciting appropriate data to answer the research questions under study. Advice was given on how I could enhance my interviewing techniques to gather richer data. To this effect, I also had to acquaint myself more with phenomenography as a research methodology, to honour the methodology. I invested time to study phenomenography as a methodology including the interviewing techniques to improve my interviewing techniques. Ashworth and Lucas (1998) encourage phenomenographers to avoid using prepared questions as much as possible; use questions with no answers; listen with empathy to understand and make sense of meanings; use nudges to follow up on the participant's thoughts about their lived experiences. give the participant a chance to elaborate, provide details, clarifications, and maybe even long discussions about their experiences. I followed the same practical steps to enhance my phenomenographic research data collection.

In phenomenography, codes and categories of description are derived from the participants' own words, stemming from and derived from the multiple repetitions found when reviewing the interview transcripts (Saldaña, 2013). For Phase 1, a total of sixteen interviews were conducted, with each participant interviewed only once. It is also important to highlight that the first four interviews were also included as part of the sixteen interviews that were transcribed. Each interview lasted 37 minutes on average, but varied from as succinct as 26 minutes to as long as 91 minutes depending on the conversation.

I did not wait until all the sixteen interviews were completed to start with the transcription. This allowed me time to reflect and to see how as a researcher I could enhance my interviewing techniques to be able to draw out rich data from the participants. Initially, I opted to self-transcribe the research interviews, the first four interviews in particular. This enabled me to be in tune with the data as the participants shared their lived experiences and I was then able to follow the emergence of new conceptions. Realizing that self-transcription was time-consuming, I opted for paid transcription for the remainder of the interviews which proved more viable equally eliminating the risk of data inaccuracy that may have possibly occurred from using transcribing tools or applications, caused by sound quality, vernacular language transcription, accents, and unrecognizable names. The process also minimized the editing process, although there were sections where the transcriber flagged as *inaudible*, and I had to make corrections following through the transcriptions to ensure that everything was recorded accurately with no bias. I still ensured that I revisit the transcripts word-for-word whilst listening to the audio to ensure that the transcription captured the interview conversations verbatim and this also allowed me to be in tune with the data. The process aided with personal reflections and bracketing as outlined in section 4.6.3. The majority of the transcriptions were significantly accurate.

The data analysis process, which started in mid-July 2021 with Phase one interviews, continued through the end of April 2022 with data analysis, interpretation, and conception identification, and ended in mid-June 2022 with the production of the outcome space.

4.5.1.2   Phase Two

Being cognizant that identity is an evolving concept, and to enhance the data collection process, I returned to nine participants interviewed in Phase 1 who proved amenable to be interviewed, with transcripts of the discussions. I shared the transcribed research

transcripts and the audio recordings with the individual participants and asked them to reflect on these, mentioning that I have additional questions and would like to re-interview them. Of the nine participants, seven follow-up interviews were conducted successfully. For the follow-up research interviews, I employed the interviewing techniques which I subsequently used post the initial four interviews. Due to the circumstances of working within a small population, and thus the difficulty of finding respondents, I also opted to further expand the sample by revisiting a similar sampling criterion as outlined in section 4.4.2, and interviewed three additional participants for initial and follow-up interviews. Similarly, I requested additional data sources from the participants in the form of written accounts, images, and to use the participants' social media posts.

Although Phase 2 of the data collection process still took place under COVID-19 restrictions, during this phase the restrictions had been eased down to Level 1 which allowed me as the researcher to propose in-person follow-up interviews and site visits. Participants were distributed across four provinces in South Africa: Western Cape, KwaZulu-Natal, Mpumalanga, and the Gauteng province respectively. The details of the interviews and site visits are outlined in Table 4.2.

4.5.1.3   Additional data sources

I requested additional data sources in the form of written accounts, images, and social media posts to delve deeper into the participants lived experiences. The written accounts are discussed in the subsequent section. Marton (1986) recognizes written accounts as an additional source of information through which researchers could understand how people conceive different aspects of their world. In the context of the current research study, social media posts are included as an additional source of information through which I could understand the individual urban farmers experience and make sense of different aspects of their world of technology adoption in the urban farming space. Social media posts are also discussed in the subsequent section, as part of written accounts.

Phase two of the collection of additional data commenced on the 13th November 2021 to the 30th January 2022, an approximate one-and-a-half-month period. All-in-all and to ensure data consistency, a total of ten follow-up interviews were conducted; all ten participants were interviewed twice. I also used one of the participant's media interviews as an additional interview to ensure consistency in the data sources. On average, each follow-up interview lasted 45 - 50 minutes, although the interviews still varied as succinctly as sixteen minutes to as long as one hour and twelve minutes as directed by

the conversation. An interesting observation was that most of the follow-up interviews lasted longer than the initial interviews. I again opted for paid transcription.

4.5.2 Written Accounts

Each urban farmer was requested to give a written account of his or her experience of technology adoption in the urban farming space. This was done so that the participants can be offered a reflective opportunity and share details about their lived experiences that they may have missed during the interviews. Secondly, this was done to afford participants who felt more comfortable articulating themselves in writing than in speech, an opportunity to do so. The request to the urban farmers was that they should express themselves freely in writing about their lived experiences of technology adoption in the urban farming context. Initially, there were no predetermined guidelines on how the written account should flow, other than the encouragement for the farmers to be as open as possible in their accounts. Some participants, however, expressed that they would appreciate guidelines with regards to what the written account should contain. To ensure that the written accounts are aligned to other research tools used in the current study, I shared pointers related with the questions in the interview schedule, which were developed with the intent to collect data that will help answer the research questions.

The request for participants to share written accounts was made to all ten participants whose data are used in the analysis. All ten participants responded with written accounts of their experiences of the phenomenon. An interesting observation was how the majority of the urban farmers, regularly, share their experiences through social media posts. This encouraged me to consider social media as an important data point as I discuss in the subsequent section.

The variation in the written accounts emerges in the uniqueness of perspectives on how each individual reflected on the lived experience of the phenomenon under study. The written accounts supplemented the interviews, adding to the richness of the data on the phenomenon under study, and are included in Appendix E.

4.5.3 Social media posts

Byrne (2017) mentions that 21st-century researchers encounter new methodological challenges with the inclusion of social media in their research processes. He adds that social media platforms provide qualitative researchers with a wealth of data because they provide a unique window into the lives and interactions of their users. Social media, LinkedIn in particular, served as instrumental in the identification of potential participants.

For the current research study, social media posts are included as an additional source of information through which I could understand how the individual urban farmers experience and make sense of different aspects of their world of technology adoption in the urban farming space. The ten participants whose views are used in the analysis of the study each have social media posts and screenshots of these have been included in Appendix F.

4.5.4 Observations

Participant observation comprises interaction by the researcher with the participants in the social environments of the participants (Stainback & Stainback, 1984). The idea is to allow the researcher, taking on the role of an observer, to study first-hand and within close-range the daily experiences of the participants in their respective settings, and, if necessary, to engage them about their lived experiences and meanings derived from these experiences. In the current study, observations consisted of images taken during the site visits to the urban farms, particularly the in-person site visits. As Waddington (2004) suggests it is important to define the form of observation the researcher will undertake in the field. In the case of the current study, I took on the role of "observer-as-participant" (Waddington, 2004) whereby I maintained contact with the participants by asking occasional questions as I toured and observed the operations within the urban farming practice, without concealing the intentions to observe.

Seven of the site visits were done in person at the participant's urban farms. The participants took me through their farming practices explaining the processes and technicalities involved in running their operations.

The urban farms varied in terms of the technologies used and therefore each visit entailed unique interactions by the participants with the technologies or tools within the urban farming practices. Images and in some cases video links are included to illustrate the observations (Appendix G). For the three virtual site visits, the participants provided explanations of their practices and the technologies or tools used in the urban farming practices. Details of the observations are outlined in Table 4.2.

4.5.5 Saturation

Phenomenography does not pronounce saturation because as a methodological approach it aims to understand individuals' lived experiences with phenomena from their perspective. Reed (2006) maintains that the extent of the variation that has been

captured during the interviews can only be seen by the researcher during the process of data analysis.

Dahlgren (1995, as cited in Åkerlind, 2003, p.54) suggests that ten is a sufficient sample to capture variation, provided the sample is selected, from the onset, to maximize variation. For the current study, the objective was to obtain maximum variation in the individual participant's lived experiences. The object of research is the different meanings the individual urban farmers bring to the phenomenon of technology adoption from an individual cultural identity perspective, at a collective level (Marton, 2014).

4.5.6 Ethical considerations

The level of depth of phenomenographic interviews gives rise to ethical concerns. Ethical issues are critical in any qualitative research approach due to their complex, sensitive, and comprehensive nature. Collier-Reed (2006, p. 45) argues that although the process of probing through follow-up questions is essential in phenomenographic interviews in order to examine a variety of aspects of a participant's experience of a particular phenomenon, the process is frequently intimidating and may cause participants more anxiety than other qualitative interview methods. Francis (1996) urges phenomenographers to consider interviewees as reporting subjects rather than interrogated objects.

Before the beginning of each interview, I developed informed consent statements that I read verbally with each participant (Appendix C). The statements provided comprehensive information about the study's purpose, the information participants would be required to provide, and the time commitment each participant would be expected to make. When a request was made to the organizations to help identify urban farmers who would be willing to participate in the research study, the approved Ethical Clearance was shared (Appendix D). Participants were reminded, before the start of the interview, that their participation is voluntary and they had the option to stop the interview at any time should they wish to do so (Rovio-Johansson, 2017). This was done to avoid any misunderstandings between the researcher and participants. All interviews were conducted in English and participants were allowed to make expressions in the language they felt comfortable in if they felt the need to do so.

Throughout the interviews, it was clear that the participants could understand and express themselves in English although there was one participant who mentioned that she is not good in English although she will respond in English for the interview. The participant did not seem to struggle in any way to speak or comprehend English,

however, some expressions were made in their home language and the participant would confirm whether I understood what was being communicated. Something worth mentioning is that during the in-person interviews and site visits, some of the participants felt more comfortable speaking to me in their native language. These were the most difficult interviews to transcribe, and I had to get an independent transcriber to first transcribe verbatim in the native language and then request for translation into English.

No one was harmed as a result of their participation in the interview, and no incentives were provided for participation. The organizations I reached out to in search of individual urban farmers to participate in the study, and the participants that participated in the research study were guaranteed anonymity therefore the individual urban farmers will not be identifiable based on any of their verbatim interview quotations or the write-ups that will proceed based on those quotations (Rovio-Johansson, 2017). In a phenomenographical research approach, data are collected from individuals, the unit of analysis is a conception by the individual and analysis is at the collective level which are the conceptions of the individual urban farmers interviewed (Åkerlind, 2012; Collier-Reed & Ingerman, 2013; Limberg, 2012). The names of the participants are not included in any of the discussions of the results. The data collected has been stored electronically and transferred to an access-controlled Cloud for safekeeping.

4.6   Data Quality

The data was analysed systematically following the data analysis steps as outlined by Sjöström and Dahlgren (2002) and explained in detail in Section 5.3 to ensure validity and reliability of the data.

4.6.1   Validity

In the current study, the follow-up interviews helped to ensure that I further explore the relationship between conception as understandings, meanings, and verbal expressions (Sin, 2010). The discussions of the follow-up interviews were guided by what the individual participants voiced as conceptions and understandings from the initial interviews, and similar to Anderberg (2000) the approach for phenomenographic follow-up interviews was such that participants' conceptual meanings were clarified and confirmed methodically to obtain valid data. Observations from the site visits also aided to confirm the individual meanings, understandings, and conceptions formed and enacted by the individual participants in their environments. I would occasionally ask questions to verify what the participants' meant in conversation by asking them to point

to or demonstrate the same. This was done to ensure that there is clarity in participants' conceptual meanings and the same is confirmed methodically to obtain valid data.

4.6.2 Generalizability

Generalizability beyond the context within which the study is carried out stands as a limitation, however, although the results of the current study will be specific to the context of urban farming in South Africa, the findings can be transferrable to similar contexts (Lamb et al., 2011). To address this, I used purposive sampling, and tapping into my personal networks as sampling approaches to identify ten participants with maximum variation (Table 4.2).

4.6.3 Reliability

The reliability of a phenomenographic methodology in the current study is addressed primarily through bracketing. The main objective of phenomenographers is to go into the everyday experiences that make up an individual's world to explore their lived experiences of a particular phenomenon (Hajar, 2020). Marton and Booth (1997) urge researchers taking on a phenomenographic research methodology to bracket personal experiences of the phenomenon under study, to avoid having the researcher's prior knowledge of a phenomenon influencing the direction of the research.

Bracketing in phenomenography necessitates that a researcher does not impose predetermined ideas (Marton, 1994), suspends judgment (Marton & Booth, 1997), and does not pre-categorize the data while conducting the interviews (Ashworth & Lucas, 1998). In this case, I avoided shaping the categories of description through bias, therefore permitting the participants' conceptions of the phenomenon under study to be discovered. Taking into cognizance how important bracketing is in phenomenographic research, (Richardson, 1999) advises that phenomenographers should minimize assumptions and adopt a second-order perspective, and define the world as experienced by the individuals interviewed. Phenomenographic data collection, therefore, becomes a process of discovery (Ashworth & Lucas, 1998).

Although I went into the field with an interview schedule to guide and provide structure to the interview, I sought to ensure that the interviews were as conversational as possible, making use of minimal questions prepared in advance. The interviews were in-depth, and open-ended questions helped to facilitate the conversational flow such that no perspectives from the respondents were hampered. The objective was to listen empathetically to hear the meanings, interpretations, and understandings of the

respondents to draw insights on the lived experiences of the participants' awareness and reflection of the use of technology in the urban farming space (Limberg, 2012; Stenfors-Hayes et al., 2013). Details of the interviews are explained in section 4.5.1.

Ashworth and Lucas (2000) indicate that to completely bracket and lay aside the researcher's previous knowledge and experience is near impossible. To my advantage, I had no prior experience with urban farming and therefore a lot of the insights shared were new, particularly with regard to the processes and the types of technologies used. However, as indicated by Ashworth and Lucas (2000) in phenomenography the researcher's selection of critical cases, and in this instance individuals involved in urban farming, predominantly reflects the assumptions already built into the intuitive likelihood probability of the researcher. For instance, the study's purposive sampling method allowed me to select participants who were known to have experienced the phenomenon under investigation (Collier-Reed & Ingerman, 2013; Starks & Trinidad, 2007). It is unlikely that a researcher could ever be, a blank canvas on which participants paint their experiences (Hajar, 2020). As recommended by Ashworth and Lucas (2000), to bracket, I kept reflection notes post some of the interviews as new insights emerged, to consciously silence judgments, pre-assumptions, and possible unconscious bias before commencing with subsequent. Adawi et al. (2001) advise the researcher should examine his/her own beliefs, judgments, and practices during the research process by indicating their understanding of the entire research study and seek ways to avoid controlling the data and analysis on already predetermined paths.

4.6.4 *Trustworthiness*

As a phenomenographic researcher I sought to control and check the interpretations at every stage of the research process; from the research questions to ensure that they were able to solicit the correct data to respond to the phenomenon in question (Sandbergh, 1997). To ensure the trustworthiness of my qualitative research, I followed a stepwise replication approach (Jackson, Drummond, & Camara, 2007; Pratt et al., 2019). I reviewed my research questions and interview approach with my supervisors and faculty, receiving valuable feedback to refine and ensure the accuracy of data collection. This process guarantees the credibility and reliability of the study's findings.

The participants were selected across multiple contexts, ranging from individual farmers forming part of various urban farming initiatives and those that operate independently as explained in section 4.4 to allow for variation of descriptions (Stenfors-Hayes, Hult, & Dahlgren, 2013); and also minimize the potential for bias. Eraut (2004) mentions that the selection of participants across multiple contexts helps to reduce any unintentional bias

on the side of the researcher. I also aimed to build a relationship with the participants before the interviews to ease them into the process of data collection. This was mostly done through friendly interactions via WhatsApp, asking about some of their status updates, with those that felt comfortable sharing their WhatsApp numbers.

During the interview process, I also sought to ensure that participants were clear with what is asked of them without limiting the expression of their experience of the phenomenon (Lamb, Sandberg, & Liesch, 2011). The interviews were designed to be in-depth, open-ended, and conversational to allow a flow such that no perspectives from the respondents are hampered, and to help me draw insights into the dimensions of the phenomenon (Limberg, 2012; Stenfors-Hayes et al., 2013). Follow-up questions were used to gain clarity and to delve deeper into understanding the participants experience of the phenomenon, particularly then (Åkerlind, 2012; Lamb et al., 2011). An interview schedule was used to provide structure to the interview conversation, and the interviews were recorded and transcribed verbatim (Collier-Reed & Ingerman, 2013; Cope, 2004). The outcome space is reinforced through the use of specific quotations as transcribed from the interviews to ensure that interpretations are anchored in participants' experiences (Lamb et al., 2011).

To further enhance the trustworthiness, I integrated the step of member checking into the study (Jackson et al., 2007; Pratt et al., 2019). After conducting interviews with nine participants during Phase 1, who willingly agreed to be interviewed, I transcribed the discussions and shared both the transcribed research transcripts and audio recordings with each individual participant. I asked them to review and reflect on the content to ensure the accuracy and correctness of the interpretation of their responses. By incorporating member checking and conducting thorough research, the study's findings are strengthened and made more reliable.

4.7 Limitations

One of the main limitations of phenomenography is generalizability beyond the context within which the study is carried out (Lamb et al., 2011) and is addressed in section 4.6.2.

The second limitation was the participants' understanding of the concepts used in the study. As an example, some participants expressed sentiments of not understanding the concept of cultural identity during the demographic questions and therefore not knowing how to identify themselves in this regard. A different approach was used to draw insights

into the individual participants' cultural identities, such as asking the participants to talk about their background.

Third, working within a small population of urban farmers posed a limitation in identifying participants to interview for the research study. The existence of urban farming projects and urban farmers as such in South Africa exists on a relatively small-to-medium scale. As a result, I asked the participants to refer me to other urban farmers within their networks.

Fourth, the location of the urban farmers posed a challenge in terms of accessibility and I, therefore, had to opt for proposing virtual interviews and site visits in some instances to ensure data consistency.

4.8   Summary of the research design and methodology

The current study used phenomenography to explore the phenomenon of technology adoption from an individual cultural identity perspective within the urban farming context in South Africa. Data were collected through semi-structured interviews with ten urban farmers across South Africa. Through the phenomenographic approach, valuable insights into diverse individual experiences with the phenomenon were gained, informing subsequent data analysis and interpretation. Consequently, the development of archetypes emerges as a logical outcome within the phenomenographic approach. Chapter 5, details the phenomenographic data analysis process.

4.9   Personal Reflections

Reflecting on the Ph.D. journey my identity has shifted from being solely a professional to being a student, then a researcher, and evolving further into a scholar. The Ph.D. has challenged my worldview of research through interactions with global scholarship literature, faculty, and peers.

I started with limited knowledge of the phenomenon and urban farming context within which the study was situated. Studying literature on the phenomenon became the frame through which I entered the world of urban farming in South Africa, and wore a Western lens to the phenomenon of technology adoption and the research study concepts. Situating the study in the African context, I had to humble myself to learn from the perspectives of the participants. Through interaction, all that I thought I knew about the phenomenon was challenged – an emotional experience to surrender to a different worldview. A learning for me was that to achieve a particular objective, identity negotiation is inevitable, and in my case, I had to surrender to respect and accept

worldviews different from mine for an inductive inquiry. What counted as knowledge were the explanations of the experiences of phenomena as revealed by individuals, and experiences are different for each individual thus concepts of the same phenomenon may be conceptualized differently by different people and in different environments and settings. The variation embedded in the South African context sprouted shoots of rich insights which could have otherwise been missed had the study been conducted in a Western context, and I believe scholarship stands to gain from a locally connected research, conducted in an African context by a scholar who is locally connected. Some of the lingering insights are:

Technology and its adoption are to an individual as conceptualized by them:

> *"A shade net is technology; so, I'm just saying that sometimes, you know, we will try to overcomplicate what technology is. But basically, it enhances or makes life better, it's a tool or whatever that can be used."*

And context is everything:

> *"When we started then 2019, we thought that, so we were indoor farming, indoor growing under lights. That was so flashy and so interesting. But then, but like we actually saw the African reality of urban farming, uhm whereby, you know, it would be nice to have lights but you know, the reality of it, it's that Africa has the most sunlight of all your continents."*

> *"There are no rooftops here for you to be plugging."*

And perhaps the age demographics matters:

> *"Firstly, I want to say to you I'm still primitive … listen very carefully to what I am going to say. During my time when we were doing mathematics we were not allowed to go with a calculator in an exam room. That's point one. Point two, if I have to start using technology, I must first start with a scientific calculator which I cannot use … it's difficult for me to use … Now, I must first start by asking (my assistant) to teach me how to use a scientific calculator from there he must come back and teach me how to operate a computer as I said I'm primitive. Now technology is … that's why I have (my assistant) next to me … He's the one who is using technology, you can ask him about those … I'm not familiar with that."*

The Ph.D. journey has been for me shaping my thesis and contribution to the body of knowledge, as it has been to my identity and character. Because multiple identities of

being a professional, student, researcher, and scholar functioned simultaneously within the context of the Ph.D. journey, they had to also be negotiated simultaneously.

Reflecting on my own cultural identity situated in South Africa, I am of the Sepedi culture with roots in rural Ga-Marishane in the Limpopo province, with branches of urban Polokwane in the Limpopo province, and urban Tshwane in the Gauteng province; leaves from international exposure, and growing KwaZulu-Natal province barks on me. In parallel, I am negotiating the self through being a professional, student, researcher, and scholar to ascribe the sense of self through which I will continue to navigate the world.

Chapter 5: Data analysis

The current research produced a thorough description of the qualitatively different ways that individual urban farmers in South Africa experience the use of technology in the urban farming space. Eight dimensions that inform individual cultural identities, namely cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity emerged from the participants' responses and served as sensitizing concepts guiding the exploration of their cultural identity experiences in relation to technology adoption. By examining the degree to which the identified dimensions influenced cultural identities regarding the adoption or rejection of technology, four archetypes of technology adoption emerged: Strategist, Adaptavist, Innovationist, and Traditionalist. This explains the inter-relationships between cultural identity and technology adoption helping to answer the research question and sub-research questions. Details of the analytical procedure are provided in the following section.

5.1   Phenomenographic analysis

Yates et al., (2012) mention that there is no single approach to analyzing phenomenographical data, however, phenomenographical analysis should consider the principles of putting off any predetermined interpretations about the categories of description. The analysis should focus on the variation of experience; therefore, the interview transcripts and emerging categories of description in the current study were viewed from the individual transcripts. The objective was to explore meaning or variation in meaning throughout the interview transcripts (Åkerlind, 2012; Yates, Partridge, & Bruce, 2012). The process of phenomenographical analysis is iterative between what the researcher understands, the nature of the phenomenon being studied and the distinctiveness of the data available from the participants (Yates et al., 2012).

The outcome of analyses in phenomenography is the variation in meaning and experiences of a given phenomenon (Stenfors-Hayes, Hult, & Dahlgren, 2013). According to Collier-Reed and Ingerman (2013) the researcher can only know the extent of the range of experiences when a phenomenographical analysis has been completed. For the current study attention to the individual experience was kept by looking at the transcripts and the emerging categories of description individually (Yates, Partridge, & Bruce, 2012). The outcome analysis for the current research study is a detailed account of the variation of descriptions and meanings drawn from individual urban farmers'

experiences of technology adoption in urban farming, South Africa, from an individual cultural identity perspective.

Phenomenography offers a collective way to understand how a phenomenon is experienced once the data has been analyzed (Collier-Reed & Ingerman, 2013), although the individual experiences are different (Åkerlind, 2012). During data analysis codes and categories of description are derived from the participants' own words, and multiple repetitions are found when reviewing the interview transcripts (Saldaña, 2013). The exercise demands continuous sorting and resorting of the data, comparing data between categories, and re-establishment of categories by the researcher (Åkerlind, 2012; Lamb et al., 2011).

Based on the internal and structural interactions between the categories, phenomenographic analysis produces an outcome space (Åkerlind, 2012; Röing et al., 2018; StenforsHayes et al., 2013; Svensson, 1997).

5.1.1 Transcription

For phenomenographic analysis, the transcripts of the verbatim interviews serve as the starting point (Ashworth & Lucas, 2000; Booth, 1997; Marton, 1986). Although transcripts must be transcribed exactly, it is not necessary to transcribe inflections, tonal changes, or pauses that may have occurred during the interview because the transcription process focuses on ensuring that the exact spoken words are transcribed (Collier-Reed & Ingerman, 2013).

The review process took approximately two hours on average per transcript. In addition, I undertook additional research to ensure that I accurately captured the industry-related jargon and spellings including phrases articulated in vernacular language to clean up each transcript before starting with the coding process. The transcription process took place parallel to the data collection phase, ending in February 2022. Transcripts were exported in Word format for coding using Atlas.ti.

5.1.2 Interpretation

Verbatim transcription of spoken words by the participants is the key focus for interpretation in phenomenography (Åkerlind, 2012; Marton, 1981). In the current study, I paid careful attention to the use of words by participants when expressing interpretation and meaning of experiences including in their native language, although this was not dominant as the interviews were conducted in English. I deemed the vernacular expressions as important in participants' responses and these were also recorded as

such, verbatim (Sjöström & Dahlgren, 2002). According to Mugler and Landbeck (1997), it is helpful to consider how participants use words and the meaning inferred, and the context in which they are used. For this research, this was an important aspect to consider in deriving meaning, particularly from a cultural identity perspective (Mugler & Landbeck, 1997).

Whilst looking for differences, commonalities, complementary information, and writing summaries are common practices in qualitative research (Åkerlind, 2012; Marton, 1981); phenomenography data interpretation includes looking for distinct interpretations of experience (Booth, 1997; Marton, 1986). I ensured to keep an open mind when listening to interview responses without trying to control the data (Åkerlind, 2012). The transcription included marking statements of interest of individual experiences as they relate to the phenomenon, and collating these to draw the meaning of the phenomenon as per participant's experiences (Collier-Reed & Ingerman, 2013).

Phenomenographic data analysis aims to identify and discern the participants' different experiences of a phenomenon. This process is guided by the research questions (Marton, 1986). In this study, I sought to follow the data analysis steps as outlined by Sjöström and Dahlgren (2002) namely familiarisation, compilation, condensation, grouping, comparison, naming, and contrast comparison of categories.

For familiarization, I read and reread the interview transcripts to immerse myself in the data and understand the conceptions of technology adoption, by the participants (Marton & Booth, 1997). Repeatedly reading the transcripts provided a broad overview of the conceptions by the participants and the embedded meanings. I made notes as I worked through each transcript correcting errors in the transcripts either in the form of grammar or errors recorded as inaudible in the transcripts. This meant, in some instances, contacting the participants, as member checking, to clarify meanings as intended by the individuals (Jackson et al., 2007; Pratt et al., 2019).

Compilation involved reiteratively reading and rereading the transcripts throughout the process to identify the most significant elements in the responses given by each participant, and compiling these to a certain question (Marton & Booth, 1997; Sjöström & Dahlgren, 2002). The open-ended nature of the phenomenographic interview questions made this a rather challenging task, as I had to identify the elements in participants' replies that help answer a particular question. This step was done manually on a Microsoft Excel spreadsheet, to identify the most significant elements to respond to a certain question in the interview schedule. This iterative process enabled me to think about participants' usage of words and the implied meaning of concepts within the

context in which they are used rather than making assumptions about the intended meaning. Mugler and Landbeck (1997) believe that this is a crucial aspect, particularly when conducting research across cultures. According to Svensson (1997), similar ideas can be expressed in different ways, and different ideas can be expressed in the same way.

