

The Future of Africa:

Investigating How Entrepreneurship Education Can Boost Technological
Innovation In Sub-Saharan Africa

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ABSTRACT

Africa is the largest continent in the world, with an impressive population-size of almost 1.4 billion people, where roughly 60 percent of its inhabitants are younger than 25 years of age. With such an extensive volume of human capital, in addition to a promising technological upsurge seen in the later years, major economic prospects are estimated to be found across the 54 African countries. That being said, the continent is at present containing the highest concentration of underdeveloped countries. Much research has been invested in understanding the current predicaments that Africa is facing, and how to best overcome these challenges.

According to macroeconomic theory, innovation is considered as an essential factor in enhancing socio-economic development. In this context, the researcher investigated the components required to ensure that entrepreneurship and innovation are thriving. Based on the related literature, one area that presents promising theoretical findings is the function linked to the entrepreneurial university. Much focus has been given by the academia to the connection between major universities like Stanford, and Silicon Valley. That said, less emphasis has been placed on the comparable relationship in resource-scarce countries. Therefore, this study attempts to investigate the aforementioned by taking a look at the Meltwater Entrepreneurial School of Technology, and the potential impact such institutions may have in improving technological innovation in Africa.

A sample of ten in-depth interviews were conducted with the MEST alumni. As the scope of this study was to capture and examine the graduates' experiences and perceptions, qualitative content analysis by in-depth one-on-one interviews was believed as the most suitable method to answer the research question of this thesis. By conducting a thematic network analysis, three key themes were revealed, including: 1) the role of entrepreneurship education, 2) issues related to the African market, and 3) factors related to technological innovation. These themes put forward the key barriers that Africa is currently facing to improve socio-economic development throughout the continent. Furthermore, presenting the ways in which the entrepreneurial university or entrepreneurship education potentially can contribute in order to overcome these challenges. Finally, this thesis provides a critical evaluation of the limitations found, in addition to recommendations for further studies.

KEYWORDS: *Entrepreneurship, Education, Africa, Technology, Innovation, Socio-Economic Development.*

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1. INTRODUCTION

Africa has the fastest growing population in the world, where it is projected to increase approximately 50 percent by 2035, reaching an impressive number of 1.8 billion. Though population growth is crucial for the socio-economic prospects in a country, this significant progression seen on the African continent also brings a number of social risks. For one, the government face massive public expenditures concerning education, healthcare and basic services. Moreover, there is a need to invest in the development of skills and job creation, to enable employment for the upcoming surge of young adults. At present, both the former and the latter are current predicaments in most of sub-Saharan Africa (Bello-Schünemann, 2017).

In 2017, the World Bank reported that the quality of education needs to be improved, worldwide. Furthermore, this is especially relevant in the “developing world”. Currently, an unprecedented number of African children has been reported to complete primary school. That said, many of them do not graduate with the competency required in several subjects, such as mathematics, reading, or higher order skills. Though there are plenty of reasons for why someone invests in an education, the central reason for most, and especially in poorer countries, are the fact that they want and need jobs. Education is been verified to improve earnings considerably. Globally, it is found that one year additional schooling is likely to enhance earnings by 8 to 10 percent. Moreover, the level of a population’s education, presents to be reflected in the growth of its respective economy. Countries where students exhibit high competency, echo higher growth rates overtime. That said, currently there are not enough job opportunities offered to young adults on the African continent, regardless the quality of their education (Diop, 2017).

What is more, the World Bank (2017) reported that low and middle income countries, worldwide, is estimated to require 520 million new jobs for youths that graduate school in 2030. This is 80 million less than what has been roughly calculate to be created by this time. In regards to Africa, around 50 percent of the job opportunities available are within agriculture, which at present pay quite poorly as a result of low productivity. This propose that prospective employees in Africa do not have many encouraging alternatives to choose from. Next to employment within agriculture, much of the current job creation comes from microenterprises or small businesses that only hires a small number of people. To ensure

future stability and growth within Africa, there is an absolute requisite to create jobs, and innovation is implied to play a key role in seeing to that this is archived (Diop, 2017).

Innovation is the backbone to “industrial mutation”, which is the processes that either destroys or push out the old. This process underlies economic growth, and is an essential component in making countries achieve prosperity (Schumpeter, 1950). That said, due to the fact that agriculture dominates the labour market, and has a history of providing stability and safety (ILO, 2020), compared to new industries such as tech, it becomes slightly difficult to implement the concept of by Schumpeter (1950). Culture has a strong hold in many African countries, and certain aspects of it, such as strong traditions, inequalities and hierarchical power-structure, makes it difficult for innovation to thrive. According to Hofstede’s cultural dimensions (2021), most sub-Saharan African countries score quite similar on the different dimension, with the exception of a few. What was found is that, most score rather high on power distance, masculinity, uncertainty avoidance and indulgence. Then on the contrary, fairly low on individualism and long term orientation (Hofstede, 2010). All of these cultural dimensions is suggested to play a significant role in terms of improving innovation (Prim et al, 2016).

The study conducted by Prim et al (2016), found that countries that score high in the dimension of power distance, meaning countries where the power distribution is relatively centralised, innovation have the tendency to not thrive. This, is due to strict rules and the lack of equality. Furthermore, uncertainty avoidance refers to how well a society deals with the unknown. And, the point of masculinity represents what a society considers as success, either being the best (masculine), or quality of life (feminine). The study by Prim et al (2016) indicates that countries scoring low on uncertainty avoidance have a higher degree of acceptance and willingness towards innovation. Likewise, countries scoring low on masculinity, hence being more feminine, seem to be more error-tolerant, thus a more fruitful environment for innovation.

In regards to the dimension of individualism, it was found that countries with high level of independence have similar level of autonomy, consequently this represents a society that encourages the growth of innovation. Next to this, indulgence refers to in which a country controls their impulses and desires. Scoring high on this means having a positive and optimistic attitude, which in result has a positive effect on innovation. Finally, long-term orientation describes to which a country focus on the future or not. Societies scoring high on this dimension are highly pragmatic, and have the ability to adapt traditions easily to fluctuating conditions. Thus, countries with a pragmatic orientation are oftentimes

more accepting towards new ideas, innovative products, and has an keen attitude when it comes to trying something original and different (Prim et al; Hofstede, 2016; 2010).

In addition to scoring similarly in the cultural dimensions by Hofstede (2010), many companies also have the tendency to divide Africa into two separate markets, the North African and the sub-Saharan African one. This is due to the strong cultural, economic, and linguistic differences found in the two regions. That said, there is some misconception in regards to the sub-Saharan African region, which in result makes it difficult for companies to succeed in the respective markets. Most of this misconceptions is related to the lack of general knowledge about a the region, and the 46 states that falls within. Including the myths that there is no competitive urgency to prioritise this market, that sub-Saharan African is too volatile and unpredictable, and that markets can purely be prioritised by the use of data. Where on the contrary, the region has fairly competitive markets at present, most sub-Saharan African countries are relatively stable, and data on the different markets are close to non-existent, which makes impossible to navigate any business based on that (Rosenberg, 2015).

Though Africa is faced by a number of challenges, there are indeed plenty of opportunities to be found as well. In order for African countries to surpass its current situation, and for innovation to take place, the aforementioned barriers to name a few, has to be recognised. For one, Africa needs to build a firm stock of physical capital, and invest in the immense current and future population, which includes funding into basic and higher education. In addition to this, many African countries struggle with the fact that they are dependent on a range of underlying economic policies, such as the cost of doing business, the protection of intellectual property rights, and trade policies (Diop, 2017). In addition to this, fundamental issues linked to faulty infrastructure and a shortage of support by the government and industry, are present challenges that need to be resolved to create a sustainable environment for innovation.

1. 1 Academic and Societal Relevance

Research suggests that there is a need for educational institutions or programs that mainly focuses on developing the skills of aspiring entrepreneurs (Adams, 2005). Furthermore, other research proposes that whereas some subject-matters are beneficially taught using a theoretical method, entrepreneurial competencies on the other hand, are acquired through a more practical and real-life technique (Tautila, 2010, p. 56) What is more,

a study conducted on building ICT Entrepreneurship Ecosystems in resource-scarce contexts, found that increased support of entrepreneurship organisations is key in order to boost technological innovation in African countries. Moreover, it proposed that the implementation of measures such as entrepreneurship accelerators and schools, tech-hubs, and scholarship programs, could commence industry emergence processes, train human capital, and help establish conducive sociocultural norms (Bramann, 2017).

That being stated, there is this dispute concerning the relevance of education in relation to entrepreneurship and innovation. Where for instance, Elon Musk has on several occasions indicated that he does not necessarily see a strong correlation between higher education and thriving entrepreneurship (Clifford, 2021). Nevertheless, there are a number of studies that sates the extract contrary, claiming that entrepreneurship education, or the entrepreneurial university, most definitely plays a key role in creating successful innovators and allowing for socio-economic development to occur (Etzkowitz & Leydesdorff, Neck et al, WEF, 1998; 2004; 2014). What is more, the target area of this study is the African market, and how these theories may be applicable in this particular context. To assist the researcher in achieving the aforementioned objective, a qualitative study on the Meltwater Entrepreneurial School of Technology, which is an Africa-wide technology entrepreneur training program, have been conducted through interviewing 10 for their former students. Finally, in order to guide the researcher throughout the research, the following research question has been constructed:

How entrepreneurship education can boost technological innovation in Africa.

1.2 Chapter Outline

As presented above, the aim of this research is to investigate how entrepreneurship education can boost technological innovation in Africa. To enable this, a comprehensive literature study has been put forward in chapter 2, covering key topics such as the 1) current level of innovation factors on the African continent, 2) the entrepreneurial ecosystem, 3) matters related specifically to entrepreneurship education, 3) and 4) the relationship between the entrepreneurial university and other social actors. Thereafter, the methodology will be presented in the chapter 3, including the research design, the sample, the operationalisation, method of analysis, and the validity and reliability of the study. Following this, the findings will be thoroughly interpreted and analysed accordingly in the chapter 4. Finally, in chapter 5, the reader will be provided a systematic discussion of the study's implications, in addition

to a brief synopsis of the ascertained limitations, and recommending comments for future studies.

2. THEORETICAL FRAMEWORK

The upcoming chapter will build the fundament for the study in question, and constitute three overarching sections. First, the researcher will introduce a brief overview of Africa's current status concerning technological innovation, which is to understand the opportunity and pitfalls that is present in the region. Second, literature covering theories on the entrepreneurial ecosystems will be presented, this is to give the reader an general idea of the principal components that needs to be in place in order for a new business to thrive. Thirdly, a section reviewing literature explicitly concerning entrepreneurship education will be put forward, followed by a final section investigating the specific relationship between the entrepreneurial university, industry and government.

2.1 Current Status of Tech Hubs on the African Continent

Establishing ICT ecosystems in resource scarce countries proves to be complicated. Next to the fact that most of these ecosystems tend to be at a nascent stage, they seem to be missing fundamental elements and resources such as financial support, specialised organisations, universities, and relevant human capital. There is a necessity to overcome these barriers in order to enable high growth of innovation (Bramann, 2017). Moreover, this study proposes a model that features four phases of development to prompt ICT ecosystem emergence, as follows: 1) establishment of a nationwide ICT infrastructure; 2) establishment of institutionally facilitated corporate entrepreneurship to help build embryonic structures of a market for ICT-enabled products and lay the groundwork for an entrepreneurship support infrastructure; 3) birth of first ecosystem structures with significant barriers to entrepreneurship; and 4) formation of first ventures, creating spin-off effects that help build the conditions for further entrepreneurship (p. 245).

That being said, in the last decades an immense growth with regard to technology factors have been seen in several African countries. Reported in 2019, there were about 618 active tech hubs on the continent, creating the foundation for technology entrepreneurship in Africa (Friederici, 2018). According to the GSMA's 2016 – 2018's definition, an active tech hub is an organisation currently active with a physical local address, offering facilities and support for tech and digital entrepreneurs. Furthermore, obtaining a status as an active tech hub, is mostly based on the kind of support or facility that is provided to the entrepreneur, which includes accelerators, incubators, technology parks, maker spaces, co-working spaces, and university-based innovation hubs, which aligns with the model proposed by Bramann

(2017). However, 25 percent of the 618 hubs included in this mapping, only offer co-working facilities, rather than specified funding or tech-focused support programs. That said, due to the significant social role these spaces play in the tech community, such as creating a safe environment for the youth and catalysts of digital professionals, these organisations have been included despite their shortcomings (Giuliani & Ajadi, 2019).

Furthermore, Africa is the second largest continent in the world, containing a total of 54 countries spread out on an area of 30.3 million km². Nevertheless, in the effort of recording all the active tech hubs on the continent, it was found that only 15 countries within Africa had one or more. At the moment, Nigeria and South Africa are the two leading countries with respect to the advancement of tech ecosystems. The two, fronting 85 and 80 tech hubs, in addition to providing well-established collaborations and investment networks. Furthermore, in terms of the most innovative African-city, Lagos takes the first place with approximately 40 hubs, followed by Western Cape, Gauteng, and Durban as South Africa's leading cities on the tech hub scene. What is more, Kenya is considered as the heart of East Africa's technology ecosystem, with circa 50 tech hubs, most found in Nairobi. Finally, Egypt houses 56 active hubs, placing itself as the connector between Africa and the Middle-Eastern Ecosystem (Giuliani & Ajadi, 2019).

These technology ecosystems are predominantly enhanced by a torrent of venture funds, development finance and corporate involvement. For one, a great amount of the hubs found on the African continent have received noteworthy support by companies that are involved in the digital space, such as mobile operator and internet providers (Friederici, 2019). Amongst these are Orange, who have set up Orange Fab labs across Francophone Africa, as well as Liquid Telecon and MTN, which are two ICT infrastructure providers that have introduced in-house tech hubs initiatives in a number of markets across the continent. Though mobile operators have played a significant role in corporate partnerships, several tech giants are also contributing to the ecosystem by establishing a physical presence. Some of these include, Google Launchpad Accelerator, Facebook NG_Hub in Lagos, the Microsoft Development centres in Nairobi and Lagos, and IBM and WITS' Tshimolohon District in South Africa. In addition to these, more traditional corporations like Standard Bank and Standard Chartered have contributed by organising incubators in a number of countries, including Mozambique, Angola and Nairobi (Giuliani & Ajadi, 2019).

Along with ones mentioned above, several other companies have joined the scene in the later years. In 2019, Bizlab by Airbus partnered up with GIZ Make-IT, MEST and

Innocircle to launch an aerospace accelerator in Africa through the #Africa4Future initiative. The same year, Nestle and Kinaya Ventures initiated their R6D Innovation Challenge. Moreover, Merck and Sanofi, two large pharmaceuticals, have been coordinating entrepreneurial contests for several years, in addition to the Chinese company, Transsion, that entered the African tech scene a few years ago, putting up its own Future Hubs in Lagos and Nairobi. What is more, training programs and booth-camps are progressively entering the tech scene all around the continent, such as Google Developer Groups, Facebook Developer Circles, Forloop Africa, and Andela Learning Community. Within some of the referred hubs, internal mentoring programs are offered to students and women. In addition to this, startups themselves are setting up intrapreneurial labs such as Africa's Talking, creating their own labs to aid local entrepreneurs. Finally, next to other key actors, enterprise builder Village Capital launched VilCap Communities Africa, which was put in place to enhance the flow of capital to startups in sub-Saharan Africa (Giuliani & Ajadi, 2019).

What is more, the study by Bramann (2017) put forward another alternative to enable financing in the early stages of technology ventures, one being stipend-programs financed by public stakeholders. A major example of this is Germany's EXIST technology scholarship entrepreneurship program. These are managed through university incubators which have proven to positively effect network creation and the integration of universities in regional entrepreneurship ecosystems.

That said, though a number of tech hubs in Africa are steadily increasing, in addition to support from both local and international players, the study conducted by Giuliani and Ajadi (2019), found that over 150 tech hubs have shut down operations since 2016. This is due to weak business models, and the need to establish a more collaborative agenda built on common interests. Each of the African countries are battling individual regulatory obstacles in terms of doing business. Thus, there is a need for more conciliation and collaboration across the continent, as sharing information and experience (Juma, 2019). Furthermore, there is a requisite for policymakers to take action in order to boost the entrepreneurship ecosystem. This by involving local practitioners in their entrepreneurship policy, not only copying what is being done in the global north. Additionally, the government should providing financial incentives for private sector companies prompting them to invest in local ICT ventures (Bramann, 2017). Altogether, this may result in collective enhancement of technological innovation on the African continent (Friederici, 2019).

2.2 The Entrepreneurial Ecosystem

There is a perception surrounding entrepreneurship called the “myth of the startup garage”. This creation myth is especially connected to Silicon Valley, concerning how businesses begin their ventures and later become major tech-conglomerates. The belief itself has its basis in well-known journey-stories from several great companies, such as Google, Apple, Disney, and the list goes on (Sullivan, 2014). Though the tale of the college dropout creating a multimillion dollar company in the garage of her parents is thrilling, Van de Ven (1993) argues that entrepreneurship is not only about the entrepreneur alone. It is also about a set of individual components within a geographical area that plays a significant role, and to why regions such as Silicon Valley, the Boston’s Route 128 and North Carolina’s Research Triangle amongst a few, have earned the reputation for being centres of sustainable innovations (Cohen, 2006).

An entrepreneurial environment within a particular area is often referred to as an entrepreneurial ecosystem. There is some dispute surrounding the definition of this distinct system. Nevertheless, Cohen (2006) define a sustainable entrepreneurial ecosystems (SEE) as an interconnected group of actors in a local geographic community committed to sustainable development through the support and facilitation of new sustainable ventures (p. 3). Furthermore, Cohen (2006) states that there are indeed very few cities or areas that truly have been able to build a strong entrepreneurial ecosystem, besides the ones mentioned above. Van the Ven (1993) proposes that one reason for this may be that researchers have focused too much on the entrepreneur alone, and not enough on the actions by external (both private and public) actors. He carries on, stating that an entrepreneurial ecosystem only develops by generating new venture creations, and this is done through the interaction between a number of interdependent components (Van de Ven, 1993). What is more, Spilling (1996) states:

Economic development is a result of complex entrepreneurial processes. Many things are linked together; many ventures develop in close interaction with each other and with environmental factors. Furthermore, the development of communities requires more than just the development of a number of businesses; it is also about infrastructure, public institutions, and about firms that can match together in advanced production systems (p. 91).

That said, Cohen’s research (2006) continues to explore the components required to attain the objective of a sustainable entrepreneurial ecosystem, specifically by reviewing the study conducted by Neck et al (2004), An Entrepreneurial System View of New Venture.

Neck et al (2004), was one of the pioneers in researching the interplay between several components within an entrepreneurial ecosystem, and the conjoint impact they have on developing technology hubs in a particular geographical area. By applying the information gathered from the study carried out by Neck et al (2004) on to the topic of sustainable entrepreneurial ecosystems, Cohen (2006) drew out the essential components, as well as putting forward the significance each of them have in creating an SEE. From this, a model was created, featured below in Table 1.

Table 1

Components Related to a Sustainable Entrepreneurial Ecosystems (Cohen, 2006).

System component	Definition/applicability to traditional systems	Application to sustainable entrepreneurial ecosystem (SEE)
Informal network	Represents the entrepreneur's friends, families, colleagues and informal relations with similar companies (Neck et al., 2004; Birley, 1985).	The same members of an informal network can assist (or hinder) an entrepreneur in pursuit of sustainable innovations. Sustainable entrepreneurs sometimes face more barriers from the formal network so the importance of the informal may be even greater.
Formal network	Is a diverse group of actors in an economic community such as a research university, government, professional and support services, capital sources, talent and large corporations (Neck et al., 2004; Birley, 1985).	Members of the formal network often cause challenges for sustainable entrepreneurs due to lack of understanding/expertise in sustainability. Formal network actors are addressed individually below.
University	Research universities can have a significant impact on the evolution of an ecosystem through primary research and education of skilled workers (Bruno and Tybjee, 1982; Neck et al., 2004).	Research universities can create and disseminate knowledge regarding sustainability and even developing and commercializing technologies, prior impacts of unsustainable behaviour and raising awareness in the community at large,

		particularly through leading by example.
Government	Federal, regional and local governments foster or hinder the development of entrepreneurial ecosystems through tax rates and incentives, subsidies and grants and eliminating the bureaucratic 'red tape' (Siegel et al., 2003).	Governments can play a significant role in fostering an SEE through policies that encourage or mandate more sustainable behaviour on the part of consumers and firms. Much innovation can actually be compelled through proper policy application (e.g. mandating reduced vehicle emissions).
Professional and support services	Entrepreneurial support services include entrepreneurial tax and legal support, consultants, and firms in the supply chain (Neck et al., 2004).	To support the SEE, a variety of specialty advisers who understand and value sustainability principles should be present to overcome barriers from traditional advisers who do not understand the challenges faced by these ventures (Schick et al., 2002).
Capital services	Access to start-up capital such as venture capital or angel investors for new ventures is of critical importance in the development of entrepreneurial ecosystems (Prevezer, 2001; Neck et al., 2004).	Sustainable ventures are also dependent upon access to start-up capital, and often have challenges finding investors who understand their businesses and share their values (Schick et al., 2002). Specialized 'green investors' are needed.
Talent pool	Access to a large number of qualified employees is critical for the success of an entrepreneurial ecosystem (Neck et al., 2004).	Access to qualified employees with knowledge and values relating to sustainability would be helpful. Employees looking for sustainable innovations are also necessary.