After manually coding the transcripts I noted that I was actually coding deductively to try and organize the data. For example, the temptation was to use the inferred categories that emerged from the initial transcription such as *educational background* as a code to which then I deductively coded the subsequent transcripts. This was noted, and methods were developed to guarantee that all transcripts were coded using phenomenographic-aligned inductive coding. To become more familiar with different coding techniques, Saldana's (2009) coding manual, Sjöström and Dahlgren's (2002) guide on phenomenographic coding steps, and lessons on Atlas.ti coding were reviewed. I subsequently used Atlas.ti to assist with the coding at the most granular level of detail.

I exported the transcripts in Word format for coding onto Atlas.ti. At this stage, I was already familiar with each transcript. One additional review was done per transcript before I commenced with the coding. The initial and follow-up interviews meant that each participant had two transcripts, which were combined and looked at as one transcript per participant. I revisited and carefully considered the research questions and interview schedule questions to look out for possible concepts or terms used by the participants that can be used to answer the research questions. This process involved reflecting on the underlying meaning behind concepts of individual cultural identity, technology, technology adoption, and individual conceptualizations; and reflecting on the meaning of the research questions and participant articulations from the transcripts.

At this point, I was not looking for themes but used broad concepts to create a mental image of the research questions and possible answers from the transcripts. The codes generated for the analysis process emerged directly from the participants' own words (Sin, 2010), and throughout the analysis process, each transcript was given the same level of importance (Lamb et al., 2011). As I coded each of the twenty transcripts, I kept an open mind, making it possible to generate as many codes as possible to capture each participant's unique responses. I looked at the most critical part of each of the participant transcripts and further reflected on what these answers or concepts could mean (Booth, 1997; Marton, 1986). I used the Atlas ti function for open coding, which allows for an inductive approach in terms of analysis, to create codes. The goal was to gather codes that would then form the basis of the compilation of answers through grouping (Booth,

1997; Collier-Reed & Ingerman, 2013; Marton, 1986). In the end, 811 unique codes were created (Appendix H).

The codes were further condensed to find central parts of larger answers. (Sjöström & Dahlgren, 2002). For example, the quotation *"… in farming, when you want to farm, you must go big. Don't plant for the sake of saying that I'm just planting … and from there be able to go out to market your product"* was condensed using a descriptive phrase to *"farm big to market your product"*. Different codes were further condensed into a shorter list according to similarity (Sjöström & Dahlgren, 2002). Similarly, the quotation *"Now, I don't just look at hydroponics or aquaponics as my focus, you know, I just look at farming that makes profit"* was condensed using the descriptive phrase *"farming for profit"*. Initial codes that mean the same thing were condensed and renamed into one code. The example quotations were condensed into one ultimate code *"urban entrepreneurial and profit-driven identity"*. Phenomenographic interpretations are summarized into categories of description, or conceptions, which represent the collective understanding of participants' experiences as well as a limited number of qualitatively distinct ways in which a studied phenomenon can be understood (Åkerlind, 2012; Collier-Reed & Ingerman, 2013; Larsson & Holmström, 2007).

Similar responses were grouped after multiple iterations of rearranging the codes, resulting in conceptions with clearly defined margins and characteristics (Åkerlind, 2012; Booth, 1997; Marton, 1986; Neuman, 1997). During the first round of categorization, six high-level themes were created in order to group similar codes, and these were identity, technology, type of farming, educational background, location, and vocation. In most cases, one or two more sub-categories were also included to start breaking down the codes into more manageable data pieces. As an example, identity was further broken down into ethnicity, beliefs and cultural values. Using the code previously mentioned as an example, *"… in farming, when you want to farm, you must go big. Don't plant for the sake of saying that I'm just planting … and from there be able to go out to market your product"* then became cultural value │ commercialization │ business and entrepreneurship │ *"farm big to market your product"*. In the second round of categorization, additional subcategories based on emerging major themes were added.. The example code became cultural value │ commercial identity │ value for profit │ business │ produce to sell │ *"farm big to market your product"*.

The quotations drawn from the individual transcripts demonstrate each conception, and these were further checked to ensure that they fit within these conceptions (Marton, 1986). This process requires thoughtfulness in that new features, links, or dimensions

may emerge during the process (Åkerlind, 2012; Ashworth & Lucas, 2000; Booth, 1997). The categories of descriptions reflected the experiences of the participants, and were therefore be based on the accuracy (Ashworth & Lucas, 2000). During the data analysis the categories of description, or conceptions, are not identifiable with any of the individuals and no single conception represented the singular views of individuals (Brew, 2001; Collier-Reed & Ingerman, 2013).

The third and final round of categorization followed a similar process. The example code became cultural value │ urban entrepreneurial and profit-driven identity │ value for profit │ entrepreneurship │ produce to sell │ *"farm big to market your product"*. During the final round of categorization, the example code ended up as cultural value │ urban entrepreneurial and profit-driven identity │ value for profit │ entrepreneurship │ produce to sell │ *"farm big to market your product"*.

I then renamed the grouping or categories that refer to the same conceptualization (Dahlgren & Fallsberg, 1991). Finally, I described each category to ensure that each group is distinct. Eight dimension that inform individual cultural identities were identified to be cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity, and four archetypes developed; Strategist, Adaptavist, Innovationist, and Traditionalist helping to answer the research question and sub-research questions.

Traditionalists in the South African context prioritize sustainability and organic farming as essential aspects of their cultural heritage, upholding harmony with nature and community well-being for generations to come. These practices embody a harmonious relationship with the environment, underscoring their integral role in traditional culture.

Table 5.1 Code Changes

Stage	Result
Quotation	*"… in farming, when you want to farm, you must go big. Don't plant for the sake of saying that I'm just planting … and from there be able to go out to market your product"*
Original Quote (Condensation)	*"farm big to market your product*
Round 1 Code	cultural value │ commercialization │ business and entrepreneurship │ *"farm big to market your product"*
Round 2 Code	cultural value │ commercial identity │ value for profit │ business │ produce to sell │ *"farm big to market your product"*.
Round 3 Code (Final code)	cultural value │ urban entrepreneurial and profit-driven identity │ value for profit │ entrepreneurship │ produce to sell │ *"farm big to market your product"*.

5.2 Summary of the data analysis

In the study, I deployed a phenomenographic approach to explore the participants' diverse experiences and perceptions of their individual cultural identity. The first step in the data analysis process involved the verbatim transcription of each interview, followed by the identification and coding of relevant quotations in each transcript.

Through seven data analysis steps, as recommended by Sjöström and Dahlgren (2002), and three rounds of code categorization, eight dimensions that inform individual cultural identities were identified: cultural values, cultural geography, ethnicity, beliefs, and exposure to technology, knowledge and education systems, farming practices, and individual identity. These dimensions represented different aspects of the participants' cultural identity experiences and provided a foundation for understanding the richness and complexity of their individual cultural identities.

The resulting sensitizing concepts represented the key themes and patterns that emerged from the data, guiding the analysis process without imposing preconceived notions or theories (Marton & Booth, 1997). The phenomenographic approach allowed for an in-depth exploration of the variation in how the participants experienced and made sense of their individual cultural identities in the context of urban farming practices (Säljö, 1979a; 1979b).

Moreover, the study sought to understand the inter-relationships between individual cultural identity and technology adoption. By examining the degree to which the identified dimensions influenced cultural identities regarding the adoption or rejection of technology, four archetypes of technology adoption emerged: Strategist, Adaptavist, Innovationist, and Traditionalist. These archetypes provided a framework to categorize and understand the participants' diverse experiences with technology adoption in their urban farming practices.

The findings chapter will present a detailed explanation of each of the eight dimensions that inform individual cultural identities, using relevant quotations from the transcripts to illustrate and support the analysis. Additionally, the chapter will provide an in-depth exploration of the four archetypes of technology adoption, shedding light on how the participants' individual cultural identities influenced their attitudes and behaviours towards incorporating technology into their farming practices.

Chapter 6: Findings

The findings chapter is described using a theme-based approach to understand how individuals' cultural identities influence how they accept and use technology, following the phenomenographic analysis process described in Chapter 5.

Through seven rounds of code categorization, eight dimensions that inform the individual cultural identities of urban farmers were identified; this chapter goes over specifics of this process for each of the eight dimensions. In addition, I use quotations to support each of the eight dimensions. During the phenomenographic analysis process, it was found that participants experienced each dimension in varying ways in the urban farming context, leading to the development of four cultural identity archetypes that make up the phenomenographic outcome space. This chapter concludes by providing details of each archetype and the outcome space.

My evidence shows that there are four archetypes that can be used to categorize participants' experiences with technology adoption in urban farming practices, namely Strategist, Adaptavist, Innovationist, and Traditionalist (Table 6.1). Eight dimensions define these archetypes, which participants discussed when they conceptualized what informs their individual cultural identities in the context of technology adoption in urban farming namely their cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity categorize participants' conceptions (Table 6.2). The dimensions feed into the archetypes in varying degrees, to explain the inter-relationships between cultural identity and technology adoption.

Participant K, AF and AH are categorized as Strategists; participant J, L, AG, P, N, and M are categorized as Adaptavists; and participant I was categorized as a Traditionalist. The evolving nature of individual cultural identities facilitated the migration between archetypes, such as participant K and AF from Strategist to Innovationist (Appendix F). The findings point to the (re) negotiation of technology adoption on an ongoing basis along a continuum through individual's cultural identities.

Individual identity is viewed as the frame through which individuals navigate technology adoption in the urban farming space. Once in urban farming, individuals' identities are further informed by the different dimensions. The individual identities are then negotiated for the adoption or rejection of technology through the archetypes. The four archetypes establish the phenomenographic outcome space of the current study.

Table 6.1 Archetype Description

Archetypes	Description
Strategists	Entrepreneurial, profit-driven farmers who plan and employ a mix of modern technology and traditional methods in urban farming to meet market demand.
Adaptavists	Open-minded farmers looking for opportunities and who are willing and ready to accept technology-driven farming methods even though different from their worldview of farming.
Innovationists	Farmers who are inquisitive, explorative, and believe in experimental change.
Traditionalists	Farmers who are entrenched in traditional farming practices, advocate for maintaining tradition and are resistant to change.

Table 6.2 Summary of Findings

	Cultural Values	Cultural Geography	Ethnicity	Exposure to Technology	Beliefs	Education & Knowledge Systems	Farming Practices	Individual Identity	Archetype
Technology Adoption	Organic and Nutritious Food Production Values	Appreciation for Controlled Environment & Smart-Agriculture	Cultural Gender roles	Culture of reliance on technology and global trends	Collectivism	Educational Background	Technology for Efficiency, Effectiveness, Reliability & Sustainability	Understanding Market Demand and Food Scarcity	**Adaptavist**
	Urban Entrepreneurial and Profit-Driven Identity	Urban farming: Does not require large spaces	Upbringing, background, place of origin, and residence	Conceptualisation of Technology	Appeal to the younger generation and modern lifestyle	Incubation and Skills Development	Farming Model	Value to Imparting Skills & Developing Other Farmers	**Strategist**
	Organizational Culture	Urban Farming, Location, and Population Density	Kin influence	Work Exposure Assimilation	Individual Attributes	Personal Knowledge	Farmer Aesthetics: Clothing and Farming Landscape	Openness to Innovation	**Innovationist**
Technology Rejection	Conservation Cultural Values	Community Development,	Ethnicity & Tribe, Religion, Race and Inclusion	Cost of technology and socioeconomic status	Disposition to care for the environment	Complexity and Lack of Knowledge	Need to Preserve Indigenous Practices and Subsistence Farming	Traditionalist Value System	**Traditionalist**

6.1 Strategist

6.1.1 Individual Identity

Strategists were more market-oriented and always ready to plan their approaches to work. Strategists embarked on farming in the urban space with a proliferation mindset. This proliferation mindset compelled strategists to consolidate, and they mentioned the importance of imparting skills and developing other farmers in their local communities as a value they embrace. This strategy focuses on developing community members' skills and knowledge so that they can participate effectively in agricultural markets. The strategy also strengthens a focus on the market, empowering smallholder farmers to successfully connect with potential customers and make goods they can sell rather than attempting to sell what they have produced. Imparting skills and developing other farmers can be considered harmoniously with empowerment which informs the cultural identities of strategists. Important to note that participants in this archetype were once farmers who were first exposed and empowered to learn and start their farming businesses to be commercially competitive, and therefore, empowerment on the part of strategists is focused more on commercialization versus subsistence, as is the case for traditionalists. Reflecting on his planned approach to empowerment and to ensure the commercial viability of his business model, Participant L mentioned:

> "It was a community school that closed about more than 30 years or 20 years ago. And we were like, hey guys; you already have some sort of gardens going on in your backyards. Can we just set up here? And while we set up here, fine. We'll, help you with your gardens. So, then they were like, No, it's fine. Then set up. Yeah. So, we … so we then jumped …"

Similarly, Participant P planned her approach to empowering other potential urban farmers for commercial viability and said:

> "I'm currently busy with the proposal for the department of education neh. Yes, wanna call in other guys like I have a friend who is doing the, that drone technology thing, the drone. Yes, I do have other fellow farmers whose is having a packhouse which is certified. So, what I want to do, I want to have a camp, a one-week camp where for girls from grade 10 to grade 12 where we learn technologies like agricultural technologies. Yeah, I'm busy with that proposal, I'm going to include all that drone, how your packhouse should look, even how you write your proposals, business plan, how you register yourself

> *with CIPC and stuff so it's all those things that are included in that camp I want*
> *to do. Just a one-week camp."*

The image below shows a dilapidated community school in Soweto township, South Africa revived through urban farm gardens. The school is strategically located in one of South Africa's largest townships to provide seedlings for community members doing home gardening, and to sell to enterprises in neighbouring urban, suburban, and peri-urban areas.

Picture 1: Participant L, Urban Farm in Soweto

6.1.2 Cultural Values

From a cultural values perspective, the core principles and ideals of strategists' identities were informed by an urban entrepreneurial and profit-driven identity. The value for profit results from entrepreneurial basics embedded in their identities linked with the urban economic identities. Unlike the traditional values that focused on subsistence, providing for the needy, and feeding the community; the urban identity is more associated with the urban culture driven by entrepreneurship, profit, diversification, market demand, and supply. Furthermore, the values of an urban entrepreneurial culture prioritized business success over livelihood sustenance. Participant AH communicated this theme strongly, mentioning:

> " *… we have to come with a strategy maybe to outsource from farms in*
> *Limpopo and repack in boxes and be able to supply, but at the end of the day*
> *it's the revenue you're generating."*

The images below support the above quotation and demonstrate proliferation. The image on the *left* shows a systematically planned production process to ensure regular

harvesting, and the image on the right shows an abundant harvest stored and ready for supply.

Picture 2: Participant AH, Urban Farm in Randfontein

Picture 3: Participant J, Urban Farm in Pietermaritzburg

Strategists demonstrated much skill in planning to ensure entrepreneurial competitiveness. The quotation below illustrates a reflection by Participant K, on this dimension and is echoed in image of a hybrid model of farming adopted by Participant AH, to meet demand.

> *"Now, I don't just look at hydroponics or aquaponics as my focus, you know, I just look at farming that makes profit."*

Picture 4: Participant AH, Urban Farm in Randfontein

The planning ability of strategists is further demonstrated in Participant AH's written account extract below. To this point, it is evident that strategists are forward-looking and therefore the adoption of technology is steered by foresight.

"My plan in the next three years is to have 20 greenhouse tunnels or urban faming for tomatoes production. The technology/4IR is booming, one is able to control the irrigation on the smartphones at home, I always say to people coming to my farm for visit, infrastructure is important in farming reason being it opens up opportunities for the organisation to meet Local GAP system which is an Agriculture standard that we need to comply with for Food safety purposes …"

6.1.3 Beliefs

In this particular study what further informed the adoption of technology in urban farming for Strategists was technology's appeal to the younger generation and modern lifestyle. Strategists revealed that they adopted technology in their farming practices also because it appealed to their lifestyles and generation. As evidenced in the written account extract above, strategists are forward-looking and drawn by a technological era. The use of technology in urban farming complements the values, beliefs, preferences, and interests of the modern or young population. Historically, farmers were characterized as an older population, with no to minimal education levels, engaging in subsistence farming, resident in rural areas, and concerned with the preservation of traditional and indigenous

practices of farming which were transferred through generational cultural scripts from one generation to the next. Urban farming introduced technology that is more appealing to the younger generation. Strategists alluded to adopting technology into their farming practices as an enabler for a more pioneering identity. Participant M, operating an aquaponics systems reflected on a positive experience of technology usage as a young person and said:

> *"So, the use of tech has sophisticated the industry of agriculture and has formed a coolness in the mind of a young person but also a sense of importance because we use technology every day so if I can't even use my cell phone at work one time then that job kind of feels boring. So, I'd say it's got, it's created some attraction for young people in agriculture because now we are thinking beyond just a hoe in hand, back pains on the field. It's shown us that agriculture is so much more complex than the image that we have."*

Participant N also echoed this particular experience:

> *"For me that is exciting and that also it is encouraging because it gives me the flexibility. At the end of the day, I am young, you know I don't want to be slaving away on the farm like doing it the old way, I don't have to. I mean technology made it easier. So, I'm embracing it now, so the transitioning for me is very exciting and definitely the direction."*

The Participant N's social media post and written account extract below support the theme and appreciation of technology by the young urban farmers.

> "Yes, I would still pursue urban farming because it really relates to where we are as a nation. Like we are a generation that is moving into technology, that has birthed technology... that wants to be able to be smarter, faster, slicker. Soy, for me it's something that I relate to. I can monitor the system from my phone ... you know, I can have quality of life and still produce food efficiently ... still produce healthy food for consumers ... I can take this design and replicate it anywhere I am in the world so for me urban farming is something that I feel needs to be exposed to a lot of my generation ..."

6.1.4 Education and Knowledge Systems

Incubation and skills development programs were referred to by strategists as having informed and shaped their identities toward the use of technology for farming. It appears that there is an association between exposure to technology through incubation, skills transfer initiatives, and identity shaping of the farmers, which translated to the adoption of technology. Important to note is how this dimension facilitated the migration of identity. When asked about his experience Participant AF noted this dimension as pivotal to moving from simply adopting technology to thinking strategically:

> *"And so, I started coming up and joining these incubators is taken to various thinking of different ideas… And what happened there, they teach you basically the business model … We had to learn different spheres of farming, and then the last two weeks, they teach you about hydroponic farming, and it's okay, this still fits within my idea of having an agri-tech business."*

Also, of interest is that strategists mentioned the contribution of work exposure to technology adoption in their farming practices. Most strategists mentioned that they had been employed on farms that made use of technology, and as a result, they had to use technology in their farming. Participants integrated themselves into the urban culture identities as presented by their work environments. As part of this dimension, some participants had minimal option in the decision to use technology in farming in cases where they were employed and were expected to engage with technology in their work environments. When asked about her experience, Participant AF said:

> *"I didn't know bear in mind I had no experience in agriculture. So, I've known everything first-hand as I'm going through my journey…. So, the lucky thing while I was in my experimental phase …. So, I was given an experimental demo site with 10 rows. At the time the programme was sponsored by organization A ..."*

However, some participants like Participant J still mentioned that the adoption of technology had always been a personal interest or something that some participants had already started on. In this case, the technology-infused working environment aligned with their interests or already adopted identity.

> *"Basically, the role that I was working with at Pietermaritzburg, was under the hydroponic farming where I was working as in hydroponic assistance. I got involved in that type of farming via future urban Farm Organization, where they recruit a graduate fresh one from varsity … I then joined them, so when joining them, they give me an opportunity to choose basically I've been exposed to the field when I was still at varsity but not more in hydroponics. So, it was also my wish to learn about hydroponic farming …"*

6.1.5 Farming Practices

The strategist approach maintained a focus on entrepreneurship that allowed smallholder farmers to successfully connect with potential markets. Informed by this value, strategists employed a combination of traditional and modern approaches, technologies, and tools for farming. Although strategists appreciated modern technology

in farming, they seemed to also approve of a paced transition from traditional to modern forms of farming. The hybrid model of farming challenges the interpretation of the urban farmer identity, however, demonstrates an identity shift for a co-created adoption of technology. Strategists are very calculative in their approaches. Outlining his approach Participant L mentioned:

> *"Some of the technologies are going to improve seeds, they're gonna be you know the poly plastics, the shades, the systems, technologies and those are kind of then somewhat are just still new to face up to a changing in climate because you can't just do, you can just do open field when there's gonna be hail coming, so then you'd get a net and then at least you are protected from the hail now. So, it limits your risk as the farmer but it makes you a bit more profitable. So, then the question now is then what kind of technologies do you then adopt, and the current scale of your production in response to the challenges that you are facing."*

The images illustrate Participant L's farming operations in the Johannesburg, South Africa CBD and a replicated model in Soweto township, Johannesburg South Africa. The hybridity is undertaken as a strategic move to address the demand of different market segments and to reduce risk.

Picture 5: Participant L, Soweto, Johannesburg, South Africa

Picture 6: Participant L, Johannesburg, CBD, South Africa

6.1.6 Exposure to Technology

Interesting about this archetype is the strategist's conceptualization of technology. The variation in conception is that whilst other strategists conceptualized technology as a mechanism that allows them to control and manipulate the growth of crops, others simply conceptualized technology simply as a tool that allows them to enhance efficiency in production processes. This again demonstrates the merger, even conceptually, between traditional and modern approaches to farming. The need for efficient production methods captured the conceptualization of technology for strategists. It is the varying interpretations and performance of farming activities in farming, that interestingly shape the cultural identities of the strategists and the use of technology in urban farming. Participant L presented examples of context-specific technologies, and how as a strategist technology is conceptualized in alignment with feasibility:

> "Technology comes also in the form of irrigation, it comes in a way of mechanization, it comes in a form of you know robotics, tech and what it is? It comes in a form of robotics and software, it got many variations so then you know maybe you could, could say uhm I don't know how you'd like to categorize the different types of technologies but even those are just the infrastructural and support technologies."

> "A shade net is technology; so, I'm just saying that sometimes, you know, we will try to overcomplicate what technology is. But basically, it enhances or makes life better, it's a tool or whatever that can be used."

6.1.7 Cultural Geography

Strategists also discussed urban farming not requiring large spaces as influential to the adoption of technology. Strategists mentioned the ability to grow crops within confined spaces either vertically or horizontally, enabling market competitiveness without having to acquire more land, and allowing the formation of new farmer cultural identities. Urban farming facilitated strategists' ability to cultivate, process, and distribute food in or around urban areas. The limited space in urban areas spurred the adoption of technology by strategists. Participant K presented examples of technology adoption enables the ease of operation in confined spaces:

> *"You can literally take a bucket and add soil that is fed and just start planting there even if maybe you are staying in a tall building and you just putting it in your balcony that's urban farming you know, you can do it in plastics…"*

Once Participant N came into the urban farming space, the exposure to urban farming operations changed her worldview and she acknowledged:

> *"Then I realized that there's actually a new way to farm and it doesn't need land doesn't need so much land and I can be as commercial as I've always wanted to be. So, when I realized that you can be commercial without having lots and lots of land, it was a huge turning point for me."*

The image below illustrates the convenience enabled by technology in urban farming limited spaces at Participant M's operations. Urban farming operations enable the maximization of space and yet efficient production.

Picture 7: Participant M, Urban Farm in Midrand

Correspondingly, Strategists discussed urban farming by referring to urban locations with dense urban populations, and that in South Africa, urban farming can be undertaken in urban and peri-urban areas. This aspect of location frames cultural identities and the resultant decision to use technology and the type of technology to be used for the location within which they find themselves. Strategists used different techniques to expand the scale of their farming to address the food supply for the urban population. In her expression, Participant N mentioned:

> *"Yeah, absolutely. You know, and I think that what I love about urban farming is that it can literally be anywhere …"*

The variation in the type of technology depended more on where the farm was located, and in this regard, Strategists would select a technology that is best suited. Explaining his choice of technology based on location, Participant K said:

> *"So, after constructing the system [aquaponics in Mpumalanga] when you go to our backyard you hear the flow of water… you know there is aquatic life growing there … it brought in a different experience … it's a nice experience to have, even now I assembled one hydroponic system in my door [Midrand] last night."*

6.1.8 Ethnicity

Strategists acknowledged that embedded in their backgrounds and upbringing were entrepreneurial basics tied through selling agricultural produce. Despite growing up in a rural area Participant AH reflected on the agriculture and entrepreneurial component thereof in his upbringing:

> *"… those kind of things. I would say it did in away ya gore gape ne ba etsa le (that they [family] used to make) dried fruit, you take bo di, ba bitsang perekisi (what do they call them, peaches), di apricot. Ha ne e le (when it was about) harvest time, kgetse ne re tla ema mo (we would stand by) R28 this road, re rekisa (and sell), they would buy…. some things start at a tender age and you don't see that. They are planting a seed in you."*

Strategists engaged in urban farming with a proliferative mindset and a strong emphasis on entrepreneurship and profit. To a large extent, Strategists were influenced by the existence of agricultural practices in their backgrounds some of which were profitable although at a small scale. Learning through incubation and skill development programs supplemented strategists' education and knowledge. To meet the market demand,

strategists engaged in hybrid models of farming, implying that the participants would equally maintain traditional farming methods provided the methods served a purpose such as growing crops that would otherwise not be able to be grown with the current technologies available to them. Strategists conceptualized technology and its adoption by how it enabled them to enhance productivity. The interest to incorporate technology into their urban farming practices was also because of a strong belief that technology adoption appealed to the younger generation and modern lifestyle. Strategists preferred a *co-creation* approach to technology adoption, which would honour both traditional and modern approaches.

6.2 Adaptavist

6.2.1 Individual Identity

Adaptavists demonstrated flexibility in individual identities and were willing to accept and adopt technology in the urban farming spaces with no hesitation, and with reason to respond to the demand for food for the urban population. Participants under this archetype alluded to understanding the urban market and the need to ensure accessible food security within proximity as the reason for technology adoption in urban farming. The urban market setting, therefore, made an impression on the participants' value systems and thus informed the formation of new identities which frame the decisions around technology adoption.

Talking about how the urban environment and the need to ensure food security for the urban population made an impression on her identity and the subsequent decision to adopt technology; Participant N, working on an urban farm in Hekpoort, Gauteng said:

> *"I don't think I will leave the city anytime soon just because the market is already here, so why stressing out when you can just stay where the market is at. So that's why urban farming and hydroponics and aquaponics is becoming popular because we want to still stay in the cities…"*

Participant M, employed at an urban farm in Midrand, Gauteng also commented on being prompted to the adoption of technology by the urban environment. For Adaptavists, the urban farming environment expects assimilation which informs the adoption of technology.

> *"We have things that are prompting us, pushing us really to, to farm in the urban space and there are too many consumers in Gauteng for instance, as a place that doesn't have arable land appear … and that even though then it*

was arable we simply don't have the space, and also an increasing consumer demand is what is pushing us to farm in these places and also the desire to, to limit the amount of transport and, of transportation that we're doing between farms and the final consumer, we need to close that distance. So, we are really, there are things that are pushing us those factors that I've already mentioned that are pushing us to farm this way …"

6.2.2 Ethnicity

When the Adaptavists came into the urban environment, their identities were further informed and moulded by their ethnicity in ways that shaped their perceptions and behaviours. They reflected on the influence of societal ethnic views on identity formation and referenced the espoused opinions about farming and in particular cultural gender roles by their communities. The female participants mentioned that they often have to challenge endorsed beliefs on gender roles in agriculture and farming. Historically, farms were owned by males, and women took on the roles of housekeepers or employees on the farms. The possibility and opportunity to own and operate a farm presented by urban farming as a practice, therefore, challenged the perception of gender roles and identity in farming, thus serving as encouragement and providing an opportunity for women farmers to adopt technology to become competitive in a male-dominated industry. This further demonstrates how Adaptavists had to negotiate their identities out of traditionally held beliefs about agriculture landing them in ready-to-sign cultural contracts to challenge this worldview. When detailing her worldview about women's participation in urban farming, female Participant P mentioned:

> *"Ok a lot of farming, yes my father, my grandfather where I grew up, there were cows in the yards and the fields of planting but my grandfather just didn't believe in a woman … He didn't even believe in investing in women. Not that he didn't like it, he liked it but it's like what does this one have to do with cows? Some of the existing opportunities are needed by women and young people, but there is no room for growth …"*

Participant P also mentioned that she adopted technology to challenge the endorsed cultural beliefs about farming. The sense of achievement that came with succeeding in the urban farming space further reinforced the formation of a new identity.