Based on the combined research on entrepreneurial ecosystems, there is a collective agreement surrounding the idea that there is a number of components in addition to the entrepreneur, that play a crucial role in creating a SEE (Neck et al., 2004; Van de Ven, 1993;

Neck et al., 2004; Cohen, 2006). Furthermore, in 2014 the World Economic Forum (WEF) published a study where they had surveyed over a 1000 entrepreneurs collected from all across the globe, with the purpose of understanding how some startup companies succeed in new markets and become scalable, high-growth businesses. A model inspired by previous work conducted by Isenberg et al (2010) was created, named The Eight Pillars of Entrepreneurial Ecosystem. The model features 8 individual components, quite similar to the one introduced by Neck et al and Cohen (2004; 2006), that are considered as key for a startup to thrive. The eight pillars of entrepreneurial ecosystem is presented under in Table 2.

Table 2

The Eight Pillars of Entrepreneurial Ecosystem (Source: WEF, 2014).

Accessible Markets	Domestic market: <ul style="list-style-type: none"> - Large companies as customers - Small/medium-sized companies as customers - Governments as customers Foreign market: <ul style="list-style-type: none"> - Large companies as customers - Small/medium-sized companies as customers - Governments as customers
Human Capital/Workforce	<ul style="list-style-type: none"> - Management talent - Technical talent - Entrepreneurial company experience - Outsourcing availability - Access to immigrant workforce
Funding & Finance	<ul style="list-style-type: none"> - Friends and family - Angel investors - Private equity - Venture capital - Access to debt
Support Systems/Mentors	<ul style="list-style-type: none"> - Mentors/advisers - Professional services - Incubators/accelerators - Network of entrepreneurial peers
Government & Regulatory Framework	<ul style="list-style-type: none"> - Ease of starting a business - Tax incentives - Business-friendly legislation/policies - Access to basic infrastructure - Access to telecommunications/broadband - Access to transport

Education & Training	- Available workforce with pre-university education
	- Available workforce with university education
	- Entrepreneur-specific training
Major Universities as Catalysts	- Promoting a culture of respect for entrepreneurship
	- Playing a key role in idea-formation for new companies
	- Playing a key role in providing graduates for new companies
Cultural Support	- Tolerance of risk and failure
	- Preference for self-employment
	- Success stories/role models
	- Research culture
	- Positive image of entrepreneurship
	- Celebration of innovation

While carrying out the study it was revealed that amongst the 8 pillars, three were recognised as especially important in terms of venture growth, including; accessible markets, human capital and funding & finance. Moreover, the study reviewed 8 regions in the world, measuring their percentage in each pillar, in addition to calculating their average score. Based on the findings, it was discovered that Silicon Valley, other US cities, and the rest of North America score fairly high in most of the pillars. Europe and Australia/ New Zealand score high in some, however, surprisingly low in pillars such as major universities as catalysts and cultural support. Finally, Asia, the Middle East/Africa, and South/Central America and Mexico score medium to low in most pillars, especially in education & training, and major universities as catalysts. While, South/Central America and Mexico score remarkably low in cultural support (WEF, 2014). The results from the entrepreneurs evaluation is illustrated underneath, in Table 3.

Table 3*World Regions Individual and Average Score on EE's Eight Pillars (WEF, 2014).*

Pillar	US-Silicon Valley	US – Other Cities	North America	Europe	Aus/NZ	Asia	MEA	South/Central America and Mexico
Accessible Markets	92%	83%	85%	72%	69%	68%	68%	62%
Human Capital/Workforce	93%	87%	90%	81%	81%	73%	50%	71%
Funding & Finance	91%	76%	82%	57%	69%	44%	55%	45%
Mentors/Advisors/Support Systems	91%	72%	78%	52%	58%	38%	36%	35%
Regulatory Framework/Infrastructure	67%	57%	62%	54%	54%	39%	55%	42%
Education & Training	80%	62%	70%	60%	38%	34%	32%	27%
Major Universities as Catalysts	88%	67%	75%	33%	42%	30%	23%	27%
Cultural Support	90%	64%	75%	33%	35%	26%	45%	16%
Average Score	86%	71%	77%	58%	56%	44%	45%	41%

2.3 Significance of the Pedagogical Components in an Entrepreneurial Ecosystem

Found in the research by World Economic Forum (2014), entrepreneurs assessed accessible markets, human capital, and funding and finance to be the most significant components for a sustainable entrepreneurial ecosystem. Silicon Valley, other US cities and North America all score very high in all of the three. That said, these are the pillars most regions score the highest in. The bottom three regions collectively score low in components such as Mentors/Advisors/Support Systems, Education & Training and Major Universities as Catalysts. Which on the contrary, all the top three regions score comparatively high in. In the upcoming section the researcher will take a deeper look into the three pillars last mentioned, by reviewing different perspectives on their influential importance on an entrepreneurial ecosystem.

2.3.1 Mentors/Advisors/Support Systems

The WEF (2014) study recognises the pillar of mentors/advisors/support systems the fourth most important to develop a company. The definition of this pillar varies depending on the region in focus, including mentors/advisors, professional services (such as accounting, human resources and legal), incubators/accelerators, and network of entrepreneurial peers. That said, entrepreneurs all around the world underscored the importance of this pillar, stating that having experienced mentors and advisors to consult with, in addition to having a network of entrepreneurial peers to motivate you, and to bounce ideas off each other, is key to evolve. Furthermore, in the Table 1 introduced above, Schick et al., (2002) highlights professional and support systems as one of the chief components of a sustainable entrepreneurial ecosystem. This include, entrepreneurial tax and legal support, consultants, and firms in the supply chain (Neck et al., 2004). Most business startups require advice and support from experienced professionals during their start-up phase. In a situation where there is a lack of qualified advisors that fully comprehend the different challenges that may occur, unnecessary barriers might be created preventing startups from succeeding (Schick et al, 2002).

2.3.2 Education & Training

There is a collective agreement surrounding the idea that education plays a key role in enabling the capacity to learn new things and to gain a better understanding of the opportunities and challenges within the market and work environment. Therefore, WEF (2014) suggest that companies in the early stages of their venturers may potentially benefit from having a pool of well-educated potential employees. This pillar, as the former, recognises the different ideas concerning what education and training may entail, depending on the region. As a consequence, this pillar is built up by the three following components; 1) available workforce with pre-university education (such as high school), 2) available workforce with university education, and 3) entrepreneur-specific training.

Education institutions are oftentimes funded, in part, by the government, which may significantly impact the characteristic, worth and options of education and training in an area. In debt, entrepreneur-specific training is more or less dependent on, the availability of entrepreneurs, organisations encouraging entrepreneurship, and educators with academic and professional experience, to produce output of any great value, such as increasing the entrepreneurial human capital in a particular region (Isenberg, 2010). Moreover, the research by WEF (2014) referred to a number of examples where availability, or lack thereof, to a

schooled or trained workforce influenced either the development of a firm, or where certain businesses decided to put up shop. On example of this, being the Australian government, education system and culture not putting enough focus on the importance of the technology industry and future of the country. Resulting in a default in graduates holding an STEM (science, technology, engineering and mathematics) degree, which then again creates a deficit in specialised human capital.

2.3.3 Major Universities as Catalysts

Since the early stages of Silicon Valley, academics have invested much time researching the influence that universities have in the development of entrepreneurial systems. Educational institutions such as Stanford University, Berkeley and the University of California has throughout history held a key position in the growth of entrepreneurship in the tech and innovation capital Adams (2005). The components that forms the pillar of major universities as a catalyst is built up by three elements, such as: 1) promoting a culture of respect for entrepreneurship; 2) playing a key role in idea-formation for new companies; and 3) playing a key role in providing graduates for new companies. As noted, this pillar highlights the fact that universities alone is not enough, there is also a strong need of advocates that invests in and welcome entrepreneurship as a valuable and respected pursuit/occupation (WEF, 2014).

What us more, Cohen's (2006) study goes on proposing that research universities play an equally significant role in SEE to develop, as well as in the creation of a technology-based entrepreneurial ecosystem. To enable sustainable development, there is a need for interdisciplinary competence from political science, sociology, psychology, engineering, anthropology and biology, to name a few. Therefore universities should provide an environment that incorporates all of the above, in addition to underscoring the importance of sustainability that enables students to graduate with the required knowledge that allows them to become informed citizens and consumers, employees in sustainable ventures, or creators of sustainable ventures themselves. This note is especially important in communities that are not predisposed to recognise the environment and business as directly opposed.

Furthermore, the study by WEF (2014) presents different examples where educational institutions and its related environment have functioned as equal benefiteres. One example being the unofficial partnership between AMC Juices and to the University of Murcia in Spain. The stories goes as follows, where AMC Juices donated 80 hectares of goods to the University of Murcia. Today the University of Murcia is considered to have one of the best

programs in food technology, which attracts talent from across the country. Additionally, AMC is one of their main recruiters from the university. A similar story is provided by Green Biologics (UK), where they credit their diverse workforce to the multinational and multicultural environment of scientific researchers that the Oxford area and Oxford University attracts. On the contrary, is the narrative of Taste Holdings in South Africa. Though they recognises educational institutions as a valuable asset in providing skilled individuals, they have not experienced their local universities to fill the shortage of competencies that is required.

What is more, taking a deeper look into the relationship between the education and the industry sector, Adams (2005) dives into how Stanford University became heavily involved in the start-up community. Prior to the 1980, Stanford University did not produce a significant number of entrepreneurs. However, following this decade a staggering number of professors and graduates of the prestigious university founded hundreds of businesses, such as Yahoo, Cisco Systems, Google and many more. In addition to this, it was at that time many Stanford engineering graduates started their careers in Silicon Valley rather than established firms. Furthermore, what this study argues is that though Silicon Valley is known as the foremost incubator of high-tech entrepreneurship, it is not enough to replicate the elements that reflect success. These including, a concentration of brains, an entrepreneurial culture, and an infrastructure supportive of high-tech and entrepreneurial activity. What often is viewed as the heart of such ideas, is a solid academic anchor (Adams, 2005).