> *"I think we have done more than enough to prove that as women. Even looking at the previous seasons, we have done exceptionally well, we got some funds from organization A, young farmer programme yeah … they also improved our*

system. Yeah, it was now a more effective system, so yeah I think I have proven what I wanted to prove."

Participant N, a female urban farmer, supported that urban farming encourages inclusive gender participation.

"It's also very gender inclusive, anyone, male or female, It's not too laborious in the sense that its long hours, so it is intensive yes but It's not, it's not expensive."

"I think it also appeals to females you know because as females we don't really like burning in the sun all day, you know, driving around and then getting, you know stressed about farming and being on the fields it really so, with smart farming it kind of gives you flexibility with time you know, because it's a system, you can be on your phone you know, if you want to be a farmer and also be a mom, you know, it gives you stability, I think as a female so I think it is kind of, is kind of attractive for females, you know, that's just my personal experience."

The images below show females owning and operating an urban hydroponic farm in KwaZulu-Natal, South Africa.

Females owning and operating an urban hydroponic farm in KwaZulu-Natal, South Africa.

Picture 7 & 8: Participant P, Urban Farm in New Hanover, KwaZulu-Natal

Females hydroponic urban farmer on a rooftop in Johannesburg, Gauteng, South Africa.

Picture 9: Participant AG, Urban Farm in Johannesburg CBD

An interesting nuance was that Adaptavists also focused on two unique conceptions of farmer aesthetics, namely clothing and farming landscapes, conceptualized as representative of farmer identities. For Adaptavists, the urban farming space and adoption of technology into farming challenged the traditional farmer aesthetics since crops can be manipulated, arranged, and grown differently thus making provisions for the formation of a new identity. As such Adaptavists communicated the rejection of the clothing aesthetic previously worn and made popular by the white farmers in South Africa. This was also because the participants were a young population, they rejected what they considered to be the historical clothing and identity of traditional white farmers deeming it as foreign to their cultural identities. The use of technology also challenged the traditional farming landscape aesthetic as it enabled the production of the crop in unconventional spaces or settings. Participant M explicitly articulated this her experience, saying:

> *"But somehow young black farmers think that in order to assume the farmer identity I have to present myself in such a way and in urban farming seen uba (or) no this thing was never necessary. This presentation this aesthetic of a farmer was never necessary. So yes, in the urban farming space, I see that*

the identity and how our view, our image of farming is completely changing. And it's becoming so much more attractive to now everyone."

"So, there's a mental shift that needs to happen to say to be a successful farmer I do not need to dress in such a manner. It is not a prerequisite for us. It's not a prerequisite for us to be successful so I would be comfortable in changing my, not necessarily in changing my appearance but in keeping my appearance even in those social settings where I am with farmers and everyone is wearing a khaki and I mean you have to jell with it, but at the core of it, what is the actual meaning behind all of a sudden when I am in urban farming, man yeah, I don't want to wear khakis, but then all of a sudden when I enter the farming space, I want to wear those khakis. What is that?"

6.2.3 Farming Practices

For Adaptavists farming practices were significant to inform the adoption of technology. Subsequent to joining the urban farming space, Adaptavists adopted technology into their farming practices for its efficiency, effectiveness, and reliability. This is most likely as a result of the performance targets set out in their work spaces. The adoption of technology allowed them to produce at a faster rate while also allowing them to harvest on multiple occasions during the year. This is because the plants can also absorb adequate nutrients for growth, and at a faster rate, compared to traditional farming. Exposed to the methods different from traditional farming methods, Adaptavists were ready to accept the difference brought about by technology. Explaining his experience Participant J said:

"okay basically with technology … we are able to change and we are able to modify some of the things like temperature. But now what we have created a system where the plants can absorb an exact nutrient that they needed for growth so they don't waste much of energy. So instead of wasting the energy of growing their roots, they growing their stem, the stronger the stems, the more production it is different is… So, with hydroponic farming, it is a good type of farming that will give you anything that you have added to a system it will give you the equal things rather then you are putting something in a system and then you are getting less, you are making loss."

6.2.4 Education and Knowledge Systems

Adaptavists also alluded to their educational background and how it predisposed their decision to adopt technology in farming. Most participants mentioned that they have an

educational background in agricultural sciences and similar qualifications, and therefore, their decision to use technology was also largely influenced by their educational background. It appears that education shapes identity and as such influenced the use of technology in their farming practices. Participant P reflected on her educational background and its influence on technology adoption:

> *"I myself do not think if I didn't go maybe if I didn't go to eTertiary I wouldn't know about technologies so it's just yeah it's some sort of growth or implementing what you learned as a person or following your dreams. It's just one of those things yabona (you see)."*

Similarly, Participant AG alluded to her studies as exposure to knowledge about farming technology:

> *"My first assignment was based on hydroponics…"*

To take it a step further, with education, joining the urban farming practices, particularly through employment gave an opportunity for Adaptavists to put into practice what they learned academically. Given the opportunity, Adaptavists were *ready-to-sign*. When Participant M reflected on her experience she said:

> *"So, as plant pathologists, what I was taught in school is plant health. So, the current place where that fits in, in our company is twofold. So, we are taught about food health but also food safety meaning after handling. So, the post-harvest part of plants, So, on our farm, we have tunnels you know those greenhouses, and then we also have a pack house."*

The extracts from the participants' written accounts support this conception and prove how education provided exposed Adaptavists an opportunity to learn about technology-driven farming, and how Adaptavists were "ready-to-sign".

My name is **Participant AG** I am a student at **agriculture institution** in Pretoria doing my first year in plant production. One of my first assignments was on hydroponics and I had no idea what it was, so I started doing my research and I came across **organization B**. I was very interested and inspired by the work that they do, and I was given the opportunity to be a part of their team. That's how my journey started in urban farming. I was fortunately blessed to be

> I became an urban farmer after studying Bachelor of Science in Agriculture: Plant pathology. I had applied for numerous opportunities with conventional farming companies with no success. I finally found an internship with a company doing aquaponics and there I came to know more about the possibilities of farming in an urban area. A few months later, I was promoted to become the manager of the farm.

6.2.5 Exposure to Technology

To a compelling extent, Adaptavists' identities were also informed by global trends in an era of reliance on technology. The participants communicated that since they relied on technology in everyday life including in other areas of their businesses. They were also quick to adopt technology into their farming practices when it is presented to them. Again, it was more convenient for participants in urban areas to adopt technology in their farming as it aligned with the urban culture. The notion of global trends can be seen where participants mentioned that in terms of their urban identity and values, it was essential to stay abreast with the technological developments and adopt them into their farming to remain competitive and relevant. When Participant J spoke of the influence of this dimension, he explained:

> *"Oh, I chose a hydroponic farming because it is a new thing to me … Everything is changing so with hydroponics it's also a part of 4ᵗʰ Industrial Revolution. That is why I'm very interested in the system itself and how it's operating and I wanted to learn more. I wanted to know it, I wanted to understand it. It was my attitude and it was the thing that I love the most hydroponic farming and I'm grateful…."*

Adaptavists also mentioned that they are influenced by the global culture inculcated through media and technology platforms, thus influencing their identity to function within the urban farming context. Explaining her experience Participant N also echoed this sentiment:

> *"I've always been attracted to farming so let me start YouTube-ing because I'm always on my phone, I might as well put my phone to good use. Let me start reading; let me start seeing what farming is about as a career. That is how I started my journey and I found myself now being like a YouTube scholar, to a part where, I'm like I felt like, you knew how to farm because I keep watching these videos and reading everything buying farmers weekly …"*

Reliance on technology also resulted from global trends in agriculture. Urban farmer using a tech-device to operate aquaponics farm.
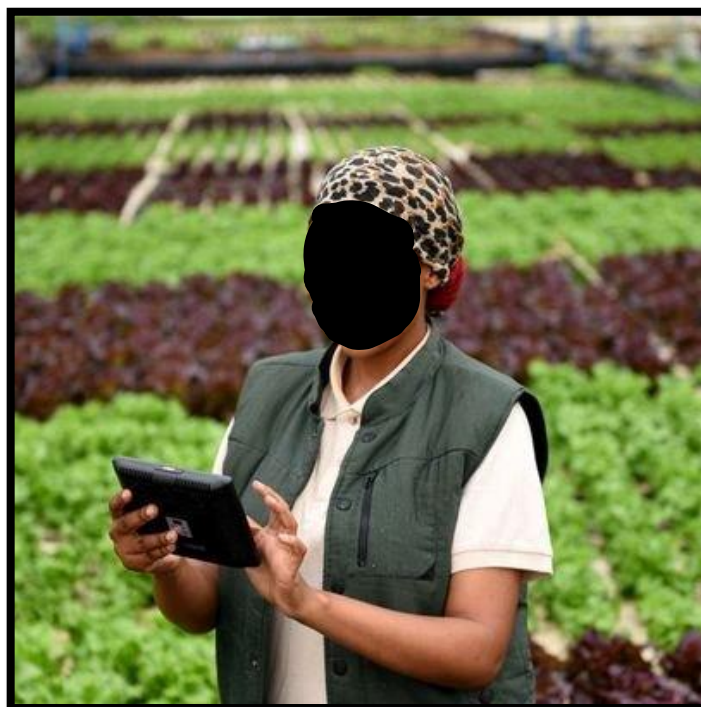
Picture 10: Participant N, Urban Farm in Midrand

6.2.6 Cultural Values

Interestingly, Adaptavists' identities were further informed by a value for organic and nutritious food production which uses organic materials to reduce the possibility of any harm or degradation to the environment and to safeguard nutrition. Organic agriculture makes a unique contribution to food security by developing ways to retain the natural production of food in a cost-efficient manner. This value further informed the type of technology used by Adaptavists. This value demonstrates the prevailing layers of traditional methods of farming despite being in the urban farming space. However, Adaptavists consciously surrendered this espoused value with a ready-to-sign identity shift to adopt technology for urban farming. Emergent in the data are that the chosen technology somewhat accommodated more organic or nutritious methods of farming, and aquaponics dominated this archetype. An interesting observation is the evolution of identity from a Traditionalist to Adaptavist archetype. When detailing her experience using technology that enables the organic and nutritious production, Participant N mentioned:

"You know, it [organic farming] provides just better nutrition. The food looks healthier and tastes great. You know, it's so sustainable and the fish is delicious apparently, I wouldn't know because I don't eat fish but apparently, it's very delicious, it's from the freshest water. You know, so I love it so much because you don't need to spend so much on inputs anymore. You know it is in aquaponics it's the nutrient-rich water that you get from raising your fish that provides like a natural fertilizer for the plants and then the plants help to obviously purify the water and take it back to the fish."

The images below support the quotation and show the aquaponic farming technology used by Participant N to align with the organic and nutritious production of crops and fish.

Picture 11: Participant N, Urban Farm in MIdrand

The image below is of an operation managed by Participant M, and shows an organic and nutritious method to produce crops and breed fish through aquaponics. Through the aquaponic system the fish produce waste that contains ammonia, the ammonia is converted to nitrates and serves as nutrients for the plants. Although technology-driven, the systems enable a more organic way of farming.

Picture 12: Participant M, Urban Farm in Midrand

The quotation and image below further illustrate the variation in the value for organic production, whereby the seedlings are first planted in soil or gravel before they can be transferred to the tunnels to be further grown hydroponically. This proves a rather seamless negotiation of identity into technology adoption. Participant J, located in KwaZulu-Natal, Northdale in Pietermaritzburg explained a different approach to organic crop production:

> *"Yes, and tomatoes as well as lettuce outside in the trellis, there is a nutrient fill technique, nutrient solution system I can say like that, were we using, we using the gravel to grow lettuce."*

Picture 13 &14: Participant J, Urban Farm in Pietermaritzburg

6.2.7 Beliefs

Adaptavists' cultural identities were also informed by a sense of collectivism and cohesiveness. Subscription to finding common values and goals demonstrates greater orientation toward the in-group than the out-group. For Adaptavists, collectivism in the urban farming space was essential for sharing values, knowledge, practices, and ideas about urban farming. It, therefore, seems that the inner group's values, beliefs, and perceptions reinforced by social networks informed the cultural identities of Adaptavists and thus the decision towards technology adoption. When detailing his experience to joining the urban farming space, Participant L mentioned:

> *"Then we were introduced to guys that were working in the urban, that had rooftop farms, it was the average 200 square metre in Joburg. So, we basically started to network and get into their networks. That's how we started our journey as urban farmers"*

> *"Yes, as then we engaged the market, engaged the industry, engaged people, stakeholders that were actually farmers, urban farmers at that time… We found that these groups of entrepreneurs especially in the CBD were actually affiliated under those programs... I mean that's the urban agriculture that we got to."*

Participant also commented on collectivism as an informant to technology adoption in urban farming:

> *"… in September so I met with other guys who some of them where in that internship programme 2 years, and others we met each other eTertiary [at tertiary education institutes], so we came together, looked for a place, we found a farm in New Hanover … we were about 5 graduates at the time s…"*

For Adaptavists, this value of collectivism appeared also a driver for individuals' decision to adopt the technology. The extracts below from the written accounts of participants under this archetype illustrate how networks informed urban farmers' orientations towards technology adoption.

Finding these agripreneurs that had successfully achieved establishing their urban rooftop farms was the first objective, in April 2019 a young rooftop hydroponic farmer that was operating on 200 meter square farm on top of FNB Bank City forwarded a recruitment link for an unban farming training program. The next six to eight months was spent in technical and business

> Over the last three years I've had the opportunity to engage all kinds of urban to peri-rural smallholder fresh crop production operations from vertical hydroponic farms to open field traditional operations and I have one take away agripreneurs uptake context specific agricultural technology solutions these can range from irrigation equipment, sharenting, enhanced seeds, operations tracking software and produce marketing apps.

6.2.8 Cultural Geography

Adaptavists mentioned that technology allowed them to monitor and control the environment for production. They appreciated the idea and experience of being able to manipulate, control, and predict the production of crops. This form of farming is linked with their urban identity and culture of proliferation within urban spaces and is illustrated by quotations and images below. Participant M, when explaining her operations said:

> *"Well, it depends on the species that you have and how easy they are to breed in captivity because what we have now is fishing captivity, we growing them in a controlled environment…"*

Picture 15: Participant M, Urban Farm in Midrand

Participant AG, operating a hydroponic farm in Gauteng, Johannesburg Central Business District (CBD) said:

> *"… very interesting because it's very nice and interesting because this way farming in hydroponic this way, for me would be able to be have a lot of controls over a lot of things like temperature, nutritional level, the water was, the pH of the water some sort of control ... I think that's the interesting part of how many things you can you have control over ... Even things when you have like pesticides it's easy to control. Yeah."*

Hydroponic temperature control system to grow tomatoes.

Picture 16: Participant AH, Urban Farm in Randfontein

Air conditioners to control temperature within tunnels
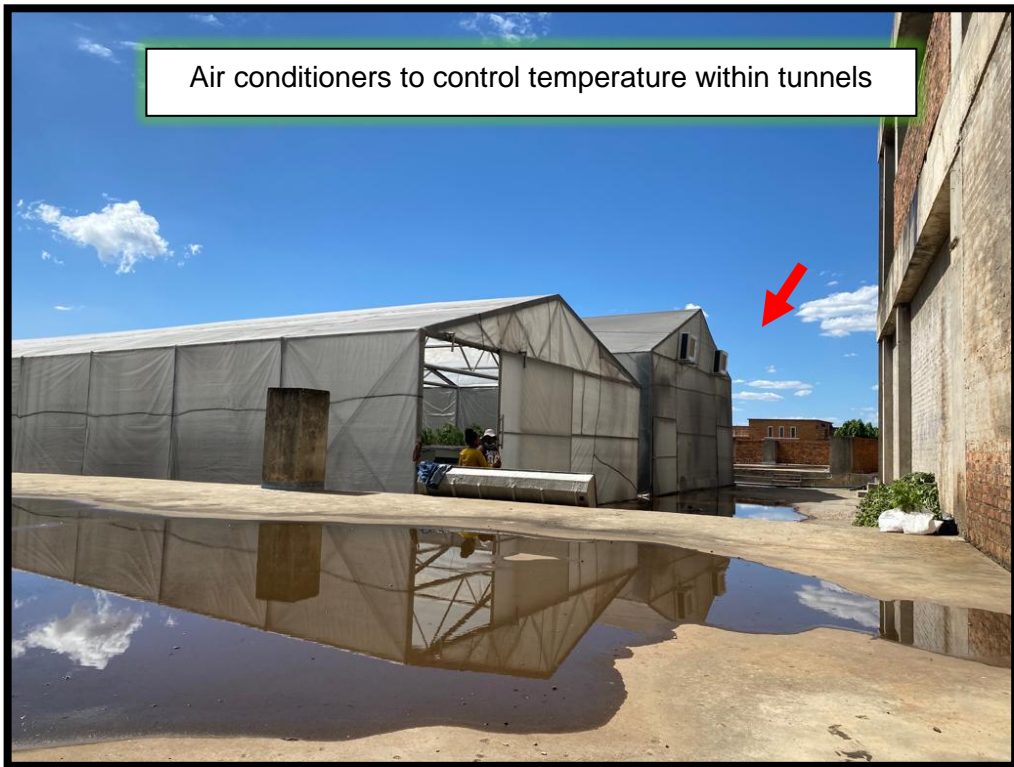
Picture 17: Participant AG, Urban Farm in Johannesburg CBD

The written account extract emphasizes the appreciation of controlled environments by Adaptavist, Participant J.

> Controlled environment (Tunnels or greenhouse) type of farming has been an enjoyable journey and a best chapter to my life. It is very interesting system where you can produce high yield of vegetables on a small area and in a short period of time because an environment optimal for plant growth is created. All the nutrients and water that the plants need are available at all times. This type of farming enable you to cultivate crops at any time of the year (there is no season) since most of the environmental conditions are controlled. Plants grow very fast since in this system plant's root system is exposed directly to water and nutrition through drip irrigation system, the plants does not have to exert any energy in sustaining itself. Plants doesn't

Adaptavists similarly mentioned being framed by an identity that demonstrates an understanding of the urban market and the need for efficient measures to respond to food security in urban areas; however, unlike Strategists, Adaptavists demonstrated flexibility in identity and, as a result, were willing to adapt when presented with opportunities to adopt technology in the urban farming space. Adaptavists' view of the urban market differed from that of Strategists, as Adaptavists' did not necessarily come into the urban farming space with a plan to adopt technology but were afforded the opportunity and in response, seized it. Exposure to the urban farming environment further led to the need and desire to challenge worldviews such as gender participation in farming by female Adaptavists who explored and embarked on urban farming as a practice.

An interesting observation in this archetype is how one can argue Adaptavists' evolution from Traditionalists' archetype; reinforcing the evolving nature of identity as a concept. The need to ensure that nutritious food is supplied in the urban market was to an extent informed by traditional approaches to farming, however, challenged by interaction within the urban farming networks from which Adaptavists continued to gather knowledge, and skills, and consequently, Adaptavists adopted technology that was in sync with organic production methods. Most of the participants in this archetype had an agricultural academic background which further exposed and informed them about technology-driven farming methods. The information age also exposed Adaptavists' to global trends, which further challenged their identities and worldviews regarding farming. Adaptavists' experience of technology leaned more towards a ready-to-adopt disposition.

6.3 Innovationist

6.3.1 Individual Identity

Innovationists are advocates for experimental change. This archetype is framed largely by an experimental and explorative identity. The sense of openness to using technology and other farming methods suggests an innovationist identity, which also suggests the ability to innovate, create and improve farming practices through technology and other tools. A commonality amongst the participants was the interest to innovate to improve their current practices. Whilst for Participant K it was more explorative;

> *"I wouldn't want to get rid of the system [self-built aquaponics system]. You know, if the budget comes I would want to build a greenhouse there and also add different systems to the one that I had, you know, I would like to expand on that. So yeah, it's a matter of learning skills and also hoping that this can also grow into become something else not hoping but if that opportunity comes you know, yeah …"*

When asked about her experience Participant M said:

> *"… So, we're forced to be innovative and to come up with new ways of farming, especially in urban spaces."*

In addition, innovationists displayed creativity and openness to new learnings and did not *fully* conform to the traditionalist approach to farming. Explaining this dimension Participant AF said:

> *"Okay so for myself, I do a lot of research. I'm always curious about some of our things and business and the world as it is, and I ask questions. So, starts from my, stems from my curiosity. And basically, I knew and read some of the, I can't remember about the UN's, EGD goals, about the number of people moving into urban areas, about people like food scarcity being a reality in the not so distant future, rising food prices; that eventually there will be a problem and where there's a problem, there's business."*

The extract from Participant AF's written account below supports the conception of an experimental and explorative identity.

"After watching an episode of Carte Blanche about Brooklyn Grange I proposed a similar urban garden initiative to the mineral council of Johannesburg, they asked for quotes and I went to a greenhouse business in Pretoria; I then was told the quotes were too high, so I joined the **organization B** and their **urban farm organization** programme which ran for 8 weeks."

6.3.2 Education and Knowledge Systems

Personal knowledge which encompasses education, experience, information, and informal learning, retained by the individual can be considered as one of the aspects that inform cultural identity. Innovationists alluded to their curiosity and inquisitiveness to accumulate knowledge and desire to learn about new ways of farming while also reinforcing the importance of exploration and experimentation within the farming space. The pursuit of knowledge influenced them to adopt technology in their farming spaces. When asked about this dimension, Participant K emphasized:

"You don't know what the future is going to be like, you have to learn something. So yeah that's, for me that's what made everything easy. My, my ambitiousness and me wanting to learn skills like a lot. Yeah."

"Well, for me … I had a bigger vision, you know, I wanted to, to learn the skill of constructing it, so that I can prove that here is the concept, it works, I've built it, let me build a bigger one for you. So, I wanted to help clients who were I build the system for them, I wanted to do like courses in hydroponics, like I actually wanted to start, like a big business, you know, that offers hydroponics and aquaponics consultations, you know, and system constructions…"

6.3.3 Cultural Values

Adjacent to the Strategist archetype, Innovationists came into the urban farming spaces either through employment opportunities or driven by their entrepreneurial pursuits; however, with the need to improve and prove economic viability. The culture of organizations within which they worked or from which they received support, as embedded in strategies and/or operational procedures; including funding guidelines of sponsors, incubation programs, and skills development initiatives were discussed by participants as influential to an individual's identity. Participants mentioned that they had to comply with organizational culture to receive support and secure funding, and this included the adoption of technology into their farming practices. The adoption of

technology was therefore due to the expectations or requirements of the funding and/or incubation organizations. Conceivably, the organizational culture influenced the innovationists' identities to adopt the technology. Explaining his experience Participant AH mentioned:

> *"… it was because of the loans that we have done and all of those and coming into that, I was exposed to what we call it organization B and incubator where you are able to pitch your idea then from there they will be able to advise if ever maybe that idea is it feasible or not? And if ever maybe it's feasible now they are able to fund you with whatever that you want and so on. So that's when I started to, to say now I want a hydroponic system or a tunnel where I can produce a tomato all year round and so on and so on."*

> *"So, I got an opportunity, so I went through that organization B program and they funded me, so they erected the structure but all along what I have been doing, I have been doing open field, planting tomatoes…"*

6.3.4 Beliefs

Although the study's focus was more on adopting technology into farming practices, it is also important to highlight individual attributes such as drive, motivation, resilience, dealing with adversity, and other virtues as guiding influences. These individual attributes also serve as a guiding compass to decisions on technology in farming. This conception cuts across the different archetypes and suggests the existence of an element of innovation across all archetypes, which emerge when urban farmers are faced with challenging conditions such as climate conditions, technical challenges, and adversities and using technology to navigate the urban farming practice. Arguably, innovationists care more about new technologies and other dimensions of novelty including those that do not involve technology but are necessary to deal with challenges in urban farming. It is essential to note that without these attributes the success of the farmer within a diverse urban farming context can be compromised. As a result, even though participants faced adversity in their farming business, they were motivated to persevere toward success in their urban farming practices. Sharing his experience Participant K mentioned:

> *"So, it was so stressful. And my parents noticed that it was stressful. They only spoke about it after the whole thing was working now ... So, so it was stressful. But other than that, everything worked out well."*

Participant N shared similar sentiments:

> *"So once that comes, you really start to understand who you are, your personality, your strengths and your weaknesses right, then once you realize that okay, now, this is who I am, this is what I can do and then you just now go for it. I think it really just builds your character. It's a character-building journey and I think it builds you into becoming a person who's more determined more than ever."*

Participant K's social media post below supports this dimension:
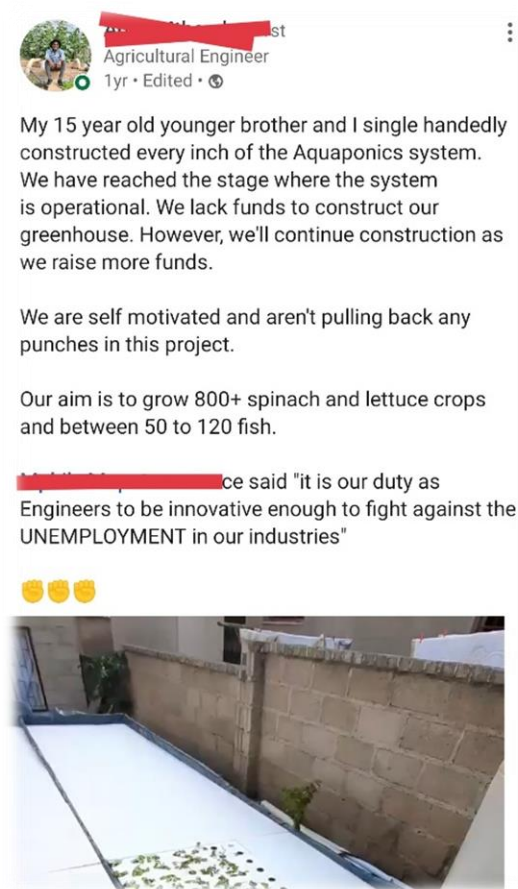
In sum, innovationists came into the urban farming space with an openness to the use of technology and innovation to improve practices. A significant contributing factor was their curiosity and inquisitiveness to accumulate knowledge and desire to learn about new ways of farming while also reinforcing the importance of exploration and experimentation within the farming space. Beliefs that cut across the different archetypes serving as a guiding compass to decisions on technology in farming and to deal with challenges such as climate conditions, and technical challenges, include attributes such

as drive, motivation, resilience, and dealing with adversity. Arguably, innovationists cared more about new technologies and other dimensions of novelty including those that do not involve technology but are, however, necessary to deal with challenges in urban farming. Work exposure and assimilation were evidenced to contribute to the adoption of technology for innovationists, although most innovationists demonstrated a prior interest to learn and further explore innovative methods in urban farming practices since they came into the urban farming spaces also driven by their entrepreneurial pursuits. Innovationists believe in experimental change and therefore appeared to settle for a quasi-completed approach to technology adoption.