2.4 Entrepreneurship Education

The focal point of this study is entrepreneurship education, the researcher will in this upcoming section review literature examining different avenues of this specific topic. First, a definition of entrepreneurship training will be presented, in addition to reviewing different theories on educational methods. Secondly, the effects of entrepreneurship education will be investigated, which includes theories suggesting both positive and negative effects. Finally, differing literature budling on the Triple helix model of innovation will be laid forth, which investigates the interactions between the university, industry and government.

2.4.1 What is Entrepreneurship Education and Can it be Thought?

UNESCO/ILO (2006) defines entrepreneurship education or training as a collection of formalised teachings that informs, trains, and educates anyone interested in participating in

socioeconomic development through a project to promote entrepreneurship awareness, business creation, or small business development (p, 21). Moreover, UNESCO/ILO (2006) goes on adding the definition of enterprise or entrepreneurial education, as this is recognised more broadly. Stating that the latter seeks to foster self-esteem and confidence by drawing on the individual's talents and creativity, while building the relevant skills and values that will assist students in expanding their perspectives on schooling and opportunities beyond. Methodologies are based on the use of personal, behavioural, motivational, attitudinal and career planning activities (p,22).

There is a growing amount of literature on the topic in question. Nevertheless, there is still some dispute concerning the issue of whether people are born with the entrepreneurial gene, or if this entails qualities that can be developed with the assistance of educational frameworks (Henry et al, 2010). Several studies have been conducted on this very matter, exploring different educational methods applied within entrepreneurship programs, and researching which approach that have the most significant effects. One study conducted by Sirelkhatim et al (2015) found that the usual practices of entrepreneurship education programs could be categorised into three broad approaches. The first approach is a heavily theoretical focused, where the students are taught about entrepreneurship and what this careered-path entails. The second and third approach, utilise a more pragmatic way of teaching. Aiming to provide students with entrepreneurial competences, through either by creating simulations or providing real life situations where they can learn by doing. The end goal of these two approaches are too graduate actual entrepreneurs (Sirelkhatim et al, 2015).

Learning methods applied within entrepreneurship education differ significantly, everything from lectures, presentations and handouts, to video and case study-based learning with group discussion and role-plays. Next to this, both traditional and non-traditional approaches to learning is utilised depending from program to program. Where some academics are critical to the former, and other to the latter (Henry et al, 2010). In Taatila's (2010) research, it is suggested that entrepreneurship education needs a more pragmatic approach, rather than a theoretical one. In pragmatism, the objective of science and higher education is that the students learn from practical tasks earned through "messy" real life situations. What is more, this form of acquiring knowledge is a connected to an abductive process. While the student constantly learn and build personal knowledge from solving real-life problems, students additionally becomes motivated to build something that is their own.

This motivated learning evolves into a cyclical process that continually creates new knowledge through an abductive process (Taatila, 2010).

On that premiss, learning is suggested to be inspired by personal interests, and that the student is empowered by its surrounding environment. Moreover the output will be a strong internal motivation. The research proposed that this motivation is the fuel behind innovation, and that the learnings is created as a by-product of this. With no indication that the need of entrepreneurial competencies will diminish in the future, rather the opposite, research recommend the following: Firstly, to enhance the entrepreneurial education for the student, added opportunities for and in enterprise should be provided by the education institutions. Secondly, more real-life cases should be implemented in entrepreneurial education, enabling students to reach their full potential. Thirdly, the method of pedagogy in higher education institutions should be modified to support a more pragmatic approach (Taatila, 2010).

Other researcher agree with Taatila's (2010) ideas, criticising traditional education methods that focus mainly on theory and didactic approaches. Moreover, deeming this learning technique as irrelevant in relation to a subject that almost exclusively deals with activity, proposing that experience and practical skills applied by entrepreneurs needs to be acquired though handling real life situations (Davies & Gibb, 1991; Young, 1997). On the contrary, some question the use of non-traditional methods such as role-play, case studies, simulations and problem solving teaching approaches. Suggesting that the activities mentioned above, works against its purpose, promoting logical thinking rather than a creative and entrepreneurial mindset. This due to the confines of the classroom, such as having guidelines and knowing the outcomes (Shepherd & Douglas, 1996).

Finally, a study conducted by Vuuren (2005), propose that the best way of learning entrepreneurship is by combining both theoretical and practical methods. Suggesting that traditional courses such as finance, marketing, management to name a few, can be taught the traditional way. Other more critical skill, however, like handling people, judgement, responsibility and patience cannot be learned in a classroom, it has to be absorbed from real world experiences. Furthermore, aspiring entrepreneurs need more flexibility within their learning. Further suggesting that providing the best knowledge and skills about entrepreneurship is not enough for someone to start acting entrepreneurial. In order for this to happen, their mindset, attitude, behaviour, confidence and willingness to take risks will have to be influenced as well (Vuuren, 2005).

Thus, for entrepreneurship education to bring value, the entrepreneurial programs need to be open for experimenting with teaching methods, to the point where an unstructured approach is adopted. Then finally, students need to have the opportunity to be in real work situations where they can apply theory and knowledge onto practical activities (Vuuren, 2005; Henry et al, 2010; Taatila, 2010; Sirelkhatim et al, 2015).

2.4.2 The Effects of Entrepreneurship Education

The impact of entrepreneurship education is yet to be fully comprehended, a number of studies propose that entrepreneurial education courses or programs at universities to have positive influence on recognised attractiveness and practicability of new venture creation or startup activity (Tkachev & Kolvereid, 1999; Peterman & Kennedy, 2003; Fayolle et al., 2006; Souitaris et al., 2007). On the contrary, other studies propose negative effects. Where a study conducted by Oosterbeek et al, (2010) present that students review their entrepreneurial skills as worse after attending entrepreneurship education.

There are a number of effects entrepreneurial education may have. For one, entrepreneurship education may have a probable impact on knowledge and skills. Courses in higher education oftentimes have a method, concept and fact oriented way of learning, teaching students generic components such as how to write a business plan. Though such courses may be useful, this type of education may not shift entrepreneurial intention by much. However, entrepreneurial education providing the environment for attitudes and perceptions to be effected, may result in the influence of entrepreneurial actions. What is more, entrepreneurship courses may enable students to participate in entrepreneurial activities, both in an experimental and real life setting. As aforementioned, in class simulations are often provided at universities, where students are able to test and act out scenarios within safe settings. Additionally, educational institutions sometimes have partnerships or collaborative deals with industry businesses, where students get the opportunity to engage in a real-life work conditions (Graevenitz et al, 2010).

Moreover, the results from Oosterbeek et al (2010) study, proposes that entrepreneurial education has a rather negative effect on students. Presenting that students tend to evaluate their entrepreneurial competencies as poorer after attending said education. However, these results may come from the fact that students have acquired more realistic perspective of what it requires to become, in addition to their own suitability to become an entrepreneur. This realisation may in the end be relatively positive, as this can prevent naive

people from undertaking major business ventures that their not qualified or able to carry out (Oosterbeek et al, 2010). Furthermore, Graevenitz et al, (2010) argues that such educational programs may be harmful if they succeed in convincing those individuals not suited for entrepreneurship to becoming an entrepreneur. That said, having entrepreneurship programs that provide scares information of what entrepreneurship really entail, may help students to take an informative decision based on their personal abilities and interests. In the bigger picture, this can reduce wasteful investment in potentially failed ventures.

What is more, another effect from entrepreneurship education, are university spin-offs. Though there are a number of different definitions explaining the concept, the broad definition by Rappert et al (1999) give a clear and general idea of USOs, conceptualising them as firms whose products or services develop out of technology-based ideas or scientific technical know-how generated in a university setting by a member of faculty, staff or student who founded (or co-founded with others) the firm. The individual or individuals may either leave the university to start a company or start the company while still inside the university (p. 874). With respect to this, several great companies today are considered as university spin-offs, such as the ones mentioned in the study by Adams (2005).

Today, several universities in addition to Sandford University, including University of California, Berkeley, MIT, Technical University of Munich (UnternehmerTUM), Imperial Collage, just to mention a few, are all educational institutions that invest heavily in creating an sustainable entrepreneurial environment or educational system. In the later year, more and more universities are following the approach of the ones mentioned above. As research suggest that by taking an entrepreneurial approach, universities can build fruitful collaborations with the industry, where both parties can benefit greatly (Eisenberg

et al, 2019). By providing an environment with the right tools, such as mentors and internship programmes that enable students to work in early-stage companies, universities can play a significant role in helping students in understanding what being an entrepreneurs entails. Additionally, by creating a small entrepreneurial ecosystem, universities can aid aspiring entrepreneurs in creating successful business ventures (Eisenberg et al, 2019).

Despite the dispute surrounding the effects of entrepreneurial education, it increasingly being offered by universities across regions (Graevenitz et al, 2010; Henry et al, 2010; Eisenberg et al, 2019). For one, researchers suggest that USOs potentially are very important for industrialised countries, where spinning off-mechanism is considered the most efficient way to transfer new technological knowledge into businesses (Shane, 2004; Sternberg, 2005). This theory might also be the answer to how less industrialised regions

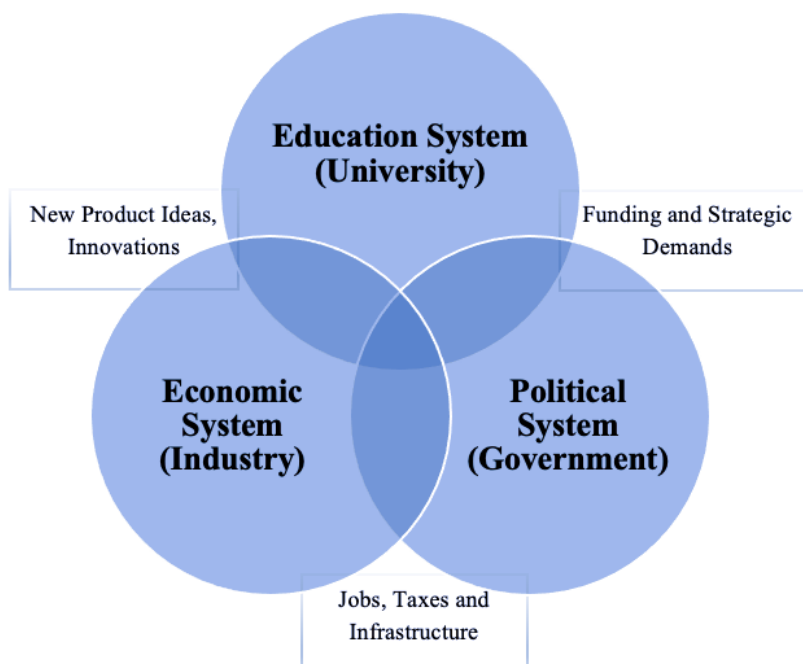
such as Africa may overcome the many barriers that hold them back from realising true market potential.

2.4.3 The Interaction between the University, Government and Industry

As proposed earlier in this paper, innovation is one of the key components in terms of socio-economic development of a country (Bello-Schünemann, 2017; Diop, 2017). Moreover, a study conducted by Etzkowitz and Leydesdorff (1998), argues that in order for innovation to thrive, a close cooperation between the educational system, government and industry needs to be put in place. Major Universities and research centres, such as the ones mentioned in the former section, usually rely on financial and regulatory backing from the industry and government. That said, the study claims that in a knowledge-based society, this dependency is mutual, as the educational institutions supplies society with equally valuable output, such as well-educated and skilful human capital. Moreover, the aforementioned social actors have been imputed into a model, where the number of interactions between the initial role associated with the three are assed. This model is called the Triple helix model of innovation (1998), and can be found underneath (Figure 1).

Figure 1

The Triple Helix Model of Innovation (Etzkowitz & Leydesdorff 1998).



What is more, Etzkowitz and Leydesdorff (1998) argues that the three system featured above in Figure 1 has an distinct preliminary function. First, the initial role of the educational system or university is to provide basic research, and to educate individuals. Seasonally, the political system or government, has an predominant position, as they control everything in regards to policies and regulations within a state. Thirdly, the economic system or industry's function is to innovate and create work-opportunities that boost development within the society. Nevertheless, none of the systems would produce the same valuable output by themselves, as each of the systems plays an equal role in supplying the public with the required fundamentals in order to achieve the common goal of increased innovation. Thus, their actions are conditioned on one another.

That said, the theory by Etzkowitz and Leydesdorff (1998) have a particularly strong focus on the education system, and how the role of the university has undergone revolutionary changes over the centuries. First, taking a wider step from its primary role as an educator, to including research as part of the academic functions of the university. Then the second academic revolution incorporated economic and social developments as part of the educational institution's objective. Moreover, the research proposes that the "capitalisation of knowledge" is the new mission of universities, which enhances the link between universities and users of knowledge, and establishes the university as an autonomous economic actor (Etzkowitz & Leydesdorff, 1998). The Triple helix model, includes four pillars in the entrepreneurial development of the entrepreneurial university, such as: 1) academic leadership able to formulate and implement a strategic vision; 2) legal control over academic resources, including physical property such as university buildings and intellectual property emanating from research; 3) organisational capacity to transfer technology through patenting, licensing, and incubation; and 4) an entrepreneurial ethos among administrators, faculty, and students (Etzkowitz, 2008, p. 40).

In the last 23 years, the Triple helix model (1998) has played a central role in many complementary and counter studies in regards to innovation research. With that in mind, a couple of studies has been conducted specially on the potential key role that the entrepreneurial university can play in non-western countries, in terms of improving innovation. For one, a study by Cai (2014) explores the said model in an Chinese context. The research found that the main problem in China's innovation system development, is the shortage of operative system interceding between top-down and bottom-up initiatives. That said, due to the fact that the Chinese government is heavily involved in most aspects of society, the role of the entrepreneurial university is not as autonomous as in western

countries. Though the government do not take direct action within the universities, the latter are still restricted by the regulations and policies set by the former. Thus, the collaboration between the government and university are on equal basis. Meaning, in order for top-down and bottom-up initiatives to improve, Chinese universities needs to be given more freedom to operate independently from the government (Cai, 2014).

What is more, Etzkowitz et al conducted a study on an university-led development strategy for Africa (2007), where the research argues that the interaction between the university, government and industry is paramount in developing organisational innovations which is required to boost the pursuit for innovation and socio-economic growth. Furthermore, the study suggest that social evolution arises through ‘institution formation’ and conscious intervention (p. 9). Implying that instead of replacing current African universities, they should rather be transformed from its preliminary role as an educational institution, into having a more dynamic function as frontrunners of innovation and growth. This can be achieved by the assistance of an interactive model, based upon the Triple helix model, that aims to improve the interaction between human needs, research goals and resource providers; science, technology and society; industry and government. By utilising such an approach Etzkowitz et al (2007), goes on suggesting that the prospective for socio-economic development in Africa, can in fact be found in the entrepreneurial higher education sector.

Conclusion

The chapter above has put forward literature and theories that the researcher regarded as imperative in order to build the fundament for this study. First, the current status of technological innovation across Africa was presented. This was to give the reader an general understanding of wherefor Africa came to be the regional scope of this study. Afterwards, literature concerning the entrepreneurial ecosystem was thoroughly covered, specifically giving focus to the components related to academia. The investigator saw this as paramount, as the research linked to this particular topic is highly relevant to understand which factors are critical to increase innovation, within any region. Following this, the last section of this chapter was specified to the focal point of this thesis, which are indeed entrepreneurship education. This final part was included for the purpose of presenting the dispute concerning the value of this distinct type of education.

What this chapter has established is the immense pool of opportunity that can be found on the African continent. Nevertheless, due to a number of restricting factors, such as

complicated governmental policies and culture differences, entrepreneurs struggle to make ideas into reality. Entrepreneurship education, or the entrepreneurial university is suggested to be an enabling factor in seeing to that these challenges can be overcome. In the next chapter, the methodology applied to further investigate topic in question, will be laid forth. Thereafter, the theoretical results presented above will be compared with results extracted from the empirical data.

3. METHODOLOGY

3.1 Research Design

The purpose of this study was to explore how entrepreneurship education can influence technological innovation in Africa, more specifically enhance or boost it. To gain a deeper understanding of this particular topic, the researcher determined that qualitative research methods would be the best suited approach (Hair et al., 2011). Moreover, the investigator decided upon an exploratory form of research, as it was believed that a number of factors were to be unfolded throughout the analysis, as an alternative to conducting the study *ex ante*. In terms of retrieving the necessary data, the researcher decided to carry out semi-structured interviews one-on-one. This variant of an interview procedure enables the participants with the necessary prerogative to elaborate on their perspectives and ideas, without removing the aspect of collecting the data on all topics that should be revealed, seeing that the partakers keep to a topic guide throughout the interview (Wengraf, 2001). Additionally, the risk of self-censoring by the interview objects is more or less removed due to pre-decided confidentiality agreements with the interviewer, next to the setting being less intimidating one-on-one (Wengraf, 2001).

3.2 Sample

The key elements of this study are entrepreneurship education and technological innovation in the African context. In view of this, the researchers deemed it fitting to interview current entrepreneurship students and graduates, in addition to practising entrepreneurs in Africa. As of this moment, there are a number of entrepreneurship programs on the African continent, both operating independently and as a part of a larger university. However, with respect to the size and scope of this work, the researcher decided to focus the attention onto one particular school and program alone. This allowed the investigator to narrow down and specify the population of the research, giving the population a common denominator. The focal point behind the study's sample is the Meltwater Entrepreneurial School of Technology, also known as MEST.

3.2.1 Meltwater Entrepreneurial School of Technology

This educational institution was first founded in Accra, Ghana in 2008, by The Meltwater Foundation, which is a non-profit arm of the global media monitoring company, Meltwater. Since then, the institution has expanded to a total of 4 additional institutions

located in Lagos, Nigeria; Cape Town, South Africa; and Nairobi, Kenya. Moreover, MEST is an Africa-wide technology entrepreneur training program, internal seed fund, and network of hubs offering incubation for technology start-ups on the southern continent. Each year the school enrolls a number between 50 and 60 individuals, out of a 1000 applicants to the one year program. Besides the education itself, the students are provided with accommodation and a small budget that should cover all essential expenses.

What is more, the year is divided into three parts or semesters, where they have a number of different theoretical and practical courses throughout it. In the beginning of the first semester, the students are required to form a team of three or four people. This small group will work closely together as business partners all through the year, with the purpose of coming up with an innovative and strong idea that will be presented to a panel at the denouement of the final semester. Furthermore, the desired goal is to graduate from MEST, not only with a diploma, but with a seed fund of 100 000 dollars. The number of students graduating from MEST with financed business ideas, varies from year to year. However, in the case of receiving this bonus, the team or company is offered the chance to “cross the bridge” from the school itself to the MEST incubator. Here they are provided with office space and supplies, mentors and advisors, and introductions to the market and other potential business collaborations (MEST, 2021).

3.2.2 Sample Size and Demographics

The motivation behind selecting MEST, was much due to it being an institution fully devoted to entrepreneurship, in addition to its reputation for having perhaps one of the best programs in this category on the African Continent (The African Exponent, 2015). Furthermore, the original plan of the researcher was to interview both currently enrolled students and graduates. However, due to unknown reasons, MEST did not have a student cohort for the academic year 2020/2021. As a result, the sample was rearranged to exclusively include graduates, with a final total of 10 participants. Moreover, the aim of qualitative research is to obtain rich insight on an issue (Flick, 2009). Therefore, concerning the demographics of the participants, the researcher attempted to collect a group that represented an equal number of both male and female, a diverse set of nationalities, in addition to a range of graduation year cohorts. The information related to the sample’s demographics and founded companies can be found underneath, in Table 4.