6.4   Traditionalist

6.4.1 Individual Identity

Traditionalists advocated for maintaining traditional methods of farming and showed resistance to change. What informed the cultural identities of this archetype is a value system through which the participants believed more in traditional methods which could be because they considered the use of technology in farming to be somewhat foreign to their cultural values. The rejection of technology and use of alternative tools for farming was as a result of the immersion in traditional methods of farming and as a result, traditionalists did not see the importance of incorporating new or advanced technologies in their farming practices. When asked about the use of technology in her urban farming practice, Participant I commented:

> *"We do use irrigation but it is a very small irrigation system for mostly our seedlings and our beds where we are planting all the vegetables, yeah we use irrigation, what else do we use? Your host pipe, your spade, your forks, stuff like those."*

The extract from the Participant I's written account further communicates the immersion in traditional farming methods.

"I sometimes use old bath tubes and toilet sits. For tools I use watering can, hand fork and spade …"

The images below also show traditional methods employed by traditionalists in urban farming, with no or minimal usage of modern technologies, but rather more traditional farming tools.

Picture 18 & 19: Participant I, Urban Farm in Khayelitsha, Western Cape

6.4.2 Ethnicity

The notion of ethnicity, tribe, religion, and race forms a critical component of cultural identity formation. Traditionalists emphasized their ethnicity and religion as integral parts of the conceptualization of cultural identity and how these shaped the conservation of practices. Traditionalists not fully incorporating technology into farming practices had a strong link with their general idea of cultural identity (ethnicity, tribe, religion and race), thus showing an appreciation of the values, lessons, and practices inculcated. Ethnicity, tribe, origin, and race contributed to individual cultural identities and regulated behaviour. Participant I, placed emphasis on her ethnicity and religion when reflecting on her identity:

> *"I'm Xhosa, but with a Xhosa tribe I will go for Hlubi, I'm a Hlubi. A Xhosa but a Hlubi. Yeah and I'm a Christian, yeah I'm a Christian."*

Whilst Participant AG reflected on how her religion as an informant to identity formation:

> *"No, I don't believe it's changing who we are because there are certain principles and values that I still oppose, yes. I don't think I would compromise easily … Ahh my principles build who I am. Things like respect, honesty, love, to care, to be kind because I'm very Gospel-oriented person."*

6.4.3 Cultural Values

Traditionalists mentioned their value for conservation in the urban farming practice. The values surrounding conservation agriculture include aspects such as reusability of resources, prevention of wasteful use of resources, and corresponds to austerity and preservation of the resources in the environment. This value in addition informed the

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participants' identity, reservations about technology adoption, and thus the choice of alternative tools used. Participant I emphasized this notion by saying:

> *"Anybody can go into it. You know that when you are abandoning your bathtub, instead of throwing it away, you can use that to farm in that, even crates, those crates for beer and stuff like that, instead of throwing away stuff you use them for farming. So, it's very cheap."*

The traditional value system appeared to anchor approaches to farming. The quote below is of Participant N who migrated from traditional farming methods to technology-driven farming and yet held strong to the cultural value of conservation. When asked about her experience in urban farming Participant N echoed the sentiment of conservation and is demonstrated in the image that follows:

> *"Zero wastage and effectively environmentally friendly I think that's how I describe my occupation…"*

Despite exposure to modern farming practices, Participant N maintained the value for conservation. The social media post below corroborates the espoused conservation value by Participant N and is seen carried forward even as the participant learned about technology-driven farming practices; evolving from a Traditionalist to a Adaptavist. Once again this illuminates the progression of values and exchange of worldviews among the archetypes.

The images below show how traditionalists value the notion of conservation and reusability of resources. These are urban community farms in the Western Cape province, South Africa using recycled materials for urban farming. Traditionalists encouraged employing the 3 R's of recycling: Reduce, Reuse, Recycle, and leveraging and using what is already available. Traditionalists' urban farming practices minimized dependency on modern technologies.

Picture 20 & 21: Participant I, Urban Farm in Khayelitsha, Wesern Cape

The written account extract further emphasizes traditionalists' determination to preserve resources in their production methods.

> "… I plant spinach, spring onion, potatoes and beetroot mostly in crates and big planter bags. I farm organically which means I don't use chemicals my fertilizers and soil building resources have to come from the soil or animals. Such as chicken manure and kraal from cows. I

6.4.4 Beliefs

Traditionalists valued the importance of caring for the environment since it provides them with food. This concept can be considered one of the principles embedded strongly in the cultural values of traditionalist farmers, and for traditionalists, this meant being one with the environment, and further suggests a bi-directional relationship between the farmer and the environment. This was an important value for this archetype and informed the decisions not to adopt certain technologies in their farming practices. The quotations below show the identity negotiation by traditionalists who find themselves in urban technology-driven practices yet with an inclination to traditional and organic approaches to farming which would suggest the use of alternative farming technologies. At the time of the interview Participant N was still engaging in traditional methods of farming despite also being in the early stages of exposure to technology-based farming. The participant expressed the connection to traditional, soil-based farming approaches. The same Participant subsequently migrated to the Adaptavist archetype further demonstrating the

identity mutation. This dimension is therefore also discussed under the Adaptavists archetype, and suggests a merging of worldviews.

> *"I'm very health conscious I think when I'd go back to the soil I will definitely be on a more regenerative organic type of style of farming."*

> *"… is always sustainability, your responsibility is food security, your responsibility is making sure that you are taking care of nature because nature is giving us so much so what are we giving back. So that is always your responsibility."*

The images below show the type of farming Participant N engaged in at the time of the initial interview, which is more traditional and soil-dominant with minimal technology usage.

Picture 22 & 23: Participant N, 14ha plot peri-urban farm in Boksburg,Gauteng

Participant N coming from a traditionalist worldview communicated that she was exposed to the knowledge to farm commercially through education and work exposure, and that this experience challenged her traditional subsistence farmer cultural values. Her

worldview shifted towards being urban farmers with a desire to be profitable, however, still held on to her traditional farming methods.

> *"Absolutely I feel like you know once you are a farmer the soil really is a connection. Just touching the soil, just being, having that relationship with the land and yourself so I think definitely, I will definitely go back. I am not abandoning farming traditionally at all I'm not. I am just saying that I have a better opportunity but I will definitely still be farming with my hands, touching the soil but I think I would be more into organic this time. Organic has always been a way I want to produce because I myself, other vegetarians transitioning to become a vegan so I'm very health conscious I think when I'd go back to the soil I will definitely be on a more regenerative organic type of style of farming."*

6.4.5 Cultural Geography

The concept of community development as a means to address poverty, unemployment, and food security captured in the concept of *ubuntu* in South Africa emerged strongly for traditionalists. Espoused principles by traditionalists include values that encourage the sharing of resources, and a sense of communalism to ensure sustainability, thus encouraging and enabling the participation of community members resourcefully and cost-effectively. For Traditionalists this is also informed by the socio-economic status of spaces and locations within which they find themselves. The embedded principles then guide the farming approaches and modalities. Relating to this dimension, Participant I said:

> *"And remember Khayelitsha is one of the poor townships, so what we encourage is plant with what you have, it shouldn't be expensive … we teach them on a 3-day course."*

Once again it appears that the traditionalism subconsciously anchors approaches to farming and as such for Participant L, who started his urban farming journey in the Gauteng, Johannesburg, CBD and later replicated the same farming model in Gauteng, Soweto; shared the same sentiments on community development and in reflection said:

> *"I'm paying here [peri-urban] and it's helping the community. Whereas the rent that you will be paying there [urban] will be paying 'actual' rent … So, its social impact it's gone up much higher because the impact that side it would be jobs, maybe, but it goes more than that here. Yeah. I guess it's a community*

resource also now. And yeah, people are seeing themselves as small-scale subsistence…"

The social media post and images below demonstrate traditionalists' delight and consideration for community development through urban farming. The type of farming and tools employed by traditionalists lower the barriers to entry and enable the resourceful and cost-effective participation of ordinary community members.

Picture 24: Participant L, Urban farm in Soweto

Location further reinforced the traditionalist impression owing to what the location was able to offer in terms of available resources, such as arable land for farming. Driven by a value for community development, traditionalists ensured to employ resources that would encourage inclusivity. Participant I presented an example of this dimension:

> *"… so sandy soil is not suitable for planting, so what we teach them is how to plant on that sandy soil. Oh, did I also mention that we also provide classes? We have a 3-day course for anyone that wants to learn how to plant organically."*
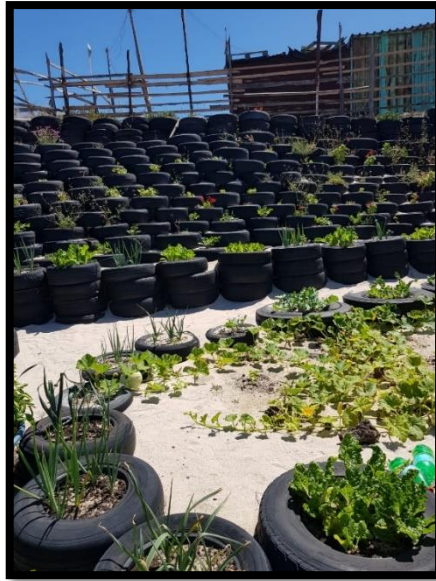
Picture 25: Participant I, Community Garden in Khayelitsha, Wesern Cape

6.4.6   Farming Practices

One of the reasons traditionalists rejected the use of technology in their farming practices is the belief to preserve traditional family farming practices. Participants felt that the adoption of technology will mean that they have compromised their cultural values that were transferred through the family cultural systems. Some of the practices include the use of hands to cultivate plants or crops and other traditional farming practices. This was closely associated with the concept of subsistence farming and livelihood sustenance. Participants mentioned that their upbringing and history are informed by subsistence farming, which was designed to ensure the sustenance of livelihoods in their communities; their families would often farm to ensure food in their households. In the urban farming setting, this value was preserved through community garden initiatives as alluded to above. The quotation below illustrates the identity negotiation process by Participant I, and the ultimate decision to reject technology.

> *"No, I wouldn't. When I say it, I don't say that I found agriculture, agriculture found me, and then we fell in love. We are going forward. It's not something that I thought I would do because, uhm I am also a city person as much as I was born in the rural areas, so the city got into me but those things that we used to practice in the rural areas, I am still so much fond, so I wouldn't change it."*

Correspondingly, traditionalists rejected technology due to a lack of knowledge, understanding, and comprehension of technology-driven farming. The complexity created a sense of inferiority and thus threatened their traditional farmer identities. The

lack of knowledge about the technical aspects of technology arguably defers the adoption of technology. Reflecting on her urban farming journey Participants P, whose knowledge of farming was based more on traditional approaches, when exposed to technology said:

> *"It has long been said that it took us some time to master the production process. Farming doesn't care if you are a graduate, it will always challenge you."*

Similarly, Participant N alluded to how the complexity that comes with technology deferred the adoption thereof:

> *"Uhm, with the tech space, I didn't identify with technology when I was watching the videos and I can tell you why. Because I felt like I didn't quite understand it, it didn't relate to me .... So, so I studied traditional ways of farming for me how I saw the technology, I was like this seems so high tech. It is something I would never get to. The only technology I was thinking about was a tractor. So, when I started that was my outlook on farming. So, I can't say that with technology I saw that and I aspired to that, for me I was very disconnected with it when I started my farming journey."*

The extract from the written account below demonstrates how the different conceptions of technology or the lack of understanding of modern technologies deferred to the possible adoption of technology.

I was exposed to technology in 2017 when I actually drove a tractor where I saw uhm self-driving tractor, where I saw … you know … machinery. I feel like machinery is technology and ya … so for me technology has always been machines and when I got into farming in2017 that is when I was like oh wow ... you know … farming is not the traditional labour-intensive exercise. It can be made easier by the use of technology.

6.4.7 Exposure to Technology

Traditionalists were not completely clueless about modern technologies and their benefits such as efficiency, monitoring, and the ability to reproduce at a faster rate, however, they lamented the cost of adopting technology into their farming practices. It seems that the cost of technology finds its expression in both access to and the investment cost of adopting the technology such as procuring or building hydroponic or aquaponics systems, greenhouse tunnels, and irrigation systems. The viable cost of technology was also exacerbated by the socio-economic status of the regions within which traditionalists resided and operated; where farmers needed to be mindful of the

final cost to the consumer especially when the pricing of products produced through intensive technologies. This suggested that farmers would not be able to make a sufficient return to counter the start-up investment costs. This contemplation, therefore, impacted the nature of technology the participants can adopt or invest in. Relating to her experience while farming in a peri-urban area, Participant N and L, respectively said:

> *"But most you know of the types of farms like eloxion, ekasi, in rural areas because they don't have the funds for all these new technologies like even seed varieties, or chemicals, or sprays, pesticides, herbicides, they use what they can they use natural resources, most of the time ..."*

> *"Yes, operation will be managed by what you can afford. And then it will it will change based on how big your operation is, and your customer segments and your contracts and how commercial production is and then it will change … So yeah, so what you set up is basically what you can afford."*

Participant I shared similar sentiments, reflecting on her personal experience:

> *"Eh, as healthy but is not profitable. Especially if you're staying in a township. Remember with organic their food is more expensive, but people are not willing to pay R15 for a small cabbage where you can go to Spar and pay the same R15 for a bigger cabbage. So, everyone wants to save. As much as you want to provide them healthy food but you are not providing money for them. So even myself, I know that ok if I were to compare. Recently there was a Black Friday, right? We sold our potatoes harvested already for R65 because it's organic, 7Kg's, R65. And there it was R35… And can you believe it, as an organic farmer but I went for those, the R35 one's."*

The social media post below demonstrates a sizeable and cost-effective operation, and the written account extract reinforces this conception.

Making agriculture fashionable

> "… . I started all this as an intern at **Farm organization** where I was thought that you don't need to a lot of land to start farming. I use my vegetable for self-consumption even though I do plan to start selling to the local community at a later stage. My main focus is eating healthy while I'm also saving money from buy certain vegetables. I am only planting medium and light feeders (leafy and root crops) which are your Spring onions, carrots, Spinach. I don't planter heavy feeders which are mostly your brassicas (cabbage, cauliflower and broccoli) they utilize a lot of the production space and need a lot of manure and I find it hard to control pests and diseases from them. With a small production space like container farming crop rotation is limited and the fact that I farm to eat so I always plant my favourites …"

6.4.8 Education and Knowledge Systems

Traditionalists communicated that when they were exposed to the knowledge to farm commercially through education and work exposure, this experience challenged their traditional subsistence farmer cultural values. Their worldview shifted towards being urban farmers, however, traditionalists still maintained traditional farming methods. Participant N explained:

> *"Absolutely I feel like you know once you are a farmer the soil really is a connection. Just touching the soil, just being, having that relationship with the land and yourself so I think definitely, I will definitely go back. I am not abandoning farming traditionally at all I'm not. I am just saying that I have a better opportunity but I will definitely still be farming with my hands, touching the soil but I think I would be more into organic this time. Organic has always been a way I want to produce because I myself, other vegetarians transitioning to become a vegan so I'm very health conscious I think when I'd go back to the soil I will definitely be on a more regenerative organic type of style of farming."*

Correspondingly, traditionalists rejected or deferred the adoption of technology due to a lack of knowledge, understanding, and comprehension of technology-driven farming. The complexity created a sense of inferiority and thus threatened their traditional farmer identities. The lack of knowledge about the technical aspects of technology arguably defers the adoption of technology. Participant N explained her experience:

> *"Uhm, with the tech space, I didn't identify with technology when I was watching the videos and I can tell you why. Because I felt like I didn't quite understand it, it didn't relate to me .... So, so I studied traditional ways of farming for me how I saw the technology, I was like this seems so high tech.*

It is something I would never get to. The only technology I was thinking about was a tractor. So, when I started that was my outlook on farming. So, I can't say that with technology I saw that and I aspired to that, for me I was very disconnected with it when I started my farming journey."

In summary, Traditionalists were framed by traditional value systems which are influenced by amongst other socially ascribed identity labels, ethnicity, and religion. These ascribed identity labels created a sense of community which leaned towards preserving and caring for the environment, and consequently influenced methods that would preserve indigenous and traditional practices. Traditionalists were not completely clueless about modern technologies and their benefits, however, the exposure to technologies was limited. Despite the slight knowledge about technology adoption in urban farming, traditionalists appeared to also be disadvantaged by their socioeconomic status as individuals, and equally by the socioeconomic statuses of the environments within which they operated, and therefore deferring the adoption of technology or opting for the use of alternative tools for production. This archetype represents participants who are resistant to change and preferred not to or rather deferred the adoption of technology in their farming practices.

6.5   Outcome space

An outcome space based on the internal and structural relationships among conceptions is the result of phenomenographic analysis (Åkerlind, 2012; Stenfors-Hayes et al., 2013; Svensson, 1997). Phenomenographic analysis stands out from other types of analyses because of the outcome space (Stenfors-Hayes et al., 2013). The underlying differences in the conceptions are analyzed to determine their fit to the category to which they belong, and then further examined to determine their relation to the other conceptions. Collier-Reed and Ingerman (2013) emphasize the significance of establishing this connection because it is useless to refer to the findings of phenomenographic research only by their names at the time of conception.

The outcome space is a visual representation of the studied phenomenon and the qualitatively distinct ways of experiencing it. It explains the relationship between the different ways of experiencing a phenomenon in a single visualization (Åkerlind, 2012; Collier-Reed & Ingerman, 2013; Yates et al., 2012). The visual representations of outcome spaces are not uniform; they can be in the form of a diagram, image, table, or figure so long as they show how the concepts relate to one another (Yates et al., 2012). In an outcome space, the categories are logically related and can be arranged by order

of hierarchy. Each category demonstrates a more in-depth understanding of the phenomenon under study (Åkerlind, 2012; Collier-Reed & Ingerman, 2013; Neuman, 1997). However, outcome spaces are not required to be linear hierarchies (Åkerlind, 2012).

The current study, like other phenomenographic studies, demonstrated that participants approached technology adoption from their own cultural identities, both in terms of what and how (Harris, 2011). The conceptions of cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, and farming practices talk to *what* informs the individual cultural identities, which addresses the first sub-research question and the archetypes explain *how* the individual cultural identities are negotiated for the adoption/rejection of technology, to answer the second sub-research question. Individual identity stands on its own as a frame that helps navigate the process of technology adoption. Säljö (1997) posited that the internal sense-making of an individual and the external world within which the individual finds him/herself are not posited as isolated entities. The two worlds find their relation internally through the individual's awareness of the world (Hajar, 2020). In the context of the study the individual cultural identity and how it is enacted in the urban farmer's ways of working, are two inseparable aspects to the phenomenon of technology adoption.

The initial objectives of phenomenographic research were merely to identify the qualitatively distinct ways of experiencing a phenomenon; more recent research has emphasized the need for additional analysis (Åkerlind, 2017). By looking at how different levels of awareness of each conception result in different ways of experiencing the phenomenon of study within the sample group, adds additional complexity to phenomenographic analysis (Åkerlind, 2017). A phenomenographic study typically yields more than just the categories the researcher identifies. The internal relationships between the categories can be examined and understood with an additional step to the analysis, which results in an outcome space (Larson & Holmström, 2007). Since conceptions can vary depending on the field of study, there are no precise guidelines in the literature regarding how to carry out this additional analysis procedure. However, the outcome space typically has hierarchical relationships among the various categories (Sandbergh, 1997). This outcome space's hierarchical organization can be inferred from the data or determined through a theoretical analysis of the categories.

Due to the varying conceptions, the hierarchical structure of the outcome space would not be suitable for the current study. However, the level of impression of each conception

to the archetypes is inferred from the data to demonstrate the relative importance of each conception to the archetype. As a result, the lens of the eight conceptions was used to categorize participants' conceptions in the current study, and each conception was classified based on participants' experiences with technology adoption. The different conceptions are classified according to the participants' experiences of technology adoption and the inferred degree of impression to each archetype, and are depicted in Figure 6.1. The participants' descriptions of the concepts served as the basis for the classification of the outcome space (Marton, Dall'alba, & Beaty, 1993), and the archetypes represent the collective level of analysis (Åkerlind, 2012; Collier-Reed & Ingerman, 2013; Limberg, 2012). Displaying the outcome space in this way allows for analysis at a collective level, and generalizability without blurring the individual participants' unique experiences (Ashworth & Lucas, 2000). Each outcome space illustrates *how* urban farmers relate to the use of technology in the urban farming space. The archetypes and accordingly outcome space should not be misconstrued as typologies of urban farmers. The four archetypes are Strategist, Adaptavist, Innovationist, and Traditionalist.
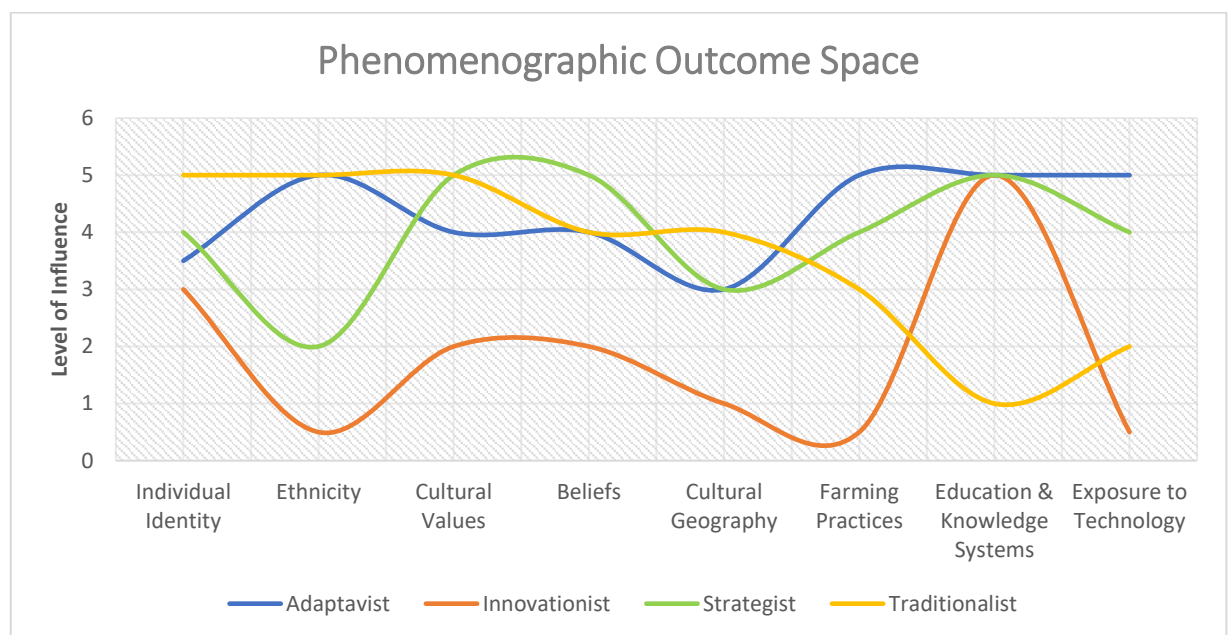
Figure 6.1 Phenomenographic Outcome Space

6.6 Summary of Findings

Eight qualitatively different ways in which urban farmers in South Africa conceptualize what informs their cultural identities were found in the current study. Those are their cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity. These eight

conceptions can be experienced and negotiated in different ways. In the context of technology adoption and urban farming, four archetypes were developed: Traditionalist, Adaptavist, Strategist, and Innovationist. This process of experiencing technology is governed by participants' individual identities, which foreground the internal sense-making of an individual.

Chapter 7: Discussion

The previous chapter followed a theme-based approach to describe the findings of the study. This chapter goes one step further to decipher the themes, guided by the research questions. I also discuss and compare the findings to literature and theory to provide integration and illustrate the interconnectedness of the dimensions to the archetypes in order to comprehend the urban farmers' experience with technology through the lens of cultural identity.

This work provides an understanding of the different ways in which urban farmers in South Africa experience technology from an individual cultural identity perspective employing the cultural contracts theory; and demonstrates why, when considered from the perspective of an individual's cultural identity, technology adoption in urban farming may result in failure or success. The research also makes possible practical recommendations on strategies that aim to encourage the sustainable adoption of technology in urban farming.

The discussion chapter answers the main research question "How do individual cultural identities inform the differences in technology adoption among urban farmers in South Africa?" by addressing two subsidiary research questions:

SRQ$_1$: What informs the individual cultural identities of urban farmers?

SRQ$_2$: How are the individual cultural identities negotiated for the adoption or rejection of technology?

Practically, understanding the qualitatively different ways in which individual urban farmers experience technology adoption will not only determine the status of technology adoption amongst urban farmers in South Africa but will also help to shape policy and strategic interventions that facilitate the provision of technology for development purposes. This research to technology dissemination experts and proposes that organizations can benefit from considering complex individual cultural identity factors when administering technology adoption interventions. Experts may also consider developing individualized interventions to address the extensive nuances of identity and positioning urban farmers as practitioners rather than merely beneficiaries of development. In an effort to promote the success of urban farming as an economic activity, experts can also take into consideration the co-creation, adaptation, and modification of technologies to fit the context of the local area.

I make a number of important theoretical contributions. I present cultural contracts theory to the management discipline, I use it to provide an individual-level perspective on the phenomenon of technology adoption and cultural identity. By taking an individual-level perspective and theorizing the experiences of urban farmers on the use of technology from a cultural identity perspective in their urban farming environments, I use the findings to build on the cultural contracts' theory. Unlike the theory suggests, it is possible to refuse to sign a cultural contract, and thus I add non-signing as a cultural contract. I change how the theory is understood, and point to a cultural identity continuum of technology adoption that focuses on the dynamic individual agency. I contribute to the sociotechnical literature by providing an individual-level perspective that can complement the better-established social and societal perspectives. I highlight participants as technology adoption agents who choose actions that make sense to them. The application of the cultural contracts' theory broadens the sociotechnical theoretical perspectives and offers a new theoretical perspective on technology adoption.

7.1 Understanding Technology Adoption from an Individual Cultural Identity

My finding is that there are variations in individual cultural identities that inform and influence the adoption or rejection of technology. This shows that organizations can benefit from considering multidimensional individual cultural identity factors when administering technology adoption-diffusion interventions (Shin, 2019), and challenges some previous sociotechnical scholarship, which suggests technology adoption as a collective action (S. Becker et al., 2021; Bögel & Upham, 2018; Sartori & Theodorou, 2022), as a result assuming that the shared meanings about a particular technology and the use thereof give rise to its adoption (Forney & Dwiartama, 2022).

My findings enhance the sociotechnical body of literature by foregrounding technology adoption from an individual cultural identity perspective and focuses on the consequential nuances of paying attention to the variation of identities. By doing so, this work bridges the gap by providing a more in-depth explanation of the role that individuals' agency plays in the adoption of technology and socio-technical developments.

The dimensions and archetypes found are interlinked and do not exist in isolation; therefore, they should be viewed systematically rather than in a linear outline. That is to say, even though the dimensions and archetypes are presented in table form (Table 6.2),

they are not mutually exclusive. Identities are constantly evolving, and not static, and from time to time they overlap.

In the current study individual identity stands as a frame that helps navigate the process of technology adoption in the urban farming space. All individuals have variations of multiple identity labels which are noticeable in different contexts and during interactions. Once urban farmers enter the urban farming space, their identities are informed by their ethnicity, beliefs, cultural values, and cultural geography. In addition, they acquire education and knowledge on urban farming practices and are exposed to various technologies which further inform their cultural identities.

The informed identities are practically applied and negotiated through interactions in their networks, and farming practices which manifest in the signing of cultural contracts that lead to the adoption or rejection of technology. The entire process is hemmed in by the urban farming environment that stimulates the use of technology for farming and is experienced through four archetypes Strategist, Adaptavist, Innovationist, and Traditionalist. Each archetype experiences the infusion of each dimension in varying degrees and therefore experiences the overall use of technology differently.