Table 4*Demographics of Sample (Myklebost, 2021).*

Name	Gender	Nationality	Year of Graduation	Company Founded
Uche Orjinta	F	Nigeria	2019	Rudimentary Alternative
Moses Mallaghan	M	Ghana	2017	Agro Innova Ltd.
Chukwuemeka Ndukwe	M	Nigeria	2019	Cofundie
Olanrewaju Adeoye	F	Nigeria	2019	Workarena
Ada Tapily	F	Mali	2019	Massira
Gloria Kaguo	F	Tanzania	2019	Kweza Technologies
Kelvin Nyame	M	Ghana	2013	Meqasa
Ebenezer E. Owusu	M	Ghana	2017	VendyAds LLC
Stella Ngugi	F	Kenya	2017	Jobonics
Precious Okafor	F	Nigeria	2018	BluSkill

3.3 Operationalisation

3.3.1 Outreach

The first step of the data collection procedure was to get in contact with the potential participants. In order to achieve the set objective, the investigator reached out to MEST through a concise and formal email which contained an introduction of the undersigned, the topic of study, and the cause behind the interface. Conveniently, the respective organisation replied within 24 hours, and referred the researcher to the community manager at MEST, Miss. Nafiesah Abrahams. Miss Abrahams constructed a general email paraphrasing the one constructed by the researcher, which was forwarded to 10 graduates. Initially, very few responded to the first email, hence the process was halted for a while. Subsequently, the investigator believed that the targeted population had to be modified. Moving away from the

original plan of interviewing MEST students and graduates exclusively, to executing interviews with experts in the field of entrepreneurship education. Fortunately, the latter was not necessary as more graduates started responding positively after a follow-up email. Nevertheless, the required number of participants in order to complete a full sample, was yet not attained. Thus, the author performed additional outreach through LinkedIn, by filtering MEST's LinkedIn profile by alumni. The investigator contacted 20 new graduates individually, where 8 responded and 6 agreed to an interview, achieving a total of 11 interviews in the end. Nevertheless, one interview was defaulted due to overly faulty internet connection. Therefore, the interview was excluded from the study.

3.3.2 Pilot Study

The second step of the process was to execute a pilot study prior to the definite interviews. This was carried out to ensure that the topic guide was suitable, and each relevant matter was covered. Moreover, to test the participants' reactions to intended questions intended to be asked by the researcher. To avoid waste of time and valuable data by conducting the pilot study on a MEST graduate, the trial interview was tested on a former student of the NTNU School of Entrepreneurship, Mr. Andreas H.F. Olsen. Minimal adjustments to the to the topic guide was enforced after finalising the pilot interview. Nonetheless, three scale questions were incorporated to sum up each of the key sections of the topic guide (the complete topic guide can be found in the Appendix A). Moreover, this element was added to allow for more explicit and distinct data to be drawn from the material. The scale applied was a Likert scale from 1 to 5, where 1 represented not significant at all, 2 slightly significant, 3 significant, 4 fairly significant, and 5 very significant. Nevertheless, the output generated from the scale was not applied to the findings.

3.3.3 Execution of Interviews

The third step was to conduct the confirmed interviews. As the researcher was located in Norway, and the intended participants were positioned in different African countries, the interviews were executed online through a Zoom, by Zoom Video Communications. Moreover, the 10 interviews were conducted within a time period of exactly two weeks, between the 28th of April to the 12th of May, 2021. The participants were provided with the zoom-invitation link, consent form and topic guide approximately a day prior to the scheduled interviews (the consent form can be found in the Appendix B). All interviews were between 40 to 60 minutes long, a total average of circa 50 minutes per interview. Moreover,

each interview was recorded using three different recording devices: 1) Zoom's own recording tool, 2) Otter.ai, a recording and transcription software, and 3) an external hardware recording tool. This to ensure that the data was safely collected, in the chance that one of the devices experienced technical difficulties.

3.3.4. Transcription of Interviews

Furthermore, the fourth and final step was to transcribe all 10 interviews. This part was executed in two steps: First, all interviews were digitally transcribed separately by using the aforementioned software Otter.ai. Second, each transcription was thoroughly read through and corrected by the author herself, while simultaneous listening to the recording. The transcriptions were then carefully examined to remove inessential sounds such as "ehm", "hm" et cetera, in addition to invaluable word repetitions. Thereafter, both the audio, and transcribed versions of the interviews were stored on the researcher's own computer, next to Otter.ai cloud device. Finally, the transcription was carefully coded on Atlas.ti by applying the method of analysis by Attride Stirling (2001). This approach will be explained more in detail in the last section of this chapter.

3.4 Method of Analysis

Following the finalised transcription of the interviews, a significant amount of time was committed to analyse the data. The researcher applied the method of thematic analysis according to Attride-Stirling from 2001. This technique enabled the investigator to conduct a structured and detailed analysis of the textual data, the process reduced the prospect of leaving out key content (Braun & Clarke, 2008). Thereafter, the coding procedure was finalised and a number of themes were identified and established. The method by Attride-Stirling (2001) proposes structuring the confirmed themes in three different levels. The first level is viewed as the "Basic Themes", which are the lowest property found in the text. Following are the "Organising Themes", this level categorises the "Basic Themes" by grouping them together in terms of likeness. The third and final level are the Global Themes, which presents the main themes in the text. What is more, the three levels of themes mentioned are interconnected, the final result of this coding technique becomes a network of codes. When coding the textual data, two techniques can be utilised. The inductive approach, where themes are created while coding. Or the deductive approach, where codes are created ahead of the process (Attride-Stirling, 2001). In the present study, a combination of both approach was applied. Nevertheless, due to the choice of interview-method, the investigator

followed the same topic guide throughout the entire interview process. By having a few cliff-hangers to adhere to while performing the 10 interviews, enabled the investigator to notice a handful of recurring themes early on. Consequently, the researcher were able to create a set of pre-decided themes that were based upon both the material generated from the interviews, in addition to the information found while conducting the literature study. Furthermore, the following part of this chapter will put forward the complex procedure behind the data extraction, how themes was established, categorised and analysed.

3.4.1 Classification of the Main Themes

As aforementioned in the last section, the researcher constructed a topic guide that was shared with the participants prior to the interview. In consequence, all 10 interviews ended up being structured in a fairly similar fashion, where a number of 4 themes was established, which included: 1) the introduction, 2) the role of entrepreneurship education, 3) issues related to the African market, and 4) factors related to technological innovation. Furthermore, these four themes have been categorised into two parts. The first part of the interview includes the introduction, which has not been incorporated in the analysis of this study, as it holds no direct linkage to the research question. Nevertheless, it was carried out in order to put both parties at ease before moving into foremost part of the interview, which will be clarified underneath, and to withdraw descriptive information on the participants, that has been set forth in Table 4.

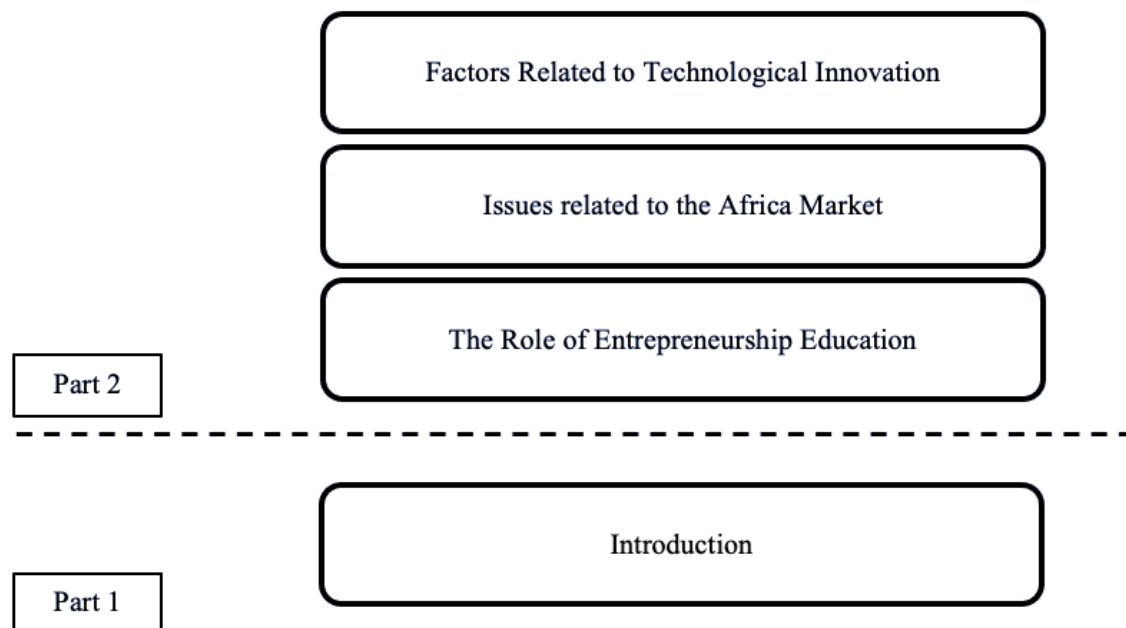
As mentioned above, the subject matter of the interviews, and the second part of the interview has been classified into 3 main themes, due to the fact that these sections include highly relevant data in regards to the study. It starts off quite generally, exploring the participants experiences with Meltwater Entrepreneurial School of Technology, everything from how they were introduced to the school, to gains and pains. Following this, the interview moves into the graduates perspective on entrepreneurship education in general, and more specifically on the potential value it brings not only to the individual, but to society as a whole. The second theme of part 2, moves away from the matter of entrepreneurship education and onto aspects related to the industry and market. More in depth, the opportunities and challenges faced when starting a business in the African market. Finally, the third topic sums up all issues covered throughout the interview by exploring the graduates view on the relationship between entrepreneurship education and technological innovation in African context. In detail, this theme aims to understand what is viewed as the key factors of innovation in Africa. Moreover, if in fact entrepreneurship education is one of these factors,

and if there is a significant positive relationship between entrepreneurship education and technological innovation.

As the topic of the interviews starts off quite generally, then refocused onto the main objective of the study, the themes obtained from the data collection can be visualised in a categorical order, featured in Figure 2 below. As thoroughly explained above, the initial conversation starts off in an extensive matter investigating entrepreneurship education, both in general and specifically focusing at MEST. Then it is concretised by taking a look into the African market. Finally, the interview is pinned down to target the chief objective of the study, which is how entrepreneurship education can enhance technological innovation in Africa. Compartmentalising the information found in the interviews and visualising it (Figure 2), enabled the researcher to get a structured overview of the study's empirical data. Furthermore, this step allowed for a more organised and efficient thematic analysis, which will be presented in the next paragraphs.

Figure 2

The Compartmentalisation of the Data Collection's 4 Themes (Myklebost, 2021).



3.4.2 Data Extraction and Coding Procedure

After the compartmentalisation and visualisation of the data collection of the four general themes, the researcher took the first step, of a four step procedure, in the thematic analysis by Attride Stirling (2001). This thematic analysis can be conducted by either applying an inductive or deductive approach. In regards to this study, a combination of both was utilised. Subsequently, the first step in the aforementioned analysis, is the coding procedure. This entails a process of thoroughly reading and dissecting the respective sample of textual data, which in this case were 10 semi-structured interviews. Each text segment is assigned one or more codes that reflects the content. In this particular research, a number of 64 codes was created and attached to the 10 interviews. Then, the codes constituting the similar idea were merged into one basic themes. Reducing the 64 codes into 25 basic themes, as featured in Table 5 below.