The findings of the current study acknowledge the (i) mutual constitution – that both the individuals and technologies may have some sort of intervention in the entire experience of technology in the urban farming space, and (ii) contextual view - that these actions are not independent of the urban farming context. This is shown by the interrelatedness of the dimensions of individual identity, cultural values, cultural geography, ethnicity, beliefs, education and knowledge systems, exposure to technology, and farming practices in the experience of technology adoption in urban farming.

The trigger for any experience in the sociotechnical body of literature is social identity (Tajfel, 1978), and suggests that groups, to which individuals belong are a key source of prestige and self-esteem, and therefore shape how experiences are interpreted. I used the cultural contracts theory to draw a focus on individuality as the centre of human action/intervention through identity negotiation. This process can be seen throughout the urban farming experience with technology and is executed differently through the three contract typologies (i) ready-to-sign, (ii) quasi-completed, and (iii) co-created (Jackson, 2002), and explained in the context of the study through the developed archetypes of Strategists (co-created), Adaptavists (ready-to-sign), Innovationists (quasi-completed), and Traditionalists non-signing (hold on to their cultural contract and resist change). The cultural contracts theory asserts that identities are constantly evolving, and not static,

and from time to time they overlap (Jackson, 2002). In this study, I use the archetypes to point to a continuum of technology adoption based on cultural identity.

For the cultural contracts theory, I use evidence from the study to suggest that preserving one's worldview still counts as signing a cultural contract and allows people to function in diverse environments. That is, firstly, I suggest a further contract typology to explain the human experience in the context of dynamic phenomenon. I suggest a distinct contract typology that refers to a non-signing or unwillingness-to-sign based on evidence of the Traditionalists' archetype, which will be detailed in the subsequent sections, to enhance the cultural contracts theory definition of human experience. Secondly, I suggest technological adoption as a continuum of cultural identity employing cultural contract typologies. That is to say, I suggest a sequential and progressive signing of cultural contracts based on the study's evidence. Thirdly, I use the study's evidence to argue that interactions influence a subsequent dimension of human experience, keeping cultural contracts open; and different circumstances offer various experiences of negotiating one's identity. The concepts of identity and technology adoption each reflect a dynamic phenomenon when examined separately. In the context of the phenomenon of technology adoption from the perspective of cultural identity, therefore, cultural contracts ought not to be restricted to a single experience, such as pre-negotiated experiences; rather, they ought to take into consideration the fact that experiences are negotiated in every context, with power largely residing within the individual.

7.1.1 A model of technology adoption as a continuum of cultural identity

This study's findings point to a technological adoption continuum of cultural identity and make use of archetypes identified in the current study, to explain the identity negotiation experience of urban farmers towards the adoption or rejection of technology. The eight dimensions that inform urban farmers' cultural identities feed into the archetypes in varying degrees, to explain the inter-relationships between cultural identity and technology adoption.

Drawing from the cultural contracts theory typologies the continuum aligns the archetypes with the three contract typologies suggested by Jackson (2002) to define the human experience. The conceptual framework demonstrates that technology adoption takes place along the continuum, and shows that urban farmers adopt technology between the *Ready-to-Sign* cultural contract and Adaptavists' archetype, the *Co-Created* cultural contract and Strategists' archetype, and the *Quasi-Completed* cultural contract and Innovationists' archetype. Using evidence from the Traditionalist archetype, the

extreme left of the continuum introduces a new type of cultural contract that demonstrates a deferment to technology adoption or rejection of technology and is labelled as the Non-Signing cultural contract. The four archetypes are arranged in a way that demonstrates the adoption of technology by urban farmers. The dotted lines around the contract typology demonstrate that cultural contracts remain open in everyday interactions.

Participants adopt and modify technology to fit their operational contexts as the continuum moves to the right. Based on the study's findings, there is an overlap between the co-created and quasi-completed cultural contracts, and similarly between the Strategists and Innovationist archetypes, anchored largely by their entrepreneurial pursuits. This backs up the idea that multiple identities can negotiate simultaneously and function simultaneously within communicative contexts (Collier & Thomas, 1988). Sustained technology adoption is more likely to occur by the *Co-Created* cultural contract, and Strategists' archetype owing to their proliferative mindset and a strong emphasis on entrepreneurship and profit.
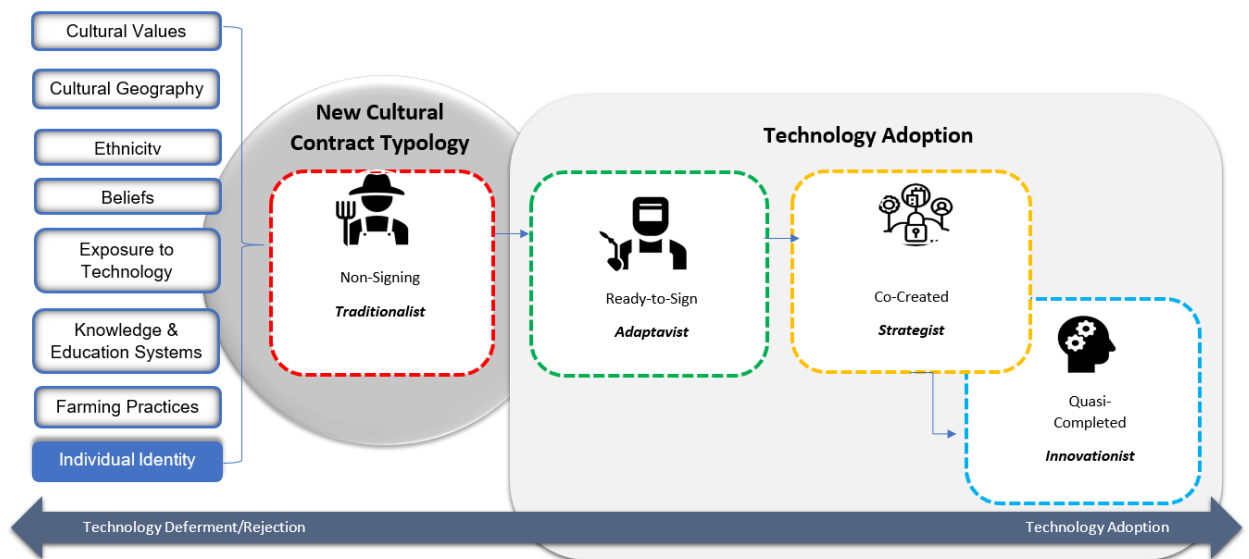
Figure 7.2: Urban farmers' cultural identity continuum of technology adoption

The interrelatedness of the dimensions and archetypes in the study confirms the evolving nature of identity and that dimensions that inform individual cultural identities are not mutually exclusive. Contrary to tenets of the sociotechnical theoretical perspectives, the current study's findings show that the trigger for any experience is the individual identity which in this study frames the experience of technology adoption before entering the urban farming space, and is constantly negotiated and informed for future experiences in the urban farming space. Evidence from the study further shows that the individual

identity negotiates itself during interactions through an archetypical continuum that categorizes how the individuals experience technology adoption in their urban farming practices.

The Traditionalist archetype was the only archetype that clung to their cultural identity which was largely influenced by their social identity. For self-preservation, identity protection, and self-definition, Traditionalists clung to their cultural contracts and maintained traditional approaches to farming. Traditionalists did not involve much flexibility in their identity negotiation, were resistant to change, and consequently rejected or deferred the use of technology in urban farming. I suggest a distinct contract typology that refers to a non-signing or unwillingness-to-sign based on evidence of the Traditionalists' archetype, to enhance the cultural contracts theory definition of human experience.

Contrarily, Strategists, Adaptavists, and Innovationists were open to identity negotiations. Strategists negotiated co-created cultural contracts which honour both traditional and modern technology approaches. The negotiated co-created cultural contract proves a strategic approach by Strategists, that though independent, they are connected to their environments and the markets they supply through relationships, so they would need to farm in hybrid ways to meet demand. As a result, technology was adopted to propel this endeavour.

Adaptavists showed identity flexibility and were willing to adapt when technology adoption opportunities in urban farming were presented to them. As a result, Adaptavists negotiated cultural contracts that were ready-to-sign. It would appear that Adaptavists felt compelled to adopt technology for urban farming because of the inherent advantages of assimilation because their goal was to join the mainstream through employment or funding opportunities. Female Adaptavists, who joined the urban farming community to challenge preconceived notions regarding gender roles in agriculture, provided an interesting nuance to the findings. Because they believed in experimenting, Innovationists negotiated quasi-completed cultural contracts and demonstrated a greater concern for novel technologies and other aspects of novelty, including those that do not involve technology. For Innovationists' there was a lot of experimenting involved in the adoption of technology.

The distinctiveness of identity negotiation between the archetypes resulted in different experiences in the urban farming space, and consequently the signing of different cultural contracts for the adoption of technology.

The current study's findings on the individual cultural identity experience of urban farmers adopting technology depict the experiences of urban farmers specifically, and it is clear

that certain aspects are distinctive to urban farmers. However, there are a few reasons why the findings may be relevant to audiences outside of urban farming. As entrepreneurs, urban farmers use technology for the efficiency of their operations.

The findings show that the majority of the participants have entrepreneurial mindsets. Many came into the urban farming space looking for opportunities, entrepreneurial skills, or even money to start their own businesses. Those who were chosen for funding were chosen specifically because they met the criteria for being entrepreneurs and had business plans that required capital injection. Also, the majority of urban farmers in this study said they wanted to run their businesses and be competitive in the business world, which motivated them to look for jobs with urban farming organizations. The adoption of technology was done to ensure productivity and competitiveness. Urban farming entrepreneurship's commercial viability is heavily dependent on technology to achieve competitive volumes and production frequencies. In addition, urban farmers are unique as entrepreneurs because they are not only pioneers in an entrepreneurial urban ecosystem but also demonstrate aspects of social entrepreneurship centered on resolving the issue of urban food security and making a measurable contribution to society. On this basis, this study's findings may be useful to entrepreneurs outside of urban farming who rely on technology for day-to-day operations.

The uniqueness of the South African context also adds essence to the findings of the study. As mentioned previously, South Africa's agricultural sector contributes immensely to unemployment, food security, and poverty alleviation. However, there is a tendency for studies on technology adoption to focus on homogenous samples or otherwise view the process of technology adoption through uniformity of identity, by potential beneficiaries. I gathered data from a heterogeneous sample with varied experiences of technology adoption. By emphasizing the consequential nuances of paying attention to identity variation and how these influence experiences of technology adoption, this work alters our understanding of technology adoption. In addition, I developed technology adoption archetypes based on cultural identity that categorize the qualitatively different ways in which urban farmers experience technology adoption. The development of the archetypes further challenges our understanding of technology adoption—that urban farmers are not merely beneficiaries but rather agents of development who choose actions that make sense for them to address socioeconomic challenges. The interconnectedness of the dimensions and archetypes makes it possible to comprehend how technology adoption is influenced by an individual's cultural identity.

By taking an individual-level cultural identity perspective and theorizing the experiences of urban farmers in their environments, I make two theoretical contributions. First, by studying cultural identity and the use of technology, from an individual-level perspective, I show that it is beneficial to focus on the implications of individual identity differences. Moreover, it mattered to understand how individual cultural identities inform the difference in technology adoption among urban farmers in South Africa. I theorize the implications of individual agency as a guide that informs the differences in technology adoption to show that technology adoption is influenced by an individual's cultural identity. This work foregrounds participants as agents of technology adoption, who choose actions that make sense to them. Second, I choose a lesser-known theory, the cultural contracts theory, and apply it to the management discipline. Unlike the cultural contracts suggests, I show that it is possible to refuse to sign a cultural contract; and thus I add non-signing as a cultural contract. In addition, I change how the cultural contracts theory is understood to suggest a continuum. I discuss these contributions in turn.

7.2   Conceptions

This work identifies eight dimensions that are salient to inform urban farmers' cultural identities to be cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity; and adds nuance to previous research on cultural contract theory which considered dimensions of identity in a piecemeal fashion, such as focusing scarcely on race and gender in the work of Daulat and Wadhwa (2023), and similarly in the work of Dickens et al. (2019) and Parsloe and Smith (2022). Informed by the eight dimensions this work further identified four cultural identity archetypes Strategist, Adaptavist, Innovationist, and Traditionalist. The archetypes confirm but add nuance to the cultural contract theory typologies: Strategist (co-created), Adaptavist (ready-to-sign), Innovationist (quasi-completed), and Traditionalist (non-signing). In particular, the Traditionalist archetype changes how we understand the cultural contracts theory typologies of human experience by showing a distinct contract typology that indicates an unwillingness to sign or a non-signing cultural contract.

Through the archetypes, I show a broader explanation of human experience and emphasize individual agency in the   identity negotiation process. The importance of this is such that the interrelationships between technology adoption and cultural identity are explained by the ways in which individuals exercise agency to navigate both. Different personal and contextual backgrounds provide different experiences of identity negotiation for individuals. The archetypes, in addition, point to a cultural identity

continuum of technology adoption and emphasize dynamic individual agency. For the cultural contracts theory, the evidence of the study shows that in different contexts, individuals can function without signing a new cultural contract, that is, a shift in worldview; and that the maintaining of one's worldview still constitutes a cultural contract. Power primarily resides within the individual.

The implications of the study findings are first, that technology adoption is continually (re)negotiated through the dynamic individual agency. Second, technology adoption takes place along a continuum that confirms but adds nuance to cultural contracts theory, from non-signing to ready-to-sign cultural contracts. While no absolute claims can be made about how representative the dimensions and archetypes are, they are likely to recur across multiple contexts. The following sections provide some in-depth discussion of the focus on addressing the overarching research question of how individual cultural identities influence differences in technology adoption among urban farmers in South Africa.

7.3 An individual cultural identity experience of technology adoption

Forney and Dwiartama (2022), like several other sociotechnical scholars, focus on the monolithic identity of potential technology adoption beneficiaries (Sartori & Theodorou, 2022; Shin, 2019). The fact that this perspective continues to provide a partial explanation for the phenomenon of technology adoption is not surprising. I show from the study evidence that each urban farmer understands and experiences the world of technology use differently, guided by their own cultural identity.

My evidence shows that individual cultural identities inform the differences in technology adoption. What matters most is how individual urban farmers use agency to navigate both identity and technology as dynamic phenomena. On this basis, I outline the varying degrees according to which the eight dimensions salient to urban farmers' cultural identities: cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity, inform the differences in the experience of technology adoption in the urban farming environment. I, later, use the archetypes to illustrate how individual cultural identities inform differences in technology adoption among urban farmers in South Africa.

The nature of individual identity is a broader dimension, and in this study, frames the experience of technology adoption in the urban farming space. Consistent with Collier's (2015) definition of individual identity as the qualities, beliefs, personality traits,

appearance, and/or expressions that characterize the individual, this work discovered that because of how each urban farmer's identity is formed, urban farmers can choose whether or not to adopt technology through the influence of their individual cultural identities. Urban farmers' cultural identities are also influenced by contextual circumstances. Evidence of dimensions such as exposure to technology, knowledge and education systems, cultural geography, and farming practices add nuance, because the urban farming context facilitates an individual's identity negotiation through a learning experience, and complex system thereby reinforcing emphasis on the dynamic nature of identity. The nature of individual identity is such that it defines distinct experiences for individuals in the urban farming context.

The level of the impression of each dimension to the archetype demonstrates the relative importance of individuals' cultural identities in informing the adoption or rejection of technology.

7.3.1 Nature of individual identity

The cultural contracts theory suggests cultural contracts are necessary for preserving, safeguarding, and defining one's identity (Jackson, 2012). My evidence shows Traditionalists acted to uphold and defend a traditional identity they believe to be true about themselves as farmers. This view, although, challenged by urban farming approaches, Traditionalists insisted to maintain a non-signing cultural contract. Ironically, some Traditionalists who joined the urban farming community took initiative to adapt to the demands of the industry and use technology. As a result, their identities were reshaped by the urban farming environment, towards the use of technology, this according to Jackson (2012) points to a rise in cultural loyalty and the resultant assimilation (Jackson, 2012). These Traditionalists agreed to a change in perspective, and the consequent fit to be categorized as Adaptavists.

Adaptavists' identities proved to be flexible with a readiness to assimilate when joining the urban farming space. Noteworthy my evidence shows through an established sense of self-efficacy some Adaptavists self-ascribed the commercial urban farmer identity, as they learned from other urban farmers and experts in their environment, which informed their approaches, and the sustained use of technology. The entrepreneurial spirit fostered by urban farming led some Adaptavists to redefine themselves as Strategists. This confirms the cultural contracts theory assumption that Identity is dynamic, not static, and it is changed by interactions with other people (Hecht, Collier, & Ribeau, 1993; Jackson, 2012).

Strategists identified as entrepreneurial and driven by profit, and planned hybrid approaches to technology adoption. Innovationists', whose identities overlap that of Strategists, adopted technology as an experiment whilst straddling conventional farming approaches. My evidence supports the cultural contracts theory assumption that suggests that different identities can also be negotiated simultaneously (Collier & Thomas, 1988). The implication is that innovationists and strategists place a high priority on utilizing technology in ways that make sense to them.

I show that the nature of identity is such that it is dynamic, and the archetypes which shadow the cultural contracts remain open throughout the urban farming experience and facilitate further negotiations. Individual agency stimulates the (re)negotiation of technology adoption on an ongoing basis, and a cultural identity technology adoption continuum: Traditionalist → Adaptavist → Strategist → Innovationist, from a non-signing to a ready-to-sign, co-created and quasi-completed cultural contract. This confirms the theory assumption that cultural contracts are temporary (Jackson, 2012), but adds nuance by showing that they are not mutually exclusive. I further show that Individual identity frames the experience of technology adoption in urban farming. The results contribute to the cultural contracts theory but add nuance to the cultural contract typologies that define the human experience.

7.3.2 Ethnicity

Traditionalists exercised agency to maintain their ethnic and religious perspectives on farming, even though these have reservations regarding the use of technology. This supports the work of Davies et al. (2018) who alike found religious beliefs and traditions, belief in indigenous knowledge, and certain agricultural practices to hold a symbolic significance and played a role in the low acceptance and adoption of Climate Smart Agriculture in Namibia. Similarly, how traditionalists in South Africa defined themselves in the context of their various ethnic backgrounds and societal roles (Terblanché-Greeff, 2022; Jimenez, 2020; Kotze, 2021) significantly influenced their agricultural practices. Traditionalists' cultural contracts demonstrate the significance they place on preserving individual identity (Jackson, 2002, 2012).

Interesting to find is that the female urban farmers that emerged from the Traditionalist archetype adopted technology to contend with ethnic opinions about cultural gender roles in farming. This was further encouraged by the fact that urban farming offered females the opportunity to own and/or operate farms. These female urban farmers identified as Adaptavists' because they were able to act independently, navigate, and assimilate to the adoption of technology in urban farming. For Adaptavists, joining the

urban farming space precipitated the shift in worldviews from traditional to modernized farming which uses technology. Another demonstrable example is how Adaptavists' challenged the clothing aesthetics ascribed as part of the South African farmer identity to infuse what I express to be a functional neo-farmer identity which motivate the use of technology as it makes sense to them.

My work further extends the insights of Rola-Rubzen et al., (2020) who found deeply rooted traditional views, sociocultural norms, and beliefs about gender roles in agriculture and farming, as barriers that have hampered achieving gender equity in access to and the adoption of technologies by females; by suggesting that individuals have agency in navigating technology adoption, and in urban farming, the process of technology adoption takes place along a continuum.

Strategists acted independently by drawing entrepreneurial basics from their backgrounds and infusing these with technology to run profitable urban farming practices. Similar to this, Innovationists experimented with the application of technology to urban farming by exercising individual agency and drawing inspiration from kin farming practices. Following the cultural contracts theory (Collier & Thomas, 1988), my work confirms that individuals' identities are dynamic and in constant negotiation within individuals. Because of the dynamic individual agency, technology adoption for urban farmers is (re)negotiated on an ongoing basis along an ethnicity-directed continuum.

7.3.3 Beliefs

Beliefs represent assumptions people make about themselves, others, their surroundings, and how they expect things to be (Welch, 2021). I discuss the evidence to show what urban farmers believe about themselves and farming as a practice directs how they connect to the use of technology in urban farming. In a study that adopts an individual cultural identity perspective, a beliefs dimension is expected; nevertheless, it goes beyond personal identity to include identity as influenced by contextual settings. I want to suggest that people's beliefs can give them agency in the adoption of technology.

The use of technology was a result of Adaptavists exercising their agency within their networks of urban farmers to gather and exchange knowledge, methods, and concepts about urban farming. The evidence lends credence to the tenets of the cultural contracts theory, which suggests that identities are ever-changing and constantly influenced by interactions with other people (Hecht, Collier, & Ribeau, 1993). Extant research documented findings on how farmers succeeded as entrepreneurs by being able to collaborate, and think creatively and innovatively to respond to production requirements (Milone & Ventura, 2019). I expand on these insights and show Adaptavists succeeded

in using technology in urban farming when they capitalized on the ecosystem's interconnectedness. In contrast, Traditionalists created impenetrable barriers around a belief to care for the environment and opposed the use of technology in urban farming.

Although the literature on the "good farmer identity" suggests that a farmer's disposition to care for the environment and conservation is an overarching dimension (McGuire et al., 2012; Burton et al., 2020), I show that this is only one aspect of the "good farmer by pointing to an implicit departure in which Strategists championed the self-ascribed identity label of being futuristic, entrepreneurial, profitable, and influenced by a technology era, as a good farmer identity, instead of emphasizing goals like conservation and custodianship. Wheeler et al., (2018) likewise found that farmers drew connections between caring for the environment and other farming objectives such as conservation, custodianship, sustainability, productivity, and profitability.

The individual agency was also exercised through Individual internal beliefs such as perseverance, determination, motivation, and resilience. To the extent that these individual attributes inform the decision to use technology, it is not surprising that urban farmers who possessed these attributes realized success in urban farming. Whilst evident across all archetypes, these attributes were communicated largely by Innovationists. Undoubtedly, innovationists were more interested in and curious about new technologies and other aspects of novelty, even those that did not require technology but were essential to overcoming urban farming's obstacles. Similarly, Milone and Ventura (2019) found that entrepreneurial farmer success is associated with exhibited tenacity, and unwavering belief in own abilities; my work supports this exposition. My evidence demonstrates that beliefs are used to (re)negotiate technology use in urban farming.

7.3.4 Cultural Values

This study of urban farmers chosen from a variety of cultural backgrounds and experiences gives valuable information on the crucial role that cultural values play in defining each person's sense of agency for the adoption of technology. In a different context, Lai et al. (2016) found that at an individual level, cultural values played an important role in students voluntarily adopting technology for sustained use and self-directed learning outside of the classroom.

I discuss evidence from the study to demonstrate that high regard for urban farming entrepreneurial profitability and a focus on business success informed the identities of Strategists. The decision to implement technology to diversify output, satisfy market

demand, and turn a profit was heavily influenced by this distinctive cultural identity orientation. Strategists exercised agency to use technology in pursuit of their entrepreneurial intents. The results of my study corroborate Morris et al.'s (2017) findings that farmers' intent to either concentrate on providing economic livelihood based on conventional food production or pursue entrepreneurial diversification to assure competitiveness affected their technology adoption.

On the contrary, yet consistent with Dyczewski (2021) research, Traditionalists believed that life lost its purpose when environmental sustainability principles were broken. As a consequence of this, they opposed the use of technology. An interesting finding in the data was that Adaptavists similarly emphasized conservation. Conservatism and sustainability, in the eyes of Adaptavists, required the use of technologies that accommodated organic production methods, such as aquaponics. This juxtaposition shows the shift in worldview, and I use it to point to the identity negotiation from non-signing to a ready-to-sign cultural contract.

My evidence shows that individuals may establish a relative importance hierarchy among core values. Therefore, the acceptance of a specific value priority can be used to explain whether a technology is adopted or rejected.

7.3.5 Cultural Geography

As people travel about and form new identities, culture changes and expands in relation to the places and spaces from which it emerges. This concept is known as cultural geography (Anderson, 2018, 2019). I discuss based on the study's evidence, that cultural geography informs the cultural identity experience of technology by urban farmers.

The extent that cultural geography informs the rejection of technology in urban farming is not surprising for Traditionalists who, firstly, operate in urban farming practices located on city peripheries and second espouse values that encourage community participation to ensure sustainability. Traditionalists exercised agency to manage technology adoption in urban farming considering the socio-economic status of spaces and locations within which they find themselves thus opting not to adopt technology. Whilst this can be explained by Belanche et al.'s, (2021) perspective, which found that individuals residing in rural or suburban communities show stronger affective place identity than those living in cities; my evidence challenges the work of Domenech et al., (2014) who found that businesses in rural areas would most likely adopt technology because of its perceived benefits over infrastructure scarcity and a lack of skilled personnel.

Findings from a recent study by Dlamini et al. (2020) proved that place identity is socially created and that people build cognitive and emotional attachments with their social groupings. I show that Adaptavists built cognitive bonds with their urban farming networks, and appreciated the experience of being able to manipulate, control, and predict crop production, which helped them to adopt technology. An intriguing feature is that the setting for urban farming, which is characterized by cultivating crops in small areas, facilitated the formation of new urban farmer cultural identities for Strategists who took initiative to integrate technology, aligned with the urban ethos.

7.3.6 Knowledge and Education Systems

The urban farming context furthers an individual's identity negotiation through a learning experience within a complex system thereby strengthening the dynamic nature of identity. I show that an essential component of urban farmers' cultural identities is informed by education and knowledge systems.

Using data from the study, I discuss that urban farming network learning and knowledge sharing are associated with the shaping of urban farmers' identities for Adaptavists and Strategists, and consequently have an impact on how they use technology. Strategists exercised agency to navigate both identity and the use of technology through educational and experiential learning, and likewise, Adaptavists cited learning from cohorts, and educational backgrounds as triggers for a shift in worldviews and the resultant persuasion to adopt technology. My findings confirm the work of Tobiassen et al., (2022) who found that entrepreneurial identities are shaped through knowledge and education systems, and learning through experience; and likewise, Bagwell (2017) who found that incubation or accelerator models embed participants into social networks, cultures, norms, values, and activities that foster entrepreneurial success within the entrepreneurial ecosystem. In line with this, the nature of Innovationists' identity interest in learning new farming methods, and their motivation to do so, served as essential components that informed decisions to adopt and experiment with technology.

Despite the knowledge about technology learned through their education, Traditionalists deemed indigenous knowledge and practices of farming important and this consequently served as a barrier to technology adoption. This nuance confirms the works of Curry et al., (2021) who found that in the developing world, farming is entrenched deeply in indigenous practices and values, and when new modalities or technologies that oppose these values are introduced, adoption becomes much less likely. The experience of technology and, consequently, its adoption varies depending on the core of an individual's education and knowledge systems. My evidence shows that the adoption of

technology along an identity continuum is also facilitated by education and experiential learning.

7.3.7 Farming Practices

The current study conceptually coined the term "farming practices" to describe the application of key farming concepts and techniques to the production of agricultural output. Based on the study's evidence, I show that urban farmers' cultural identities are negotiated in farming practices for the adoption or rejection of technology.

Over and above being presented with expectations to adopt technology when joining the urban farming space, Adaptavists demonstrated agency by adopting technology for its efficiency, effectiveness, and reliability. Strategists were intentional and employed a combination of traditional and modern approaches, technologies, and tools for farming; and advocated aligning themselves to the market and producing what the market would be willing to take up. The hybrid model of farming demonstrates a negotiation for a co-created cultural contract for the adoption of technology. I found this insight to support the work of Milone and Ventura (2019) who found that young farmers introduced different modernized systems simultaneously to improve both the productivity and sustainability of their farming activities and the quality of their products, and succeeded in their operations.