Table 5

Codes Merged into Basic Themes (Myklebost, 2021).

Basic Themes	Codes
Increased Competency; Increased Self-awareness; Network	Education, Entrepreneurship, MEST, Friends, Journey, Practical-Education, Theoretical-Education, Entrepreneurs, Self-awareness
Increased Resources; Informed Citizens	Information, Skills, Resources, Jobs, Growth.
Young Population; Technological Leap; Endless Prospects	Africa, Gain, Tech, Motivation, Youths, People, Growth, Leap
National Policies; Lack of Incentives; Investment	Investors, Funding, Policies, Regulations, Limitation
Taxes; Infrastructure; Legal Framework	Government, Nationality, Tax, Infrastructure, Electricity, Rules, Legal Framework
Market Research; Industry: Venture Creation; Job Inceasement.	Business, Company, Startup, Market, Industry, Innovation, Create, Research, Comprehension
Universities and Educational Institutions; Schooling and Tools; Increase Knowledge and Human Capital; Partnerships/Collaboration.	Program, Incubator, Mentors, Institutions, Human-Capital, Tools, Exposure, Partnerships, Collaboration, Universities, Schooling, Services
Cultural Aspects; Environmental Aspects; Timing	Internet, Culture, Environment, Timing, Society, Acceptance, Vigilance

3.4.3 Thematic Network Analysis

What is more, the next step of the thematic network analysis was to form organising themes to classify the basic themes. In total, the researcher ended up with 8 organising themes as followed: individual aspects, societal aspects, opportunities, challenges, governmental system, economic system, education system and other factors. Moreover, as explained above, the overarching themes of the interviews was establish early on. Therefore, the key themes represented in Table 6, including 1) the role of entrepreneurship education, 2) issues related to the African market, and 3) factors related to technological innovation, were assigned as the global themes, which groups the organising themes. Hence, a network of codes have been established and categorised, and can be found below in, Table 6.

Table 6

Network of Significant Themes extracted from the Data Collection (Myklebost, 2021).

Global Themes	Organising Themes	Basic Themes
The Role of Entrepreneurship Education	Individual Aspects	Increased Competency; Increased Self-awareness; Network
	Societal Aspects	Increased Resources; Informed Citizens
Issues related to the Africa Market	Challenges	National Policies; Lack of Incentives; Investment
	Opportunities	Young Population; Technological Leap; Endless Prospects
Factors Related to Technological Innovation	Governmental System	Taxes; Infrastructure; Legal Framework;
	Economic System	Market Research; Industry: Venture Creation; Job Increasement.
	Education System	Universities and Educational Institutions; Schooling and Tools; Increase Knowledge and Human Capital; Partnerships/Collaboration.
	Other Factors	Timing; Culture; Environmental Aspects

The thematic analysis by Attride Stirling (2001) enabled a network of codes that gives a clear and structured overview of the themes found in the data collection, from a comprehensive to a specified level. In the next chapter of this paper, the thematic table above (Table 6) will be thoroughly explained, by bringing forward the data found behind the network of codes. This will be accomplished by presenting a number of 20 text segments extracted from the interviews, that reflects the perspective of the MEST graduates, on the key topics of this study. These will be laid forward in the same order as presented in Table 6.

3.5 Validity & Reliability

In order to ensure the credibility and quality of the overall study, the researcher has taken the following measures regarding the applied method. First, to enable reliability within the study, a qualitative approach in the form of in-debt interviews was applied. Furthermore, the scope of the study was limited to 10 students of the Meltwater Entrepreneurial School of Technology, contacted through email and LinkedIn. The recruitment period lasted appropriately 2 months, and was concluded at the time the required number of participants was reached. In total about 30 individuals was contacted, consequently the final sample ended up being a random collection of the 10 graduates that replied to the interview-request.

Secondly, to validate the respective research a structured interview-framework was created and shared with the participants prior to conducting the in-debt interviews. This included a topic guide that covered all subject-matter and questions that the investigator saw pertinent to extract the necessary information, including: 1) general information on the participant; 2) experiences from the attending the MEST program; 3) the effects of entrepreneurship education; 4) venture creation in Africa; and 5) entrepreneurship education in relation to innovation. That said, regardless of creating a interview-framework, the structure of each interview may differ quite significantly. Therefore, the interviewer prepared for differing outcomes, this to make sure that the interview unfolded in a natural and organic conversation. Thus, the questions were asked in an open manner, in order to avoid leading the interview subject in one direction.

4. RESULTS

In the upcoming chapter of this study, the empirical findings behind the network analysis will be put forward and analysed accordingly. The network analyses in Table 6, features 3 global themes, including: 1) the role of entrepreneurship education; 2) issues related to the Africa market; and 3) factors related technological innovation. The following themes, and their corresponding organising and basic themes, will be presenting in three sections, followed by examples extracted from the data collection.

4.1 The Role of Entrepreneurship Education

As thoroughly established, entrepreneurship education is one of the three main concepts of this study. Therefore, the first global theme included matters related to the role of this particular education. Furthermore, as the participants within this study have all attended MEST, hence having personal experience on the issue, this global theme considers the possible effect of entrepreneurship education on an individual level, next to the broader societal level. Therefore, the following organising themes include; individual and societal aspect.

Within individual aspects, the participants highlighted the number of gains and pains this particular education and programs may have. Themes that reoccurred across the different interviews was network creation, increased competency and knowledge, and increased self-awareness. Most participants agreed on the fact that one of the greatest assets gained from attending such a program, is the network you build. Furthermore, many underscored the method of combining theoretical and practical courses to be key in terms of learning how to become an entrepreneur. This aligns with the argument made by Taatila's (2010), concerning the importance of applying a pragmatic approach within entrepreneurship education, as students learn best from practical tasks earned through "messy" real life situations. Then finally, a handful of the participants brought forward arguments related to the study by Oosterbeek et al (2010), regarding the value entrepreneurship education may have on self-awareness. Stating that not everybody has the qualities necessary to become an entrepreneur, and that this type of education would help one in realising this.

Example 1. And then I proceeded to MEST for a duration of one year in entrepreneurship training. I did that for a year, came out with lots of learnings, but I think the biggest thing that came out of it was the network. The network effect it had, like the effect it had on my social network was big (Precious Okafor, 2021, p.)

Example 2. Education, I could never have gotten that anywhere else. I probably did not realize that as much before, or even during the program, but definitely at the end of it. I do not know, that I could have learned what I learned that MEST anywhere else. Or I mean, I probably could have if I paid, I do not know, \$50,000. But I did not have to at MEST. So yeah, definitely the education that I acquired within the program, it was just amazed. I could not trade that for anything. (Precious Okafor, 2021).

Example 3. Yes, I think it is more result oriented, you have to understand how to produce. Because whatever you have being taught, there is always going to be an assignment that is very related. And if you do not understand it, the school will train you to be able to execute that assignment that you are given. And so, the orientation is all about if you do not understand, do not hide. Make sure you voice it out, make sure you ask questions, make sure you are clear in your communication, make sure to show where you are stuck, and your fellow colleagues are also willing to help you. So, I think it definitely was a change from traditional education. That was interesting, and the fact that it always challenging the way you think. I mean you wanted to think fast and think smart, and be creative. So, we also have different case studies and based on that, where you could apply your own startup or idea, and then you have these two other team members throughout the year, next to all your classmates, I mean they are always willing to chip in and help you with your idea. So, when you come into class and have a presentation, you get great ideas from people who are willing to contribute compared to the traditional system where nobody really wants to talk, or maybe there is just too many people in class, so people are overwhelmed. But here it was different, the culture was different, where everybody was willing to contribute to help you polish your idea of polish your presentation, and yeah, so that was key (Kelvin Nyame, 2021).

Example 4. Also, it is important, because then you end up not wasting as much time. Because if I did not go to MEST, or had the experience that followed. I was going to go about it the wrong way, you know. Just getting a developer to build this app, that maybe did not know anything about my vision. So, I think you end up wasting so much time and money. And we have seen all those startups that lack the knowledge, I believe there is a web-site callaed startup-graveyard or something. So, of course, there is also examples of big status that eventually failed. So I think the knowledge is important, so that you do not end up wasting so much time, even in the beginning (Stella Ngugi, 2021).

Different from individual aspects, this second organising theme takes a broader look into the role of entrepreneurship education. The partakers of this study was very clear on the

effect the entrepreneurship education can have on a single level. That said, they believed these effects to surpass the student, and contributing to increasing the general know-how of a population, resulting in more informed and advanced society. This affiliates with the point made by Neck et al, Cohen and WEF (2004; 2006; 2014), stating that universities play a significant role in disseminating knowledge and raising awareness in the community at large. Secondly, they also underscored the main goal of institutions and programs like MEST, which is to produce innovators. Thus, suggesting that entrepreneurship education can contribute on a societal level by improving human resources and increasing job opportunities, which is an absolute necessity to increase ability and growth within the African continent (Diop 2017).

Example 5. Oh, yeah, absolutely. So, for instance, like right now we have started having a lot of different hubs. We have started having different programs that have been nurturing people to start their own startups. Kenya is there, but like, Tanzania have just started slowly to grow their own startup ecosystems. And now you see, when you go to for instance, to different conferences, you find people actually doing things. Yes, they are doing things because they have heard that digital innovation is good and all that. But there is still not enough information on startups, entrepreneurship and digital innovation. So if there is more institutions, if there is more companies actually supporting the entrepreneurship sector, that would be really good. Because we have a lot of people now who are actually trying to engage in this area. But at the same time, there is still not enough knowledge about what to do. Most people do not know how to go look for opportunities. Most people do not know what tools to use. So, even when people are given knowledge on entrepreneurship, there is still a need to give them more awareness on what tools they could use, what tactics people could use, maybe networking and all that. So there is still more to be done. But at the same time, big corporate services have started supporting small startups. For instance, I know about a telecom company that supports organisations that trains people on entrepreneurship. So they provide Internet in schools, so students could learn coding and other innovation things. At the same time you find. Like telecoms have been trying. However, corporates, like banks, I am not so sure yet. They just give this little trainings to small business people, and then they give them loans. But I still feel like there is much to be done, but the impact it has on the society is great, there is a huge impact that that can be done if these institutions actually came together and supported the growth of either startups or other business ventures (Gloria Kaguo, 2021).