In contrast, Traditionalists insisted on keeping traditional farming practices even in urban farming, and similar to findings by Blasch et al., (2020), this was despite being aware of the various benefits of technology adoption.

7.3.8 Exposure to Technology

Belay (2018) points out that globalization introduces the reconstruction of identities. Moreover, Rodrik (2021) discovered that globalization might lead to changes in how people define their social and cultural identities. My evidence shows that in an age of reliance on technology, Adaptavists' identities were influenced by international trends as well. They expressed how the constant reliance on technology, including in other aspects of their enterprises, affected how quickly technology was incorporated into their farming techniques. Strategists, on the other hand, had a particular conception of technology and its application important to the development of their practices. As a result, they used their agency to use technology to increase production efficiency. For Strategists, the entrepreneurship identity and

the goal to realize profit inspired the mix of techniques and approaches (Belay, 2018).

On the contrary, evidence from the study revealed that Traditionalists were not completely ignorant of modern technologies and their benefits; however, the adoption of technology was hampered by the cost, which was exacerbated by the socioeconomic status of the regions in which they lived and worked. This confirms the assumption of the cultural contracts theory that the extent to which individuals are willing to engage in identity negotiations with others is influenced by the relationship between people and their environment (Jackson, 1999, 2000). My evidence confirms the insights of an opinion piece by Walter et al., (2017) which highlighted that the high costs associated with the adoption of technology for individual farms, coupled with inadequate knowledge and skills are often significant adoption hurdles, particularly in developing countries. Traditionalists' cultural identities influenced the inclination to reject the use of technology. Despite exposure to technology, my data demonstrates that unique cultural identities affect variances in technology adoption.

I discuss the individual cultural identity experience of technology adoption to demonstrate that technology adoption is (re)negotiated on an ongoing basis because both cultural identity and technology adoption are dynamic and the individual has agency over both, and describe how individual cultural identities contribute to variations in technology adoption among urban farmers in South Africa.

7.4 Technology adoption continuum based on cultural identity

7.4.1 Strategists

The cultural contracts theory assumes that there is a direct and proportional relationship between power and self-efficacy (Moon, 1999; Orbe, 1994, 1998; Ting Toomey, 1999). Even though we know this to be the case in communicative respects (Dickens et al., 2019; Peltokorpi & Zhang, 2020), the relationship between power and self-efficacy and its influence on technology adoption, specifically from a cultural identity perspective, has hardly been studied.

I discuss the Strategist archetype and show that technology adoption takes place along a cultural identity continuum. A for-profit, entrepreneurial mindset was what Strategists brought to the urban farming environment, and required negotiation and strategic planning to succeed. The negotiation was such that it required devising the most effective farming methods to guarantee profitability and ongoing market satisfaction; thus alternating between open-field and hydroponic farming, and between farming in the city

and farming in the city's peripheries. The Strategists archetype supports the co-created cultural contract of mutually beneficial and interdependent human experience. The dynamic individual agency of Strategists facilitates the transition in experience, is demonstrated by the integration of various farming approaches, and further emphasizes the power and self-efficacy-driven negotiation that takes place. Indeed, Participant AH alluded "*After doing research on hydroponic and teaching myself you know … I went to propose this idea and they bought into it, and they were able to assist with a tunnel.*" This demonstrates how Strategists used their power and self-efficacy to negotiate the adoption of technology.

Whilst the cultural contracts theory suggests that strategic communication occurs when interactants have unequal power (Giles, Mulac, Bradac, & Johnson, 1987; Jackson, 2012), I can show that strategic communication can occur even in a case where there is a power balance between interactants. The findings show that even though technology diffusers had more muscle in terms of capital, for the adoption of technology, strategists advocated for strategic negotiation.

This also calls into question the work of Bennett (2015) who argued negotiation is a power-laden metaphor that is infused with strategy and conflict. Because, Strategists conceptualized technology and its adoption by how it enabled them to enhance productivity; to meet the market demand, strategists negotiated to engage in hybrid models of farming to ensure that they produce what they can sell and remain commercially competitive. This implied that the Strategists would equally maintain traditional farming methods provided the methods served a purpose such as growing crops that would otherwise not be able to be grown with the current technologies available to them. Strategists' cultural contracts to adopt technology were only completed provided there was a perceived need for it, (Jackson, 2012).

To a large extent Strategists were influenced by the existence of agricultural practices in their backgrounds some of which were predominantly traditional, yet profitable although at a small scale. This heightened the Strategists' agency and negotiation when joining the urban farming environments, and aligned with the assumption of the cultural contracts theory that the extent to which individuals are open to new experiences is influenced by their histories, social backgrounds, and interactions (Jackson, 1999, 2000). Incubation and skills development programmes enhanced Strategists' knowledge about farming technologies, and influenced identities during the Strategists' experience of technology (Hecht, Collier, & Ribeau, 1993). It is for this reason that Strategists' negotiation of co-created cultural contracts is based on personal preferences and/or

requirements. In the urban farming context, whilst Strategists showed an openness to and embraced alternative approaches to farming, the identity negotiation for the adoption of technology was such that, even the technology disseminators that offered opportunities for urban farming technologies, embraced the proposed strategies presented by Strategists'. Strategists' negotiation of cultural identities was such that their farming preferences are acknowledged and validated resulting in the signing of a *co-created* cultural contract. I use this evidence to demonstrate that technology adoption for Strategists takes place on a continuum between a ready-to-sign to a co-created cultural contract, and enhances the cultural contracts theory by showing that the contract typologies are not mutually exclusive.

Whilst Parsloe and Smith (2022) found that co-created cultural contracts were fragile and developed with caution and not always because of a genuine desire to co-create. In the current study, I show those that offered the technologies had to acknowledge the planned business strategies put forward by Strategists. Strategists negotiated the adoption of technology in such a way that it enhanced what was already in place or planned, and similarly, those in charge of technologies rolled out and/or financed the purchase of new technologies if it was in line with the economic and/or development agenda for urban agriculture. Co-created cultural contracts were signed provided the planned strategies of the Strategists and those in charge of technologies, were accommodated. Mutual satisfaction, rather than an obligation to the requirements of the other's culture, is the centrepiece of such relationships.

Technology adoption is continually (re)negotiated, in this study, the co-created cultural contract requires the disseminators of technologies to have confidence in the ability of urban farmers to navigate the use of technology as it makes sense to them. More work is needed to flesh out how urban farmers can be viewed as agents of technology adoption, who choose actions that make sense to them versus solely as beneficiaries of technologies.

7.4.2 Adaptavists

Urban farming organizations and/or funding organizations approached technology adoption from a traditional technology adoption perspective, with the assumption that if a technology has capabilities, it will be inevitably adopted when it is disseminated (Dwivedi et al., 2017; Taherdoost, 2018; Williams et al., 2015). This perspective gives those who design, fund, and disseminate technology negotiating power, rendering the recipients of the technology vulnerable to assimilation (Jackson, 2012).

My data indicate that receiving the chance to either be employed as an urban farmer or receive funding to farm as an urban farmer entrepreneur was what mattered most to Adaptavists', therefore rendering them to vulnerability in negotiation. Using the assumption of cultural contracts to frame the discussion, the organizations that afforded Adaptavists opportunities assumed a position of power and presented ready-to-sign contracts that suggested the expectation for assimilation to Adaptavists (Jackson, 2012). The acceptance of the opportunities and consequential adoption of technology by Adaptavists show a compromise of certain espoused values and a negotiated ready-to-sign cultural contract. Essentially the urban farming organizations expected individual urban farmers to assimilate to technology adoption in urban farming by presenting a ready-to-sign contract, (un)intentionally communicating to individuals interested in urban farming that 'we are not going to change our intended objectives of driving technology adoption in urban farming, therefore if you would like to join and/or form part of our organizations or programmes, you must assimilate and adopt technology.' Notable comments were made by Participant J, when he said *"I went there for an interview, I told them that I'm interested in the crop production, you see. So, they told me that there is an opportunity in hydroponic farming."* Participant N mentioned:

> *"The turning point for me was being scouted online by, my current employers … so it was kind of a beautiful mistake. I was covered by media network and they came and they interviewed me … at the farm I was leasing, it had tunnels. They renamed the news insert on youtube as aquaponics farming in South Africa so that's how I got scouted actually because my employers are foreign investors in South Africa so they were looking at someone they can work with who does aquaponics."*

The participants' voices demonstrate how Adaptavists' cultural identities were negotiated for the adoption of technology. Although Adaptavists appeared to have little choice but to incorporate technology into their agricultural operations if they were to be active participants in the urban farming business; evidence from the study suggests that in signing the ready-to-sign contract Adaptavists did not want to miss the boat in terms of development and competitiveness opportunities, and consequently be marginalized (Jackson, 2012; Ting-Toomey, 1999), Thus, they used their agency to adopt technology. A notable comment was made by Participant J:

> *"Everything is changing so with hydroponics it's also a part of the Fourth Industrial Revolution. That is why I'm very interested in the system itself and how it's operating and I wanted to learn more."*

Those that assimilated (Participant M, N, and P) made this their new identity evidenced also through social media posts (Appendix F). The urban farmer identity was ascribed to individuals who adopt and show competence in the use of technology in urban farming and was eventually self-ascribed by Adaptavists who endorsed ready-to-sign contracts. Indeed, Burton et al., (2020) found that the term 'good farmer' was ascribed communally to a farmer who was recognized for having met the cultural competencies, which in turn would form mutual obligations within the farming community. In the context of the study, urban farmers who did not adopt technology would likely be labeled as incompetent or uncompetitive. The motivation for the adoption of technology for Adaptavists was, therefore, to merge into the urban farming ethos and achieve the desired goals as set out in their working environments.

The majority of participants in this typology, also, had academic backgrounds in agriculture, which gave them knowledge of technology-driven farming practices and exposure to contemporary farming trends on a worldwide scale. I show that Adaptavists' negotiation of identity was also influenced by their educational backgrounds because cultural contracts are concerned with maintained alignments (Jackson, Morrison, & Dangerfield, 2002).

Parsloe & Smith (2022) found that groups with negotiating power often, subconsciously present ready-to-sign contracts to the vulnerable. According to Walsh (2015) choosing to forego an accommodative approach to identity negotiation could be an unconscious response to maintain power. As noted in Participant N's expression above, the choice by urban farming organizations to forego accommodating individuals' approaches to urban farming could be a response formed unconsciously to develop emerging economies industries yet oppressing indigenous identities.

I demonstrate nuance of how Adaptavists evolved from the Traditionalists archetype, and show that technology adoption takes place along a continuum. I change how we understand the cultural contracts theory from a non-signing to a ready-to-sign cultural contract. For Adaptavists, the cultural value of producing organically has roots in traditional methods of farming. This worldview, subsequently, changed as a result of engagement with other urban farmers within networks and the sharing of knowledge, skills, and views; confirming study insights by Blasch et al., (2020), who found that the knowledge of fellow farmers who adopted the technology positively influenced the appraisal of precision farming technologies, stressing the importance of networks. The findings confirm that identity is a concept that is always changing, supporting the theory's underlying premise that identities are dynamic and impacted by interaction (Jackson, 2012).

7.4.3 Innovationists

The quasi-completed cultural contracts communicate a need for compromise on some aspects of how the interacting parties identify themselves, for the relationship to work (Jackson, 2002). My evidence shows that Innovationists were not prepared to completely renounce their own opinions, approaches, and farming methods, nor were they prepared to truly challenge the established parameters of urban farming: *"I wouldn't want to get rid of the system [self-built aquaponics system]. You know, if the budget comes I would want to build a greenhouse there and also add different systems to the one that I had."* That is to say, even though Innovationists appeared to be straddling the fence to the widespread notions of urban farming, they were also not fully prepared to accept the potential disadvantages of not using technology, which could make them unprofitable. For this reason, innovationists adopted technology while experimenting with other methods of farming to participate in mainstream urban farming. I discuss the findings to show that Innovationists' negotiate individual cultural identities for the adoption of technology through a quasi-completed cultural contract.

In addition, Innovationists were steered by curiosity and inquisitiveness to learn new ways of farming and experiment; work exposure and assimilation further contributed to the use of technology by Innovationists, and this was also driven by their entrepreneurial pursuits. My findings further show an overlap between the co-created and quasi-completed cultural contract, and I use the findings to show that cultural contracts are fluid, and not mutually exclusive over the course of human existence and that, from the perspective of cultural identity, technological adoption is dynamic and continuous.

7.4.4 Traditionalists

Even though the cultural contracts theory suggests that human experience is defined through three contract typologies, this provides a partial definition of human experience. I show how the experience of technology adoption from an individual cultural identity perspective changes how we understand the cultural contracts theory. That unlike the cultural contracts theory suggest, it is possible to refuse to sign a cultural contract, on the basis of which I add a non-signing cultural contract through evidence of the Traditionalist archetype.

Traditionalists' value systems are deeply ingrained in them and serve as a fundamental unit of organization for their social interactions. Furthermore, the depth of immersion in traditional farming practices worked for Traditionalists and they, therefore, did not see the need to incorporate technology into their farming practices. For Traditionalists, the

methods adopted for production were to preserve indigenous and traditional practices; and were significantly influenced by their ethnicity, tribe, religion, and race.

Important to note, however, is that Traditionalists were not completely clueless about modern technologies and their benefits, yet Traditionalists' identity negotiation considered the socioeconomic statuses of the environments within which they operated so as not to be exclusionary in their approaches, and therefore deferred the adoption of technology or opted for the use of alternative tools for production.

This archetype represents participants who are resistant to change and preferred not to or rather deferred the adoption of technology in their farming practices. Therefore, the negotiation of identity by Traditionalists to reject or defer the use of technology was such that it maintained traditional perspectives on farming. This supports the theory's assumption that cultural contracts are necessary for the sake of preserving, protecting, and defining one's identity (Jackson, 2002), however, the archetype contributes to the theory by adding a non-signing cultural contract.

I emphasize the deferring of the use of technology by Traditionalists and show that because both identity and technology adoption are dynamic, and because the individual has agency in navigating both, technology adoption takes place along a continuum. I reference Participant N's written account, whose identity shift was from Traditionalist to Adaptavist, to establish my point:

> "… for me, technology has always been machines, and when I got into urban farming that is when I was like oh wow farming is not the traditional labour-intensive exercise. It can be made easier by the use of technology."

I show that Traditionalists negotiate individual cultural identities to reject or defer the use of technology by maintaining their traditional perspective on farming. This shows that, unlike the cultural contracts theory suggests, it is also possible to refuse to sign a cultural contract. Thus. I add a non-signing cultural contract.

7.5   An empirical comparison of literature and findings

The traditional technology adoption theoretical perspective treats technology, and the factors that influence its adoption as static thus assuming a unidirectional perspective of technology adoption (Dwivedi et al., 2017; Migliore et al., 2022). This view has been challenged by sociotechnical perspectives which argue that collective social contexts influence technology adoption. According to this theoretical perspective, technology

adoption is primarily considered as a social act (S. Becker et al., 2021; Bögel & Upham, 2018). The sociotechnical perspectives have, however, neglected the individual and we therefore do not yet know how an individual's distinct identity will affect how they utilize technology. What has not been looked at is how individual characteristics, such as a deeply individualized cultural identity, influence technology adoption (Kristensson et al., 2020). According to Upham, Bögel, and Dütschke (2020) sociotechnical literature can benefit by taking into account both individual and social perspectives, thereby also expanding on sociological tenets.

One thing we do know, however, is that individual's identities are constantly changing as a result of how they are negotiated in everyday interactions and how they are influenced by other people (Dorjee & Ting-Toomey, 2020; Ting-Toomey, 2005). In the agricultural context, farmers' beliefs about who they are, their connection with nature, and how agriculture should be performed translate into the types of approaches they take on to farm (Lavoie & Wardropper, 2021; Westerink et al., 2021; Burton et al., 2020). This understanding continues to adopt a collective perspective. How individual cultural identities influence variations in the adoption of technology remains a mystery in the sociotechnical literature.

To bring in an individual level perspective, I employed the cultural contracts theory to study technology adoption from a cultural identity lens (Jackson & Hogg, 2010; Sullivan & Goldzwig, 2004). Although the cultural contracts theory does not simply deal with whether individuals may simply refuse to adopt or reject technology, it enabled me to take an individual-level perspective on cultural identity by focusing on the individual's agency in navigating the urban farmers' experiences (Sullivan & Goldzwig, 2004). The cultural contracts theory suggests, when identities interact, three cultural contract typologies partially define the human experience: ready-to-sign, quasi-completed, co-created.

My evidence improves the sociotechnical literature by providing insights into the consequential nuances of identity variation at an individual level, based on which I make two compelling insights. Firstly, that because both identity and technology adoption are dynamic, and because the individual has agency in navigating both, technology adoption is (re)negotiated on an on-going basis. Secondly, I use the development of the four archetypes of Traditionalists, Adaptavists, Strategists, and Innovationists and point to a cultural identity continuum of technology. Based on the archetypes, I put forward that technology adoption takes place on a continuum and change how we understand the

theory from a non-signing to a ready-to-sign cultural contract. I provide these insights to build on the cultural contracts theory. My findings show that individual cultural identity, in fact, influences differences in technology adoption among South African urban farmers.

7.6   Summary of Discussions

The study found four archetypes that can be used to categorize how the participants experience technology adoption in their urban farming practices, namely Strategist, Adaptavist, Innovationist, and Traditionalist. The archetypes are informed in varying degrees by eight dimensions, namely cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity which inform urban farmers' cultural identities and the consequential experience of technology adoption in urban farming.

Although other studies on cultural identity can support the findings of the study's eight dimensions, none of them have shown all eight dimensions together or even conceptualized them in the same way. The current study conceptualized the dimensions in the context of urban farming and demonstrated the interrelatedness of the dimensions to explain the inter-relationships between cultural identity and technology adoption. Other cultural identity studies have also not comprehensively studied the relationship between cultural identity and technology adoption at an individual level, to augment the sociotechnical body of literature on technology adoption and provide a complete understanding of technology adoption as a phenomenon.

The current study findings provided insights into the consequential nuances of identity variation at an individual level, to the phenomenon of cultural identity and technology adoption, and provides two compelling insights firstly, that because both identity and technology adoption are dynamic, and because the individual has agency in navigating both, technology adoption is (re)negotiated on an ongoing basis. Secondly, that unlike the cultural contracts theory suggests, it is also possible to refuse to sign a cultural contract, thus I add a non-signing cultural contract to change how we understand the cultural contracts from a non-signing to a ready-to-sign cultural contract, to suggest a continuum; to answer the overarching research question: How do individual cultural identities inform differences in technology adoption among urban farmers? By employing the cultural contracts theory in the management discipline, this work provides an interpretation of identity interactions in complex systems and introduced a cultural contracts paradigm to the phenomenon of technology adoption.

Although the formation of cultural identities has been discussed and developed in the identity body of literature, they have thus far been limited in technology adoption literature at an individual level and particularly the technology adoption experiences of urban farmers. The inductive suggestion of the archetypes explains the peculiarities of the South African urban farming context coupled with the uniqueness of the group of urban farmers in the study. Phenomenography enabled me to show how individual cultural identities are negotiated for the adoption or rejection of technology.

The concluding chapter will summarize the current study and detail the study's contributions to theory as well as practical implications. The chapter will also detail the limitations of the current study, and make recommendations for future research.

Chapter 8: Conclusion and Recommendations

The current study makes three distinct contributions. First, the study adds to the existing sociotechnical literature on technology adoption by foregrounding technology adoption from an individual cultural identity perspective. The study, further, foregrounds technology adoption through the consequential nuances of identity variation; and adds to the minimal discussion of monolithic identities of potential beneficiaries of technology, by looking at participants as agents of technology adoption, who choose actions that make sense to them. Secondly, the study makes a theoretical contribution by applying a less-known theory, cultural contracts theory, which inclines to be used in the communications discipline, in the management discipline to provide an interpretation of identity interactions in complex systems. I use the study evidence to build on the cultural contracts theory and show that it is possible to refuse to sign a cultural contract, and add a non-signing cultural contract to change how we understand the cultural contracts from a non-signing to a ready-to-sign cultural contract and suggest a continuum. Finally, the study contributes to practice by providing implications for technology adoption practitioners and policymakers. The chapter concludes with the limitations of the current study and recommendations for future research.

8.1 Contribution

8.1.1 Contribution to Theory

First, this study contributes to the sociotechnical body of literature by introducing an individual level perspective to technology adoption. From the sociotechnical perspective, Sartori and Theodorou (2022) mention that technology adoption is dependent on collaborative involvement (S. Becker et al., 2021). The collaborative involvement suggests that a particular technology gets adopted and developed as a result of the shared meanings surrounding it and its use (Forney & Dwiartama, 2022). But individual urban farmers within the urban farming practices understand and experience their world differently. Evidence from the study suggests what matters most is how individual urban farmers identify themselves, which aspects of their daily interactions influence their cultural identities, and how their cultural identities influence their interactions with technology in the urban farming spaces. On this basis, the current study builds on the sociotechnical body of literature by bringing in an individual level perspective of technology adoption.

Bögel and Upham (2018) argued the case for the application of identity-based approaches to link individual to social level agency and provide a more comprehensive explanation on the role of individual's agency in socio-technical transitions. The current

study bridges the gap by providing a more in-depth explanation of the role that individual's agency plays in the adoption of technology and socio-technical developments. Based on this, the study's findings shape the conversation by indicating that individual technology adoption decisions, such as whether urban farmers choose to adopt or reject technology, can affect the general adoption of technology.

The current study foregrounds first the consequential nuances of paying attention to the variation of identities, and challenges the focus on the monolithic identity of potential technology adoption beneficiaries (Forney & Dwiartama, 2022; Sartori & Theodorou, 2022; Shin, 2019) prevalent in the sociotechnical body of literature. In light of this, evidence from the study reveals that identity differences have consequences, specifically that the identities of urban farmers vary and affect their likelihood to adopt technology. That is to say, as agents, they select behaviours that make sense to them.

Secondly, the main theoretical contribution of the current study came primarily from the fact that I chose a lesser known theory, the cultural contracts theory, and applied it to the management discipline to provide a different lens for understanding the phenomenon of technology adoption. The theory shows that all individuals have variations of multiple identity labels which are noticeable in different contexts and during interactions, and suggests that human experience is defined partially through three cultural contract typologies: ready-to-sign, quasi-completed, and co-created when identities interact (Jackson, 2002).

The current study's application of the cultural contracts' paradigm to study the phenomenon of technology adoption among urban farmers in South Africa further challenged the established focus of the cultural contracts theory in the communications discipline by exploring the concept of cultural identities in management and at an individual level, to provide an interpretation of identity interactions in complex systems (Dickens et al., 2019; Peltokorpi & Zhang, 2020) such as the South African urban farming context. The theory's application unearths identity negotiation based on the cultural contracts paradigm within a complex heterogenous sample, at an individual level.

The findings from the study show that individuals have unique cultural identities and the process of interacting with technology in the urban farming space is an activator for the experience. Once in the urban farming space, their cultural identities are informed by their personal histories and antecedent interactions through ethnicity, beliefs, cultural values, cultural geography, and education; in addition, acquire knowledge through networks and exposure from subsequent interactions which further inform their cultural identities (Jackson, 1999, 2000). How each identity is informed makes each experience unique, and the informed identities are practically applied, negotiated, and re-negotiated

through interactions in their networks, and farming practices which manifest in the signing of cultural contracts that lead to the adoption or rejection of technology. The entire process is hemmed in by the urban farming environment that inspires the use of technology for farming. The uniqueness of experiences owing to the dimensions that inform the individual identities helped identify four distinct archetypes Strategist, Adaptavist, Innovationist, and Traditionalist which explain how urban farmers experience technology adoption. Although the application of the three cultural contract typologies is not novel, the discovery of technology adoption archetypes in the context of urban farming is a novel contribution.

For the cultural contracts theory, the identification of the archetypes builds the theory and creates an opportunity for the further use of the cultural contracts paradigm in the management discipline to explore the archetypical experiences of individuals that form part of their business divisions and/or market segments; and to understand the characteristic models and patterns in human behaviour centred on identity negotiation experiences. Furthermore, the variation of experiences explained through the different cultural contracts provide room to further develop the tenets of the theory by paying attention to the consequential nuances of identity in complex business and management environments.

The current study, therefore, advanced the sociotechnical theoretical perspectives on technology adoption by taking an individual-level perspective and theorizing the experiences of urban farmers on the use of technology from a cultural identity perspective in their urban farming environments, and challenged the established focus of identity theories in the communications discipline by exploring the concept of cultural identities, through the cultural contracts theory in management to provide an interpretation of identity interactions in complex systems. The use of the cultural contracts theory in the current study provided fresh insights to the discipline of technology adoption as well as the context of urban farming in South Africa. Further, building the cultural contracts theory from a non-signing to a ready-to-sign cultural contract.

8.1.2 Contributions to Practice

Practically, the current study foregrounds participants as agents of technology adoption, who choose actions that make sense to them.

Urban farming programmes are hardly designed with cultural identity in mind, more so individual cultural identity; however, the current study shows that individual cultural identities significantly influence technology adoption. A lack of understanding of this

perspective limits understanding of why some technological implementations fail while others succeed in seemingly similar settings. The current study provides insights into the consequential nuances of paying attention to cultural identity as well as archetypes depicting variation in the ways urban farmers negotiate their identities for the adoption or rejection of technology while in the urban farming space.

Evidence from the study suggests a cultural identity technology adoption continuum: Traditionalist → Adaptavist → Strategist → Innovationist. I can quite explain the transition between archetypes from the findings, such as participant K and AF's transition from Strategist to Innovationist (Appendix F), which was facilitated largely by the degree to which the dimension of education and knowledge systems informed cultural identities, and consequently a shift in worldviews. Similarly, when Participant N came into the urban farming space, the cultural geography dimension's exposure to urban farming operations, facilitated the shift in worldview resulting in a cultural identity migration from a Traditionalist to a Adaptavist; and subsequently a transition to an Innovationist archetype by cause of a shift in belief system.

The archetypes point to a continuum of cultural identity technology adoption, and the study's findings can assist practitioners in creating programs or interventions that are appropriate for various archetypes while keeping sustainable adoption in mind. Understanding how urban farmers experience technology adoption through the archetypes can help inform the structure and content of the programme interventions for a South African context and similar developing country contexts. Using the cultural identity technology adoption continuum: Traditionalist → Adaptavist → Strategist → Innovationist, practitioners can consider contextualizing, co-developing, and structuring the programme interventions to span Awareness → Development → Promotion of technology adoption. In addition, Practitioners can consider developing on boarding criteria that assess farmer readiness and incorporate psychometric analysis to also help farmers understand themselves and their persuasions.

More work needs to be done, perhaps through a longitudinal study, to corroborate the cultural identity technology adoption continuum. But perhaps the more important question is not so much to confirm the existence of the cultural identity technology adoption continuum, but what drives urban farmers' decision to switch across the continuum and what circumstances would sustain a particular archetype.

The idea of technology adoption generally concentrates on the economic benefits that might accrue. This means that technology adoption in South Africa and other developing world contexts cannot be completely left to chance, or even navigated through linear assumptions of participants as beneficiaries. The current study suggests a multi-

dimensional and development-centred view that focuses on positioning urban farmers as development partners who go beyond seeking to alleviate poverty. Practitioners should first understand that there is no one-size fits all approach to technology adoption, and therefore consider tailored interventions which also consider the evolving nature of identity. That is, technology adoption approaches should not be boxed, but consider that as farmers are exposed, their identities become adaptive. Practitioners should also consider involving urban farmers as development practitioners whereby they can bring in an infusion of their own stories.

8.2   Response to the study question

This study set out to answer how individuals' cultural identities inform the difference in technology adoption. To address the main research question, I used two subsidiary questions to find out what informs urban farmers' unique cultural identities, and how those identities are negotiated for the use or rejection of technology. My evidence showed eight dimensions that inform urban farmer cultural identities in their experience of technology, at an individual level. The dimensions discovered through the study are cultural values, cultural geography, ethnicity, beliefs, and exposure to technology, knowledge and education systems, farming practices, and individual identity. In addition, my evidence, shows four archetypes of Strategist, Adaptavist, Innovationist, and Traditionalist that categorize how those identities are negotiated for the use or rejection of technology. Therefore, how individuals' cultural identities inform the difference in technology adoption is such that both identity and technology adoption are dynamic, and because the individual has agency in navigating both, technology adoption is (re) negotiated on an on-going basis. The difference in technology adoption is categorized through four archetypes Traditionalist, Adaptavist, Strategist, and Innovationist; to show that the experience of technology adoption among South African urban farmers also includes individuals refusing to sign a cultural contract, and thus I add a non-signing cultural contract. The addition of the non-signing cultural contract changes how we understand the cultural contracts theory to point to a cultural identity continuum of technology.

8.3   Limitations

There are limitations to the current study although measures were taken to limit and minimize the weaknesses. Limitations in the current study relate to the use of phenomenography as a methodological approach, the population sample used for the current study, and the context of the study.

One of the main limitations of phenomenography is generalizability beyond the context within which the study is carried out (Lamb et al., 2011). However, although the results of the current study are specific to the context of urban farming in South Africa, the results are decontextualized throughout the phenomenographic analysis process, and the findings can be applied to similar contexts and situations (Marton, 1986). Purposive sampling was used to mitigate this limitation and allow for maximum variation to provide an understanding of how the technology adoption experiences may be different for individuals.

Regarding the population sample used for the current study, the current study sought to identify urban farmers producing food in the city, towns, or the peripheries of growing cities and/or towns in South Africa using technology (Ackerman, 2012; Glowa, 2019; Smit & Nasr, 1992). It is often difficult to separate urban, peri-urban, and rural farming in South Africa. Although the literature has clearly defined the boundaries of each, in the South African context and practice these modalities are often difficult to distinguish. However, the study used phenomenography to elucidate the qualitative differences between participants' experiences and conceptualizations of urban farming, and technology adoption in their environment (Marton, 1981).

Another limitation in the current study was working within a small population of urban farmers posed a limitation in identifying participants to interview for the research study. The existence of urban farming projects and urban farmers as such in South Africa exists on a relatively small-to-medium scale. To mitigate this limitation, I used my network to locate potential candidates and obtain referrals.

The participants' comprehension of some of the study's concepts was another limitation. A distinct strategy was employed to gain insights into the specific participants' cultural identities through semi-structured, open-ended inquiries, such as asking the participants to discuss their backgrounds.

A final limitation of the current study was the context within which it was conducted. The study was conducted amidst the COVID-19 pandemic restrictions, and the location of the urban farmers posed a challenge in terms of accessibility to mitigate this limitation some of the research interviews were conducted virtually using Zoom.

The timeframe within which the study was conducted also posed a limitation, and as a result I make recommendations for a longitudinal study are made in the following section.

8.4 Recommendations for Future Research

Various opportunities for future research have opened up as a result of the current work. Whether the concepts of technology adoption archetypes discovered solely apply to urban farmers is one of the more interesting unanswered questions. The concepts are fairly broad, and as such, similar results may be found in a study on a group of large-scale farmers in South Africa. To see if this is the case, it is worth replicating this study with a sample of large-scale farmers. Likewise, it is worth replicating the study with a sample of emergent entrepreneurs who make use of technology, for development purposes to see if the findings may be relevant to audiences outside of urban farming.

Both cultural identity and technology adoption are dynamic phenomena (Eze et al., 2019; Crocetti et al., 2018) that undergo continuous revision and change. The current study developed technology adoption archetypes that point to a continuum of cultural identity technology adoption. An exploration of this discovery is limited by the timeframe of the study. It would, however, be beneficial to use a longitudinal study to investigate whether archetypes can be understood as existing in a continuum and whether the existence of one cultural contract and/or archetype negates the existence of another.

Although the diversity of the sample in the current study helped to provide the variation required for a phenomenographic investigation, it would also be beneficial to carry out a similar study with a sample population drawn from several generations. Conducting a study on individual cultural identity and technology adoption with a sample population drawn from several generations could help uncover more intriguing results and interesting nuances, especially when compared. For the individual cultural identity negotiation process, a study should be conducted to ascertain whether the signing of cultural contracts differ when the participants are of a different generation.

The current study made several practical implications, particularly for technology adoption-diffusion practitioners in urban farming space. It would be interesting to find an urban farming organization that would be willing to involve its participants in the implementation of the recommendations and see how this may impact the adoption of technology adoption for urban farming.

8.5 Summary of the Current Study

The study of technology adoption from the perspective of individual cultural identity in a South African urban farming context brought together two distinct disciplines in a way rarely seen in the literature. By introducing the cultural contracts theory to the

management discipline, the current study advanced the understanding of the phenomenon of technology adoption, and also offered practical implications.

The purpose of the current study was to understand the qualitatively different ways in which urban farmers experience technology adoption from an individual cultural identity perspective. Past research in the field of technology adoption has not sufficiently addressed cultural identity nuances at an individual level, within complex contexts. Within the sociotechnical theoretical perspectives, there is a gap in scholars applying sociotechnical perspectives at an individual level to understand technology adoption dynamics.

Given the importance of technology adoption on the African continent, there have been few studies that investigate the nuances of identity and their relationship with technology adoption. Particularly in urban farming which has potentially far-reaching economic benefits that could address the continents' socio-economic challenges. By identifying the qualitatively different ways that urban farmers in South Africa experience technology adoption within the urban farming space, the current study adds to the sociotechnical body of literature.

Based on evidence from ten urban farmers who participated in phenomenographic interviews, there are eight qualitatively distinct dimensions that urban farmers in South Africa talk about when they conceptualize what informs their cultural identities in the context of technology adoption in urban farming, namely cultural values, cultural geography, ethnicity, beliefs, exposure to technology, knowledge and education systems, farming practices, and individual identity. Further, these eight dimensions can each be experienced in four varying ways, described as identity negotiation through the archetypes of Strategist, Adaptavist, Innovationist, and Traditionalist for the adoption or rejection of technology. The outcome space visualized the various ways of experiencing technology adoption in the urban farming space by mapping each archetype across the eight dimensions. Theoretically, the study makes a theoretical contribution by applying a less-known theory, cultural contracts theory, which inclines to be used in the communications discipline, in the management discipline to provide an interpretation of identity interactions in complex systems; and secondly contributes to the technology adoption literature and builds on the sociotechnical theoretical perspectives by foregrounding technology adoption from an individual cultural identity perspective. The current study also identified that during the urban farming experience, urban farmers experience technology adoption through four distinct archetypes Strategist, Adaptavist,

Innovationist, and Traditionalist. The identification of technology adoption archetypes in the context of urban farming is a novel contribution.

Based on evidence, the study further suggests a technology adoption continuum based on cultural identity: Traditionalist → Adaptavist → Strategist → Innovationist, and has practical implications. First, practitioners can co-develop and structure programs or interventions that are appropriate for various stages of the continuum while keeping sustainable adoption in mind. Urban farmers will also benefit if they actively participate in the organizing of technology adoption programmes and interventions and be sure to advocate for their own experiences in the adoption of technology.

Urban farming technology adoption-diffusion practitioners can utilize the findings from the current study to enhance urban farming technology adoption programmes and interventions and view urban farmers as development partners. Practitioners should also strive to build tailored interventions which also consider the evolving nature of identity. That is technology adoption approaches should not be boxed, but consider that as farmers are exposed their identities become adaptive. In addition, practitioners can develop criterion that assesses farmer readiness to help farmers understand themselves and their persuasions.

In South Africa, urban farming initiatives are present on a small-to-medium scale, but there is space for expansion. The growth and spread of urban farming initiatives depend on the adoption of new technology, so efforts should be taken to ensure that this growth continues by carefully creating and structuring programs that are flexible and can encourage the adoption of technology for urban farming. Despite South Africa's triple challenge of unemployment, poverty, and inequality, technology adoption offers the opportunity to improve urban farming productivity, create jobs through agriculture, increase farm income, reduce food prices due to proximity to markets, reduce hunger in urban and peripheral areas, and reduce poverty. Globally, urban agriculture has been recognized as a development instrument and has since gained recognition as a development tool in developing countries for the improvement of livelihoods and the creation of employment for the urban population, food security, and environmental benefits (Brinkley & Kingsley, 2017; "Urban and Peri-urban Agriculture Sourcebook," 2022). South Africa will benefit from a thriving and inclusive urban farming sub-sector that reflects the demographics and entrepreneurial spirit of the country. The adoption of technology has a significant impact on the country's development.

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Appendix A: Research Timeline

		Oct 2020 – July 2021	July 2021	Aug 2021	Sep 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	April 2022	May 2022	June 2022	July 2022	Aug 2022	Sep 2022	Oct 2022
Phase 1	**Participant Contact**	███	███															
Phase 2							███	███										
Phase 1	**Data Collection**		███	███	███	███	███	███	███	███	███	███						
Phase 2							███	███	███									
Phase 1	**Transcription**			███	███	███	███	███	███	███								
Phase 2							███	███	███	███								
Phase 1	**Interpretation**								███	███	███	███	███					
Phase 2										███	███	███						
Phase 1	**Outcome Space Development**													███				
Phase 2														███				

Appendix B: Interview Schedule

A. Interview Schedule Overview

1. Introduction

Before we start, I would like to explain to you the purpose of this interview and to make sure you understand what it entails and that your participation is voluntary. The interview process will also ensure the confidentiality of the conversation.

2. Purpose of the study

2.1 I am interested in understanding how individuals make the decision to use technology for urban farming taking from how they identify themselves *culturally* as individuals.

2.2 I am not looking for a right or wrong answer; I am particularly interested in how individual urban farmers make sense of using technology for urban farming.

3. During the interview

3.1 Note that these are your own personal lived experiences and therefore you can relate it the best way you deem fit.

3.2 *If you are ready, we can start.*

	RQ: How do individual cultural identities inform the differences in technology adoption among urban farmers in South Africa?	
Category	**Research Question**	**Follow-up question**

Background
 	
(Individual cultural identity and farming)
	• Tell me about yourself
	  − Which area/region/community in South Africa are you from?
	  − What is your native language?
	• Perhaps take me on a journey on how you came to be a farmer.
	• Do you feel like a part of this community or would you say there are some distinctions between yourself as an individual and the community from which you come from?
	  − Why do you feel this particular way?
	• How does *farming* relate to how you identify yourself as part or distinct from the community from which you come from?
		• Do you identify yourself as part of a cultural group or as distinct from what would be your cultural group?
		• Could you explain what it means to you to identify as that?

	SRQ$_1$: How are the cultural identities negotiated for the adoption or rejection of technology?	

Individual cultural identity, urban farming and technology use	• Kindly share your experiences of farming as a practice.
	• What kind of tools do you use for farming in urban spaces?
	  − Why do you use these particular tools?
	  − How have you found the experience of using these tools?
		• Is there anything distinct in the way you have engaged in farming throughout your farming engagements?
		• How would you use the same or similar tools when farming outside of the urban spaces?
		• What type of tool would you use when farming outside of the urban spaces?

	• How did you come to join the urban farming practice? • Has coming into the urban space influenced how you farm? • Now that you are farming in the urban city, would you still continue with your *conventional* ways of farming or would you maintain this form of farming?	• Are there any fundamental changes that have occurred in you as an individual as a result of a change in the method(s) of farming? • Can you provide examples of these ...? • Why does the manner in which you farm matter to you?
General	• Is there anything else you would like to discuss about your experience of urban farming that has not yet been explored?	

Appendix C: Informed Consent

Research Project: **The Relationship Between Individual Cultural Identity and Technology Adoption**

Interviewer: **Paulina Mamogobo**

To take part in this research project, you must first understand and agree to the terms of participation. The contents of this consent ensure that you understand the reason for your participation. Participation in the study is entirely voluntary, and you are free to leave at any time during the process should you wish to.

This research project aims to understand the qualitatively different ways in which urban farmers in South Africa experience technology adoption. The interview will be conducted in English and will focus on your personal experience with technology adoption; however, you are free to express yourself in vernacular if you prefer.

Data will be collected via virtual or in-person interview, should the COVID-19 restrictions be eased, conducted by myself as the researcher. Notes will be taken and the session will be recorded for future transcription. The interview is expected be conversational consisting of open-ended questions, and to last approximately 60 to 90 minutes as guided by the conversation. I will also be asking follow-up questions to obtain clarity. Should the interview need to run longer than 90 minutes, it will be terminated and a new interview session will be scheduled.

It is important to understand that all data collected will be presented in the results of the study, however, will maintain your confidentiality as a participant. Your personal and/or company name will be recorded during the interview and transcription process but will not appear in any research outputs. Partial or full excerpts of the transcribed interview will be used anonymously in the thesis and may be used in subsequent journal articles and/or reports.

There will be no form of compensation for participation, however, you will be given a copy of the final research output as a thank-you for your participation. There are no known risks associated with this study, though if any questions make you uncomfortable, you may decline to respond or end the interview. Also if there are questions that are not clear, during the interview, you may ask for clarity or elaboration of the question.

Agreeing to this consent certifies that you agree to and approve of the terms of your participation in the research project, which includes an interview and the recording of that interview.

Are you happy for us to proceed?

Appendix D: Ethical Clearance

**Gordon Institute
of Business Science**
University of Pretoria

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Dear Paulina Mamogobo

01 February 2021

ETHICS APPLICATION: Paulina Mamogobo (Student Number: 10580183)

Research Title: Individual Cultural Identity and Technology Adoption in Urban Farming, South Africa

On behalf of the Gordon Institute of Business Science Doctoral Research Ethics Committee, I am pleased to confirm that your application for ethical clearance, for the above research is approved, on the basis described in the application form and supporting documentation received on 15th of January 2021.

We wish you success in your studies.

Yours Sincerely

Professor Gavin Price
Doctoral Research Ethics Committee Chairperson

Appendix E: Written Accounts

Written Account – Participant I

*"Cultivating crop plants and herbs which also have medicinal. I plant spinach, spring onion, potatoes and beetroot mostly in crates and big planter bags. I farm organically which means I don't use chemicals my fertilizers and soil building resources have to come from the soil or animals. Such as chicken manure and kraal from cows. I sometimes use old bath tubes and toilet sits. For tools I use watering can, hand fork and spade. I started all this as an intern at **Farm organization** where I was thought that you don't need to a lot of land to start farming. I use my vegetable for self-consumption even though I do plan to start selling to the local community at a later stage. My main focus is eating healthy while I'm also saving money from buy certain vegetables. I am only planting medium and light feeders (leafy and root crops) which are your Spring onions, carrots, Spinach. I don't planter heavy feeders which are mostly your brassicas (cabbage, cauliflower and broccoli) they utilize a lot of the production space and need a lot of manure and I find it hard to control pests and diseases from them. With a small production space like container farming crop rotation is limited and the fact that I farm to eat so I always plant my favourites."*

Written Account – Participant J

Mlingo Village, Room 760
Mkuze, 3695

Phone: ▮▮▮▮▮   Email: ▮▮▮▮▮

Respected Madam/Sir,

My name is ▮▮▮▮▮ I am a gentleman of 28 years of age. I grew up at Mkuze at KZN province (South Africa) where I matriculated at Mtwazi Combined School in the year 2012. At Mkuze I stay with my mother and three siblings at Mlingo Village. I further my studies a ▮▮▮▮▮ where I completed an honours degree in BSc Agriculture: Agronomy in the year 2017.

During my studies a ▮▮▮▮▮ I've been working as Research Assistant where we performed an experiment in discovering the cure for diabetes using plant extracts of egg plants (cultivated in South Africa and India) and the project was successful. I also been working as a tutor for three years (2015-2017) assisting Students during practical work. In the year 2016/2017 I was elected as Project Manager in Agricultural Society and my duties was well served in planning, initiation and monitoring of the projects we were managing such as GCI (Green Campus Initiative). In the year 2017 I was working as a volunteer at ▮▮▮▮▮ farm for a period of one year under nursery and out-side field, and the skills of working under pressure, team work, was obtained.

In the Year 2018 I joined ▮▮▮▮▮ where they placed me into two different farms which operates mainly under Hydroponic Farming. The first one was situated at Drummond, Outer West Durban (Havilah Farm) and placed as a Supervisor Trainee for a period of six months in the year 2018. The second one is at Pietermaritzburg under KZN ▮▮▮▮▮ where I started April 2019 and I still working as a Hydroponic Assistance. Both farms have Tunnels and outside field where vegetables is cultivated. I recently awarded with a certificate of Horticulture Apprentice for my hard work by ▮▮▮▮▮

In both farms I gained a valuable experience which include, germination of Seeds, Mixing fertilizer chemicals for irrigation, mixing and identifying chemicals for pest and disease control, supervising planting of crops, crop planning and leading farm activities, motivating, developing, directing people as they work and supervising stuff, directs and coordinates worker activities, such as planting, irrigation, chemical application, harvesting, grading and recordkeeping, farm maintenances, land preparation, measuring EC (Electrical Conductivity) and PH of water, sales and marketing of products.

Controlled environment (Tunnels or greenhouse) type of farming has been an enjoyable journey and a best chapter to my life. It is very interesting system where you can produce high yield of vegetables on a small area and in a short period of time because an environment optimal for plant growth is created. All the nutrients and water that the plants need are available at all times. This type of farming enable you to cultivate crops at any time of the year (there is no season) since most of the environmental conditions are controlled. Plants grow very fast since in this system plant's root system is exposed directly to water and nutrition through drip irrigation system, the plants does not have to exert any energy in sustaining itself. Plants doesn't

waste time searching for food but all the essential micro and macro-elements become readily available for root uptake for plant growth. Unlike in the outside field where plants waste more energy and time in searching for food, fixing nitrogen and other nutrients in the soil so that is readily available for plant uptake, and it roots are perpetually searching for the necessary nutrition to support their growth.

Allow me to share my experience of producing crops under hydroponic farming which is part of forth industrial revolution, as in one Tunnel of 30mx8m can cultivate 600 cucumber plants that is cultivated under 2 metre square apart from each other, each plant produces an average of 15 to 20 cucumber fruits and in one cycle of production which take about four months to be completed, and the market price normal ranges from R5 to R15 depending in a season, in calculations 600 plants x 20 fruits from each plant = 12000 x market price of R10 = R120000 in one cycle.

What I have observed so far in my self is having a skills in passing information to other people, humbleness, good in mentorship, Patience, love my work, deeply respectful and grounded person. It than triggered me to study toward Facilitation and Assessor course which enable me to train students about farming hence to improve food security in the community. I'm well prepared, ready and strong to run a successful farming business. It is my wish to become a good example to the community that nothing is impossible through working hard and believing in yourself. I am very passionate about agriculture as we produces food to feed the nation.

My skills lie in my ability to comprehensively read and understand the situation act quickly and yet smartly. In all my leadership role and volunteer activities, I have maintained an excellent record of being on time, prepared, and eager to take on new responsibilities. I am very goal oriented and am able to get things done in timely manner. Thank you for your time.

Yours faithfully,

Written Account – Participant K

1.   Tell me about how you came to be an urban farmer?

I wanted to join the crop production business and I have a degree in Agricultural Engineering so I wanted to do advanced farming techniques that can grow produce from seedling to maturity in half the time it takes conventional farming to eliminate competition.

2.   How did you make that decision?

I did some research on urban farming methods and I liked Aquaponics more. Aquaponics has more advantages than most crop production methods. I liked that Aquaponics does not produce only crops but fish too, the production time is short and that is the fish produces fertilizer for the crops.

3.   When were you exposed to urban farming technology?

My lectures have always mentioned Aquaponics and its advantages. I first saw a commercial sized Aquaponics system in an Aquaponics company in Pretoria where I had gone for an interview/meeting. I had previously communicated to the company owners and was invited for a meeting in their farm. The meeting was concluded that I would Volunteer for their company. I volunteered for one day in a construction of an Aquaponics System In Brits.

4.   How have you found the use of technology in urban farming?

The technology I used for my Aquaponics system was a 24V power supplier, submersible water pumps and Air pumps. Everything was new to me so I had to do research on the technology and also consult a neighbour who has a pond. It has been easy for me to connect and run the technology and the performance of the pumps is good.

5.   What have been the challenges?

I came across a few challenges during the construction phase. I bought a Pond liner for the construction of the Deep-Water Culture system. The liner was cheap and of poor quality. The liner got torn before the construction was completed. I got advice from my neighbour who constructed his own pond which was to use a plastic which was even cheaper and of good quality. I also bought a custom-made fish tank which leaked a lot. I took the tank apart, sold the materials, and used the money to buy a Jojo tank. I bought a water pump which was cheap but not meant for continuous use. The pump died in a month after the system started running. I consulted my neighbour again and I got advice

on which pumps to buy, and I bought the correct pump which I am using now. I still keep the old dead pump underwater on the fish tank because it is colourful and acts as centrepiece which the fish swim around.

6. What have you learned?

I learnt some business skills. I once sold seedlings and simultaneously grew spinach. Not realizing that my customers are growing the spinach seedlings I was selling and will not buy my mature spinach when it is ready because they will already have spinach. My spinach did not sell and I started noticing how other businesses are forecasting the markets. I now notice shifts in Markets. I noticed that a local bricks company had changed to a timber company because most houses that are being constructed in our township were completed up to the roof level and now required roofing. I now notice that Aquaponics companies sell equipment but not use their equipment in their farming practices. I notice that beekeeping companies are selling equipment but are not engaging in beekeeping. I notice that these companies are opening Agri-Hubs and are making their money from selling equipment, running Aquaponics and Beekeeping courses, and consulting services.

7. Would you still pursue urban farming in the same manner, if given an alternative... And why?

I would pursue farming differently. I learnt that money does not only come from selling produce but can also come from selling services whilst in a production company.

Written Account – Participant L

"I ventured into agriculture back in late 2018 as a first generational farmer and soon after that registered an agricultural enterprise known as **participant entity**, at that point the company had no capital investment except for savings I had from my study years, no assets, no products and no infrastructure it was just an idea. The interest into agriculture was driven by "Urban Agriculture" which was a buzz word at that time, simply put the idea was tech savvy farms on top of high-rise buildings and rooftops. I had recently graduated and was interning as a junior research fund manager in Pretoria concurrently I was trying to get the agri-startup going in Johannesburg, most of 2019 was filled with research and vigorous stakeholder engagement.

Finding these agripreneurs that had successfully achieved establishing their urban rooftop farms was the first objective, in April 2019 a young rooftop hydroponic farmer that was operating on 200-meter square farm on top of FNB Bank City forwarded a recruitment link for an urban farming training program. The next six to eight months was spent in technical and business training by the end of the program we had discovered that the farmers from previous cohorts were having serious primary production inputs supply chain challenges which was then the birth of **participant entity 2**, to deliver the minimum value proposition between R350k to R500k was needed including operations for the first twelve to eighteen months. The point was the basic technology that was needed to enter the market was inaccessible understanding common constraints that youth owned enterprises faced on a daily basis.

Over the last three years I've had the opportunity to engage all kinds of urban to peri-rural smallholder fresh crop production operations from vertical hydroponic farms to open field traditional operations and I have one take away agripreneurs uptake context specific agricultural technology solutions these can range from irrigation equipment, sharenting, enhanced seeds, operations tracking software and produce marketing apps."

Written Account – Participant M

1. **Tell me about how you came to be an urban farmer**

   I became an urban farmer after studying Bachelor of Science in Agriculture: Plant pathology. I had applied for numerous opportunities with conventional farming companies with no success. I finally found an internship with a company doing aquaponics and there I came to know more about the possibilities of farming in an urban area. A few months later, I was promoted to become the manager of the farm.

2. **How did you make that decision**

   I did not! The decision was made for me in that fate would have me land in aquaponics when, throughout my studies, I had envisioned myself working in a conventional farm far away from urban spaces.

3. **When were you exposed to technology**

   I have always been exposed to technology but my use of and reliance on it has improved over the years.

4. **How have you found the use of technology in urban farming**

   I have found technology to be indispensable in the urban farming space. Urban farming and farming in controlled environments requires farmers to have more information about their operations and systems. Technology has allowed me to monitor and quantify changes in plant health, take important readings of water quality parameters and record them remotely, collaborate with other farmers and remotely assist them in managing plant health. Technology has allowed me to increase my knowledge and get better at science.

5. **What have been the challenges**

   The main challenge I have overcome is getting to understanding that I cannot change or control everything. Nature is incredibly unpredictable and no matter how much I can do right, there are some elements of the plants or fish I work with that cannot be controlled. It has been hard to part with crops that I know we have really worked hard to produce because they were infested with a pest or affected by disease.

6. **What have you learned**

   I have learned plenty: a whole science of aquaponics, a novel and sustainable way of farming. I have learned how to handle stress, manage people and resources in order to keep a farm running. I have been given a chance to practice the theory I learned and thus have learned to make the science of plant pathology practical.

7. **Would you still pursue urban farming in the same manner, if given an alternative... And why?**

   I would because urban farming means I still get to pursue my passion for producing food without having to leave the convenience of living in an urban area. I would make sure I go to study in the field of agricultural science because it helps me to reason in my work and broadens my scope.

Written Account – Participant N

1. Tell me about how you came to be an urban farmer?

I got a job at Finley Farms and I was very excited because I have never done acquaponics and so that's something new for me and so I decided to put my business on hold and grab the opportunity with both hands so that I can be exposed to smart farming … because in any case smart urban farming is something that I … was part of my five year plan so it eventually came quicker than I expected in a form of another business but I still found it it be such a great opportunity for me to learn and now I am definitely convinced that smart farming, urban farming is something that uhm is doable and something that I am really passionate about and that I am excited also about it .

2. How did you make that decision?

Like I said with the first question, I just decided to accept a job offer and the rest is history.

3. When were you exposed to technology?

I was exposed to technology in 2017 when I actually drove a tractor where I saw uhm self-driving tractor, where I saw … you know … machinery. I feel like machinery is technology and ya … so for me technology has always been machines and when I got into farming in2017 that is when I was like oh wow ... you know … farming is not the traditional labour-intensive exercise. It can be made easier by the use of technology.

4. How have you found the use of technology in urban farming?

I found the use of technology in urban farming or rather smart farming … is that it makes life so much easier for the farmer. You know you are getting reliable data … uhm you know, your systems is currently running… especially with aquaponics … your system is currently pumping water into your grow beds making it… giving you some sort of flexibility in terms of your time and it makes things very efficient… it makes farming very precise … you know how much you need to buy, you keep track and records of all the inputs and so to best maximise your operation.

5. What have been the challenges?

The challenges is really understanding the systems design because hydroponics or aquaponics you need to understand how the system works, especially when you are dealing with water and fish. A pump, a drum filter can get clogged-up and when that gets clogged-up the water level rises and when the water level rises, the fish die … so there's so many challenges that you need to understand how

the system actually works so you can attend to all the technical problems. Another challenge is selling … the market, you know I feel like we are growing premium produce but we are selling at conventional price so I think the market needs to start changing in favour for us smart farmers.

6. **What have you learned?**

I have learned that there is a new way of producing food because of current resource exhaust and water conservation and the direction of where the world is going… it is estimated that Africa is going to be the bread basket for the world by 2050… so just understanding that I am learning that you know what there's so many ways that we can produce food where we are in urban areas … we don't need hectares and hectares of land … we can have 1 hectare and produce consistently and I feel like that is something that we should all be looking into … even if it's something that's small and backyard but food production … food security is something that I feel can be everyone's responsibility.

7. **Would you still pursue urban farming in the same manner, if given an alternative and why?**

Yes I would still pursue urban farming because it really relates to where we are as a nation. Like we are a generation that is moving into technology, that has birthed technology… that wants to be able to be smarter, faster, slicker. So for mem it's something that I relate to. I can monitor the system from my phone … you know, I can have quality of life and still produce food efficiently … still produce healthy food for consumers … I can take this design and replicate it anywhere I am in the world so for me urban farming is something that I feel needs to be exposed to a lot of my generation.

Written Account – Participant P

1.   How I became an urban farmer.

This decision was honestly not mine, we were a co-op of agricultural graduates' other guys had experience in urban farming, had skills and had better knowledge. Looking at the piece of land we are leasing we decided to go intensive to maximize production and profits. However, I knew nothing about the system I had to learn from other guys. I am happy and proud of the skills I have acquired in the last 7 years.

2.   Where and How did I start?

The system is in a small town called New Hanover in KZN. Looking at job opportunities as youth, we initially decided to create our own opportunities. At that time (in 2014) I was still with Department of Agriculture and Rural Development as an Intern; the contract was about to be terminated. I had to take a decision. So, we fortunately got some piece of land from a privately owned farm in New Hanover. The first year we planted on the open field, good quality produce but not much yield hence we hence wrote a proposal to Department of Rural development and Land Reform, which was approved in 2015. In 2016 the whole system finished and we started, from there we have been learning and growing.

3.   How did I make the decision of Urban Farming?

I was honestly led to this decision I did not know much of this system I had to learn from my experienced business partners.

4.   When was I exposed to Urban Farming?

In 2016 when erection of our tunnels was finished, that was my very first time I put my feet in the tunnels. It real felt like a different world, a game changer indeed.

5.   How have I found the use of technology in urban farming

System is very interesting and advantageous. I think it is more mental than physical. It is not labour intensive but requires concentration. Amazing result. For example, on very hot day cucumbers grow with hours when irrigated properly and very high yields

6.   What are the challenges

i)   The system we are using does not control temperature, the challenge we have encountered is in winter since we experience heavy frost in New Hanover. We do not produce in June and July. We replant again mid-August and start picking late in October.

ii)   Learning the system, the first system we used did not allow us to plant crops from different families as they will have different nutrient requirement. Along the way we made very costly decision but we have learnt.

iii) Load Shedding, irrigation system and fertigation need electricity, Thank God we now have generator.

7.   What have you learned

The language of plants. I think plants react very quickly in this type of farming system, either good or bad (pest, growth and diseases). It is very easy to understand them as implement different fertigation systems and spraying programs they are way faster that open field. I have also learnt the importance of managing electro conductivity and water pH in farming, this plays a huge role.

8.   Would I pursue urban farming in same manner?

This may mainly depend on the area. In New Hanover I would not. I would opt for green houses where temperatures can be regulated. Not producing in winter hit very bad. Otherwise in warmer places like Durban and Stanger I would definitely pursue.

Written Account – Participant AF

1. Tell me about how you came to be an urban farmer.

After watching an episode of Carte Blanche about Brooklyn Grange I proposed a similar urban garden initiative to the mineral council of Johannesburg, they asked for quotes and I went to a greenhouse business in Pretoria; I then was told the quotes were too high, so I joined the **organization B** and their **urban farm organization** programme which ran for 8 weeks.

2. How did you make that decision?

I knew were the world was headed, the food scarcity that would come as a result of people moving to the inner city in search of opportunity. I also knew the effect climate change has on capacity of food produced in traditional farms, that informed my decision to look for solutions and alternatives to an impending crisis.

3. When were you exposed to technology

Particularly farming technology, was an automated farm on an episode of black mirror with bees, but my earliest exposure to technology was Facebook and mxit chat apps, and I was inspired by web 2 applications and crypto and blockchain later on.

4. How have you found the use of technology in urban farming

Many aspects of technology farming in my farm include from photo diagnosis of disease management, automated lighting and extracted fans, periodic fertilization all helps automate processes in my farm.

5. What have been the challenges

High start-up costs, maintenance, electricity expenses. Creating markets, educating staff and employees etc.

6. What you have learned?

Farming is only a numbers game and makes no room for ideas you cannot scale quickly.

7. Would you still pursue urban farming in the same manner, if given an alternative... And why?

I would pursue agritech farming because it addresses a sizable need and presents a unique opportunity for social inclusivity, and creating new economic opportunities, as well as environmental benefits and sustainability.

Reflection on my experience

My name is **Participant AG** I am a student at **agriculture institution** in Pretoria doing my first year in plant production. One of my first assignments was on hydroponics and I had no idea what it was, so I started doing my research and I came across **organization B**. I was very interested and inspired by the work that they do, and I was given the opportunity to be a part of their team. That's how my journey started in urban farming. I was fortunately blessed to be working at constitution hill alongside two other farmers with different hydroponic systems one of the tunnels system is an NFT system and the other tunnel is a Dutch bucket system, and our tunnel the demo farm the medium base farm and mushroom farm .

In urbanized farming the importance and beauty of technology that is implemented, things like Temperature sensor and thermometers that help regulate and control temperatures in the tunnel and another beauty is the farm is restricted by climate changes, with the support of lights and fans. The nutritional levels are controlled according to what your crop needs. The use of timers and pumps that feeds plant on scheduled time. Use of no soil just water that is reused, which saves water.

Challenges I've encountered was Uncontrolled temperature in our medium base farm and mushroom farm, that resulted to crops suffer heat stress. Mushroom farm heat stress caused mushroom pinnings not to grow and mature into button mushrooms. Casing soil dried up quickly. Using the correct cassing soil for mushrooms. Market access.

The importance of having a market for your produce. How to manage and keep records of farm activity and progress. How to engage with suppliers. The importance of measuring precisely your pesticides and nutrient intake of produce, amount of water each plant needs. Scouting and identifying different kinds of pesticides and treatment methods. To have a steriled and clean farm. Different harvesting methods.

I would pursue urban farming because I have seen the beautiful benefits and opportunity and how urban farming is growing and the comfort and convince it brings. As population is going up and more land spaces are used for homes, and the need to meet demands Increase we can make urbanized farming our business and lifestyle as it is the future.

Written Account – Participant AH

1. Tell me about how you came to be an urban farmer

I am a food technologist by profession, my love for farming started from the concept of seeing how the primary produce are developed to secondary and tertiary product then we talking of Agro processing, so before falling into Urban farming, we were just farming on open field for almost a year while was doing a research on the kind of system to utilise later in future to produce tomatoes on a water efficient system called hydroponics.

2. How did you make that decision?

I have always wanted to tap into Urban farming after several research on the system, as one can mitigate the risk unlike on open field planting were risk are immense leading to loss which are not planned.

3. When were you expose to technology?

I went through a programme called **organization B** which funded my business to erect the Greenhouse tunnel with irrigation. The system in simple terms is called hydroponics (producing crops with nutrient fed water). I went through a 6 weeks programme and I had to pitch the idea to funders to produce tomatoes to serve need within my community for freshly harvested produce.

4 How have you found the use of technology in urban farming?

Oh the use of technology is manageable, water-efficient, accuracy on point.

Manageable

In a way that I am able to set the irrigation on how, and when to water the produce. The environment is manageable is a way that you can control the temperature and humidity within the Greenhouse tunnel to suit the crops. Less risk as the kind of crop I am producing which is tomatoes, so it's sensitive as the tomatoes leaves do not water, this may promote fungus if not controlled leading to a disaster to loss. Less labour for weeding, harvesting.

Water-efficient

South Africa is a water scarce country, the use of the system assists reducing use of water. I am able to utilise 3000 Litres of water for 7 days to water 880 plants unlike the sprinkler system were you will water where there's no plants.

Accuracy

The system is accurate when comes to a point of procuring the fertilisers, pesticides in way that you plan for a cycle which can 7 to 8 months of production. I am able to calculate that water usage by each plant.

5 What have been the challenges?

The challenges that we faced as an operation basically were on open field however on Hydroponics farming the challenges was I did not have any background of Hydroponics I had to spend more time researching luckily we starting with an easy crops which is a Spinach. We had to deal with pests Aphids to a point that we have to reduce our cycle production reason being we could not keep them at bay, secondly high temperatures inside the greenhouse tunnel causing poor quality, lastly it was the load-shedding remember our irrigation is programmed so there is no way we can water the plants without the electricity.

6 What have you learned?

There's a lot that one has learned through this journey and I appreciate every moment of it, we learnt that for every crops we use different EC/TDS, plants don't only need warm environment to grow but humidity plays a big role by avoiding tomatoes flowers drop, that urban farming is organic reason being pesticides are utilised to keep pests at bay especially *Tuta Absoluta (leaf miner)* which causes a massive distraction of crops if not controlled, lastly we learned that scouting is of paramount importance in urban farming to check the pest, humidity and emitters if they drip water on plants.

7 Would you still pursue urban farming in the same way?

My plan in the next three years to have 20 greenhouse tunnel or urban faming for tomatoes production. The technology/4IR is booming, one is able to control the

irrigation on the smartphones at home, I always say to people coming to my farm for visit infrastructure is important in farming reason being it opens up opportunities for the organisation to meet Local GAP system which is an Agriculture standard that we need to comply with for Food safety purposes.

Appendix F: Social Media Posts

Participant I

Agriculture is life

👍❤️ 8   3 comments

❤️ Love   💬 Comment   ↪ Share   ✈ Send

Making agriculture fashionable

👍❤️👏 72   2 comments

👍 Like   💬 Comment   ↪ Share   ✈ Send

204

Participant J

👑
#Size and #Depth of the pot and tray does have an effect in the seedling growth and also have a huge impact in #production when delayed transplanting.

Through my observation:

=In the bigger pot as you can see in the picture, seedlings turn to be #stronger, #thicker and 4 to 8 leaves can form while in the #nursery.

= Seedlings can stay longer in the pot without breaking where as in the trays seedling grows long, weak stems, smaller leaves due to longer internodes if delayed #transplanting and they usually resembling #etiolation due to limited space to breath and anchoring of the roots.

=Algae build up so quick in the trays than pots due to limited space.

=High seedling mortality rate is observed from seedlings that is germinated from tray than pot.........

>>>> more results to be shared>>>>>>

#Research and #Development
#Hydroponics
#Agronomist
#soilscience
 #growth
 #sustainability

← ⋮

Nothing is wasted in farming, everything can be re-used in my calling. In the picture it showing drip irrigation made from 2liters and it irrigate autamatic 😊 without electricity or pumb , I only add water once or twice a week now😊
#Hydroponics
#Horticulture
#Future #Farmers
#Recycling
 #sustainability
 #zerowaste

Leave your thoughts here...   @   Post

◁ ○ ▢

#Research and #Development
#Hydroponics
#Agronomist
#soilscience
 #growth
 #sustainability

◁ ○ ▢

Participant K

Agricultural Engineer
11mo

#AgriculturalEngineering
#aquaponics
#noticeMe

Aquaponics is a smart and organic gardening system in which fish and plants are grown together.

After growing a variety of lettuce cultivars with great success and I believe it's time to experiment with Herbs.

Agricultural Engineer
2mo

last year this time, my younger brother and I, started the construction of our backyard Aquaponics system. The project was a success, we are growing spinach, lettuce and tilapia fish.

Today we celebrated the anniversary of our work and successes with fresh fish and spinach harvested in our system

#AgriculturalEngineering
#Aquaponics

Participant L

One of E██████████s' green houses.

SMME and award winner ████████owner of Ev████████ says, "In early 2020 we identified compliance as a core challenge thus we joined the Khulisa iBiznis Programme. Thank you for this opportunity and this award. This programme offered us the tools to better our financial literacy through funding readiness coaching and business-related workshops. Thank you to all the partner's involved in this programme as well as our farming community customers for allowing our business to grow and thrive."

Ev████████ ████ was awarded first place winner for the largest increase in percentage revenue with an incredible 843 percentage increase. They are a small agri-business based in Soweto, Gauteng, co-founded in 2018 by A█████████ ██████This business deals with seedling inventory management and provides training on modern farming practices – with aims to provide access to high quality primary production agricultural inputs.

Participant M

My eyes are exited to see... My hands continue to work... My mind is glad to dream... The future of farming #sustainableagriculture

So thankful for yet another opportunity to share my knowledge with potential farmers about the do's and don'ts of plants in aquaponics 😁. People are so hungry to mobilise their resources and farm sustainably, in a futuristic way that will steer us to making the goal of no poverty and hunger by 2030 a reality. I am glad I get to be a part of the realisation of possibilities in people's minds.

Just another day in paradise... The vegetable I am holding here is a baby chioggia beetroot. It is visually pleasing and sweet, plus we have managed to grow it aquaponically.
#foodie #aquaponics

Participant N

♡ ○ ▽   🔖

455 likes
⬤⬤⬤⬤⬤⬤ My five year plan entails
#smartfarming and using innovating ways of... more

♡ ○ ▽   • • • • •   🔖

304 likes
⬤⬤⬤⬤ We got the opportunity to visit
@cerealis_ltx to see the latest improvements on
#precisionagriculture. As the pioneers of this
technology in our country, I was excited to get to
experience their different trials on #maize +
#soyabean production.

#aaq #agco #gibs #cerealista #femalefarmers
#agriculture #agritech #trials #technology #greens
#foodsecurity #southafricanfarmers #southafrica
#womenempowerment #instagram #nature
#outdoorphotography

View all 5 comments

Participant P

Tunnels net sides - closed ✔️
Frost Cloth ✔️
Let us try again this winter 😊, with a different approach. Giving up is not an option 💪.

👍❤️ 20   4 comments

21/09/2020
Time 18:32
Couldn't stop smiling 😊 trellising the last plant out of 3 840 🌶️. The last week has been the most hectic one on the farm.
Looking forward to harvesting, we are almost there 😊.
#ProudToBeAFarmer
#Passion

Participant AF

Liked by **abdon.leatherworksza** and **2 others**
soulbarrelbrewing We're releasing the latest batch of
SA Pils today! This version was brewed with fresh
@afrileap hops, grown locally, pesticide-free in a clean,
energy efficient, and sustainable way. This batch has
amazing hop flavours of fresh cut grass, flowers, with
subtle green fruits and berries. We're proud to support
local businesses and showcase South African
agriculture. #drinklocal #localhops

Participant AG

Meet our **#WCWednesday**   ,An
Agriculture Graduate,WIBC UAI Intern.She runs WIBC
farm @VisitConHill
 A production of
Strawberries,Greenpeppers,Tomatoes and other
varieties of Vegetables.**#agriculture #farming
#fertilizer #corn #flowers #WIBC2021**
AgriesMelisses

Participant AH

Tomatoes Production loading...🍅

Things to consider when producing tomatoes using hydroponics Dutch bucket system.

• Cleaning and disinfecting.
• Growing medium.
• Choose a high yielding variety.
• Environmental management parameters (Humidity, temperatures)
• Record keeping (Visitor Questionnaire, Scouting, pH, EC etc).
• Pesticides and fertilizer application program.
#sustainability
#efficiency
#environment
#Foodsustainable
#climatechange
#management
#agriculture
#water
#Foodsafety

let's work Africa✊🏾🇿🇦, Lekker Boere🍅🌶️🌿🚜

We are 62 days old today, dutch bucket system. What a journey!!🍅 #Agripreneur #hydroponicfarming #foodsecurity

👍 2

Like   Comment   Share

213

Appendix G: Observations

Participant I: Urban Farm, Khayelitsha, Western Cape
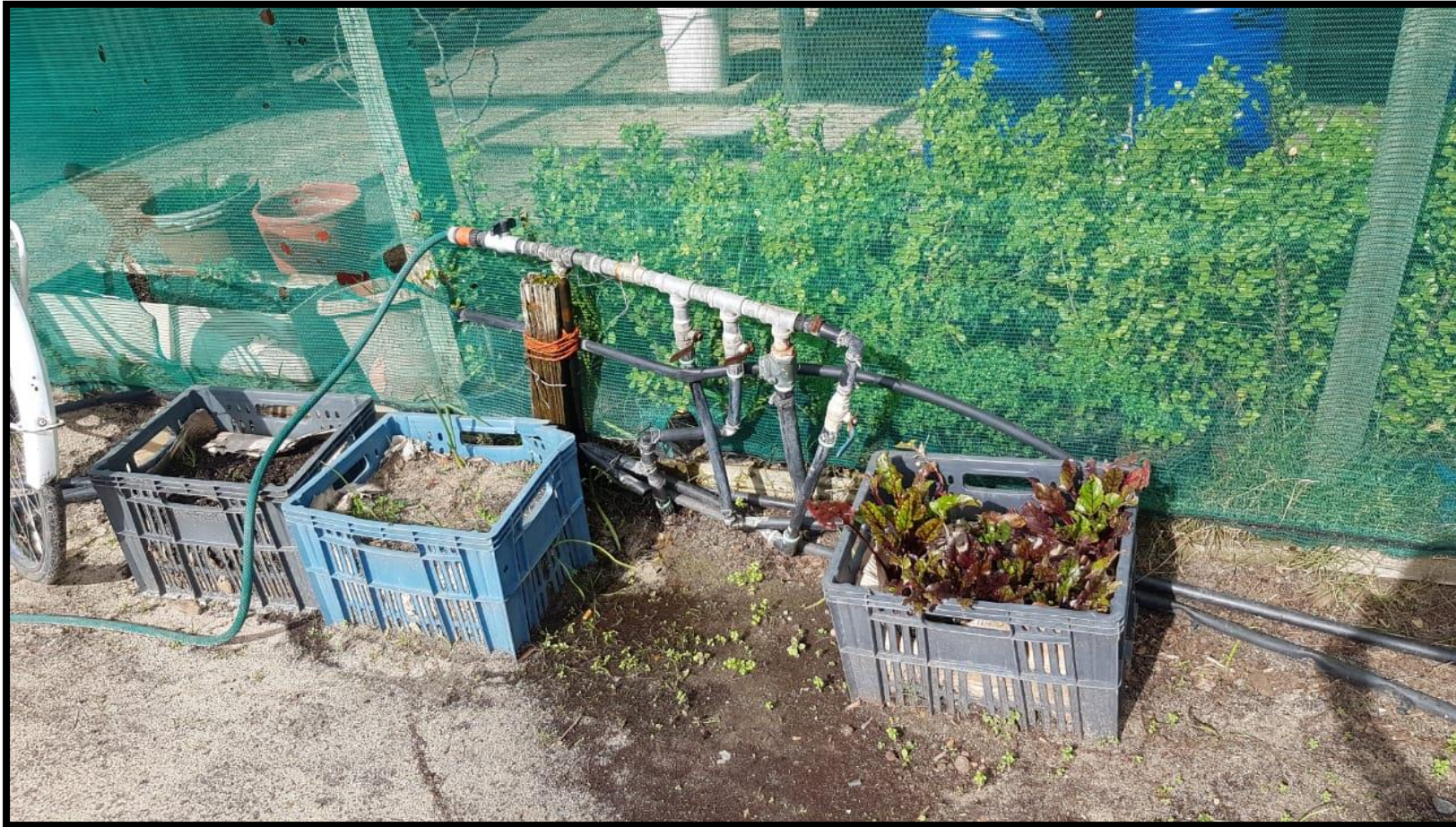
Participant J: Urban Farm in Pietermaritzburg

Participant K: Urban farm in Nelspruit, Mpumalanga

Participant L: Peri-urban farm in Soweto

Participant M: Urban Farm in Midrand, Gauteng

Participant N: Urban Farm in Midrand, Gauteng

You are going to face a lot of challenges so it has to

1 228 views   0:21 / 0:45

💬 2   ⟲ 13   ♡ 71   ⌁

We are on a smaller portion of land but we are commercial

1 228 views

0:10 / 0:45

2   13   71

Participant P: Urban Farm in New Hanover, KwaZulu-Natal

Participant AF: Urban Farm in Johannesburg CBD Rooftop

Participant AG: Urban Farm in Johannesburg CBD Rooftop
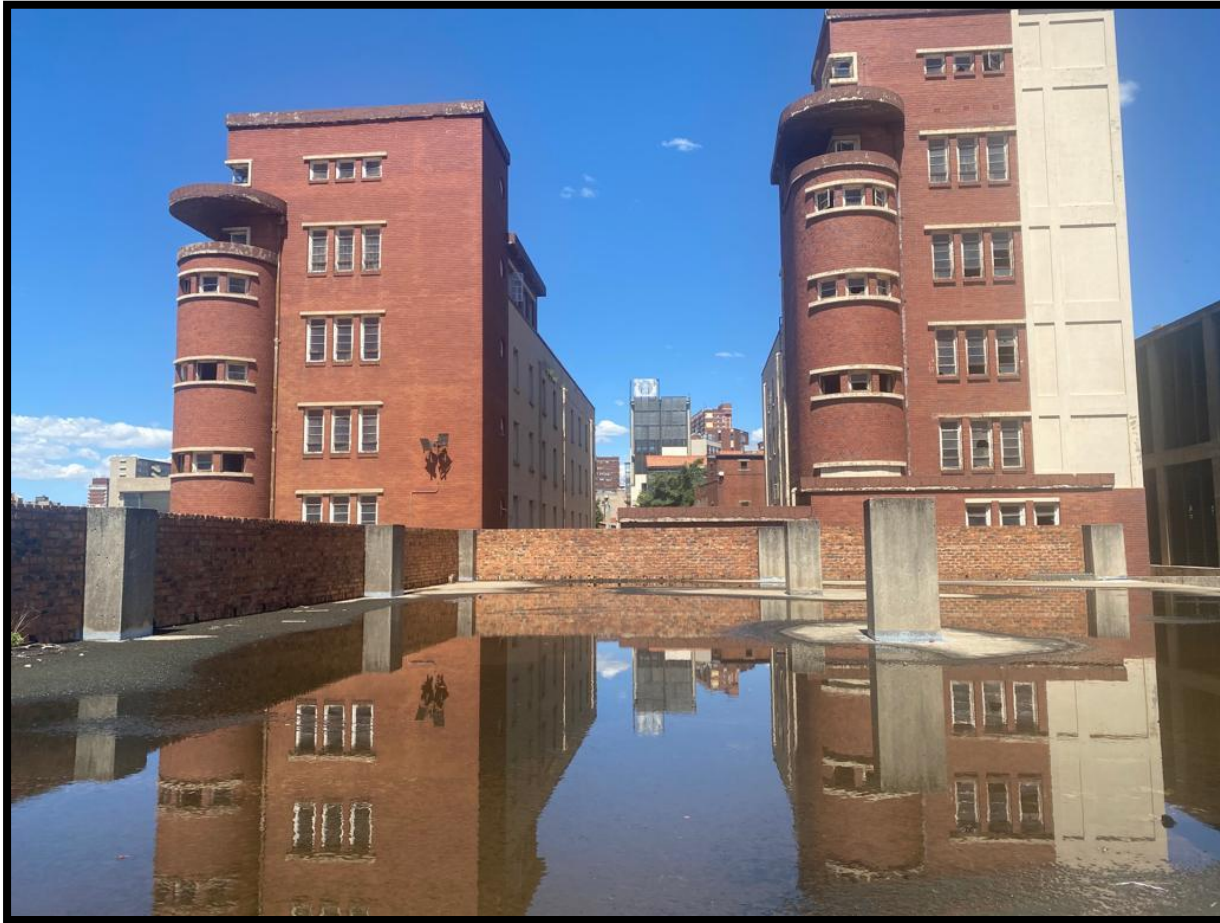
Participant AH: Urban farm in Randfontein

Appendix H: Code Categories

Codes

Category / Code	Value
Cost of technology and socioeconomic status	32
Conceptualization of Technology	7
Culture of reliance on technology/global trends/bi-...	29
Work Exposure Assimilation	26
EXPOSURE TO TECHNOLOGY	
Complexity and Lack of Knowledge	18
Personal knowledge	21
Incubation and Skills Development	42
Educational Background	32
EDUCATION & KNOWLEDGE SYSTEMS	
Need to Preserve Indigenous Practices & Subsistence...	39
Hybrid farming model	4
Farmer Aesthetics: Clothing and Farming Landscape	6
Adoption of Technology: Efficiency, Effectiveness,...	47
FARMING PRACTICES	
Urban farming: Does not require large spaces	19
Urban Farming, Location, and Population Density	19
Community development	20
Appreciation for Urban Farming Controlled Environment &...	24
CULTURAL GEOGRAPHY	
Disposition to care for the environment	20
Individual attributes	17
Collectivism	20
Appeal to the younger generation and modern lifestyle	5
BELIEFS	
Urban Entrepreneurial and Profit-Driven Identity	43
Organic and Nutritious Food Production Values	31
Organizational Culture	30
Conservation Cultural Values	15
CULTURAL VALUES	
Upbringing, background, place of origin, & residential place	30
Kin influence	35
Ethnicity and Tribe, Religion, Race, & Inclusion	27
Cultural Gender Roles	8
ETHNICITY	
Traditionalist Value System	13
Openness to Innovation	71
Value to Imparting Skills and Developing Other Farmers	16
Understanding Market Demand & Food Scarcity	45
INDIVUDUAL IDENTITY	

Annexure I: Archetype Summary Examples

Conception	Participant J "Adaptavist"	Participant AH "Strategist"	Participant I "Traditionalist"
Individual Identity	**Moderate** │ Adopted technology to explore, learn and develop skill, understanding market demand and food scarcity	**Med-High** │ Adopted technology as experimental and explorative in farming	**High** │ Rejected technology as participant believed in and was immersed in traditional farming methods
Ethnicity	**High** │ Adopted technology influenced by intergenerational practices, and now integrating technology to enhance learning and challenge worldviews	**Low** │ Adopted technology owing to entrepreneurial basics embedded in background through selling agricultural produce	**High** │ Rejected technology emphasizing ethnicity to influence farming practices
Cultural Values	**Med-High** │ Adopted technology choosing technology which accommodated more organic or nutritious methods of farming	**High** │ Adopted technology driven by entrepreneurial and for-profit mindset	**High** │ Rejected technology emphasizing the value for conservation, organic and nutritious food production
Beliefs	**Med-High** │ Adopted technology owing to networks in the urban farming space for sharing values, knowledge, practices, and ideas	**Med-High** │ Adopted technology for its appeal to the younger generation and modern lifestyle	**Med-High** │ Rejected technology emphasizing the disposition to care for the environment and not cause harm

Cultural Geography	**Moderate** | Adopted technology over an appreciation for urban farming-controlled environment and smart-agriculture	**High** | Adopted technology for its convenience to produce in confined spaces	**Med-High** | Rejected technology mentioning farming in peri-urban (non-arable) locations for community development thus 'planting with what you have'
Farming Practices	**High** | Adopted technology to achieve efficiency, effectiveness, reproduce and ensure sustainability	**Med-High** | Adopted technology to achieve efficiency, and strategically complement traditional farming for competitiveness	**Moderate** | Rejected technology over the need to preserve indigenous practices for subsistence farming
Education & Knowledge Systems	**High** | Adopted technology guided by educational background, indigenous knowledge, and experiential learning	**High** | Adopted technology owing to incubation and skills development programmes	**Low** | Rejected technology by virtue of employment in a community-focused incubation with non-tech related skills development programmes
Exposure to Technology	**High** | Adopted technology from working for a hydroponic farm organization, influence by a culture of reliance on technology and global trends	**High** | Adopted as a mechanism or tool that allows them to enhance efficiency in production processes	**Med-Low** | Rejected technology from working for a community-based NGO that did not use technology

Annexure J: Participant Categorization to Archetype

I	J	K	L	AG	AF	AH	P	N	M

TRADITIONALISTS

LIBERALISTS

STRATEGISTS

INNOVATIONISTS

————	Primary categorization
▪▪▪▪▪▪▪▪	Identity migration