Example 6. Oh, yes, I think these programs are very good. Yes, and it really helps every economy, especially ours, which is growing. I think the program is a good one. Not only MEST, there are also the Cosmos Innovation Centre, Impact Hub has programs that they do. Ghana tech lab. So, there are a lot more programs springing up now. And it only tells that there is a trend that we need to tap into. Okay, and technology is kind of improving things, you know, in our part of the world, and there is digitisation across board. And so young people, especially who are passionate about technology should be encouraged to get into some of these principles. So that, first of all, they get the training and the skills they need, then they get exposure. So, that their problem solving abilities are sharpened, and then they can take on real problems, and solve them. So, I would say that these are very good programs. Overall, they are really helping to change the narrative... First of all, as society gets to benefits, problems get solved. That is one. If the business works, there is employment, which also brings some economic improvement in the lives of the entrepreneur himself and his dependents, as well as those that he is going to employ and their dependents as well. So it has a ripple effect. In terms of advantage. Yes, it solves societal problems. And it creates wealth for the entrepreneur. And for those who are hired to work with them. Yeah. So it is a two way thing. And it's improved lives. I mean, it improves lives. (Ebenezer E. Owusu, 2021).

4.2 Issues related to the African Market

The second key concept and global theme of this study is the African market, which includes two organising themes; challenges and opportunities. Firstly, in terms of challenges, many exist on the African continent. Two being the significant cultural and regulatory differences that can be found across the 54 countries (Prim et al, 2016). Within this study, most of the entrepreneurs that attempted to expand their business ventures to other African markets, indeed underscored the aforementioned challenges in addition to the lack of fundamental needs, such as stable electricity and internet. Furthermore, though Africa is the second largest continent in the world, many non-African companies share a series of misconceptions related to the continent. Such as clumping Africa as a singular unit, not appreciating the variety of opportunity, and where that opportunity can actually be found (Rosenberg, 2015). Understanding the target market is key to succeeding, thus joining forces with the local workforce may be a winning strategy for outside companies to best capitalise on the vast opportunities in Africa.

Example 7. But the major blocks in Africa, I think it is the policies, like the governments are different, the cultures are different from state to state. So, you find sometimes, even in innovations, that the government is structured, the policies are quite different. So, for instance, you go to West Africa, you go to Nigeria, and I think just starting a FinTech company requires you to have a license that costs more than, I think more than \$5,000 or something. And that is just for the license stuff. But you can East Africa, it does not cost as much to start a FinTech company. The policies there are not so hard on that side. In East Africa, you see Kenya and Rwanda are very easy to go to. They are very acceptable like when you bring something different, they easily accept changes. But when you come to Tanzania, I do not know if you have come across Zip-Line. But yeah, they deliver blood and all that. So, you come to Tanzania you find the policies just one the health sector, are really not flexible. So, you find startups like Zip-Line, their idea originated in Tanzania, but because the health sector, the health department was not flexible, they ended up having to go to Rwanda, and now they are doing well, but they still can operate in Tanzania. So, if the government can adjust the regulations and policies. And, like, I think if entrepreneurship education was given to people or citizens, even if it could just be a special study or something in either secondary schools or whatever levels in education. I think it would be really good, because people do not have that knowledge. People are trained things in class, but they do not know how to apply those things in real life. And then the infrastructures are slowly getting there. Yeah, so I think it is mostly about the awareness and knowledge being provided, and policies needs to be more flexible, and people just becoming more and more innovative. (Gloria Kaguo, 2021).

Example 8. Yeah. So it is a known thing here. Actually, there is a timetable to that. Three times in a week, or four times a week the electricity goes off. Imagine starting a business, you have to go and buy a generator, and that is very expensive to both buy and use, the amount you need to afford a generator. So, that is just some of the challenges you face (Moses Mallaghan, 2021).

Secondly, in regards to the topic of opportunities, most of the participants brought forward the issue on Africa's vast and quick population growth. Up until the 90's child mortality was a high in most of sub-Saharan Africa, however this number was measured to have decreased with more than 50 percent in 2019 (UN IGME, 2020). That said, having more than 4 children, is still a commonality in most African countries (World Bank, 2019), and have posed as a rather significant burden in terms of several social risks (Bello-Schünemann,

2017). Nevertheless, concerning this study, the matter of Africa's growing population-size, particularly of the youths, were brought forward as a major opportunity. The participants suggested that by combining the two factors of population growth and quality education, human capital could indeed become one of the most valuable assets of Africa, both seen within and from outside.

Example 9. Yeah, in terms of wages, like the role that technology education would play, would be to give us a level playing field to really compete, or you know, work together with the world or with other countries. Because I mean, by 2034, there is research that shows that Africa would have the largest working population. So if that is the case, if there are more people who have technology education, and who are skilled in that area, then they can be exposed to global opportunities. Because I believe that business is just about skilled people, it is not necessarily about the race, and any of that. So if there are more people who have more technology education, they would be open to take up global opportunities, they would also be open to think about solutions to the problems that exists in Africa. And then be able to scale faster, because that is the point of technology, it is to enable solutions that can scale. So, I feel like there is two ways that technology education would impact Africa (Lanre Adeoye, 2021).

Example 10. First I would say, the opportunities are many. Just, waking up in Africa is quiet. Life in Africa is really something else. So, people are motivated to always do something, when you give someone something and tell them to do this or do that they will eventually do something as long as they know, it is going to give them some actual return. So, for instance, since most people engage in either agriculture, education, FinTech etc. Everyone, is looking for money, I would say the FinTech market is quite saturated. But opportunities are almost everywhere in Africa, as people is always looking for something. Like there is always something to be solved. And I will say Africa is still at a very early stage, cause people have not started waking up and started creating all these innovative solutions, to all the things that can actually tackle the problems we are having. So, people have not started being receptive to technology. But then now people are ordering things online, people are not scared to order stuff. People have really started believing in technology. So there is a lot of opportunities to find. (Gloria Kaguo, 2021).

4.3 Factors Related to Technological Innovation

The last global theme of the respective thematic network, addresses components that are recognised by the participants as substantial in order for innovation to thrive in an African context. This final global theme draws on elements that have been assessed in the two former sections, and specifies the focus onto particular actors within a state, that are viewed to play an important social role, related to innovation. These key factors include, the political system, the economic system, and the education system. Additionally, other significant elements such as timing, culture and environmental aspects, was mentioned. Nevertheless the factors connected to the study by Etzkowitz and Leydesdorff (1998) were acclaimed to hold the most importance in regards to this distinct context.

The first organising theme in this category is the political system. This addresses all matters related to the government, and the power of the state. The rules and policies of a state, affect all social actors in numerous ways. For one, general law and regulations, such as high taxes can make it hard for new businesses to survive and even be created in the first place. Furthermore, limitations found within a country, like poor infrastructure or faulty electricity and internet, can obstruct a startup to grow and expand (Bramann, Rosenberg, 2017; 2015).

Example 11. With a lot of markets, like with Nigeria, for example, I think that entrepreneurship education, training institutes, should, besides for from just looking out for individuals like myself, who you know, got into this program. I think one very key thing would be for them to work with the government, in terms of developing policies that enable these ideas to really scale and fly. Because, there is the impact of them, giving this knowledge to people. But government regulations and policies could scale a business. I mean, we saw that happened last year with Nigeria, and there was a particular sector that was just shut down, because of a policy that came about (Lanre Adeoye, 2021).

Example 12. As long as there is more electricity, as long as it is internet connectivity. These are factors that influences technology adoption. So, having more of this would improve innovation within technology. Because you need this to reach out to your market. If you do not have internet access, or the electricity to access all this, then you will not be able to get there. So I think, Ghana have done well with electricity connection and stuff. Compared to some other countries, it is okay. But we can could do much better (Moses Mallaghan, 2021).

Example 13. The government also needs to provide an enabling environment, or at least not actively block people who are doing the innovation (Chukwuemeka Ndukwe, 2021).

The second organising theme of the last global themes, is the economic system. This theme takes all matters related to the industry and market into account. The economic system is very much related to the opportunities within a particular market (WEF, 2014). The participants of this study underscored the importance of a receptive market, to enable venture creation, followed by a prospective job increase. In consequence of this, it was discovered from the data collection, that thorough market research is highly important in regards to succeeding within any industry or market.

Example 14. Yeah, a lot of research, market research is very important. Okay. So if market research does not really go well, you may have a very erroneous outlook to think that this is what is needed. And you might go ahead with the project, and it would not work as you would have expected (Ebenezer E. Owusu, 2021).

Example 15. If the business works, there is employment, which also brings some economic improvement in the lives of the entrepreneur himself and his dependents (family and close ones), as well as those that he is going to employ and their dependents as well. So, it has a ripple effect (Ebenezer E. Owusu, 2021).

The third organising theme, which is acknowledged as one of the most important actors in terms of innovation, as well as one of the focal points of this research, is the education system. This organising theme comprises all components related to education, such as the universities and other institutions, the schooling and tools those institutions offer, and the increased knowledge and human capital it puts forward. Furthermore, it underscores the role that the educational system has in terms of collaboration and partnership between several social actors (WEF, Cohen, Etzkowitz & Leydesdorff, 2014; 2006; 1998).

Example 16. The most crucial has to do with collaboration, let us just call it the STG, 17. Okay, everyone needs to work together, we all need to understand that in order to achieve the greater purpose, which is, for example, increasing Africans innovation, or getting as many people as possible into the space to help us to boost our economy. So, the government, for example, can be curbing down on your innovation potential. The venture build-up of the entrepreneurs school can limit the number of applicants or limit the number of individuals they enrol. It is not about saying you have 10,000 people that apply to your program or school, you need 10,000 people innovating. That needs to be the new goal. So, for this whole ecosystem to work, we all need to have a common end goal, we need collaboration between the single innovator and other fellow innovators, also partnership between the innovator and

the government. Basically we all need to work together. That is the first thing you always need to have in mind, a common goal. (Uche Orjinta,2021).

Example 17. Very, very huge role. I think. My University has like an Entrepreneurship Centre. You know, it is supposed to be about teaching people about entrepreneurship and things like that. In my final year, it was about 2013 or 2014, they introduced a new course, brand new course called entrepreneurship studies or something like that. It tried to teach you about entrepreneurship. But you know, it was taught by people that been never had done businesses before. So, yeah indeed, like you said, they do have a key role. I think they might be the best people to present these things to the government in the way that the government can then sort of accept it. Because, you know, it is like a known entity... but the way the universities are currently set up, I do not think there is much that they can do. It is easier for training programs like MEST, right, where they are already a established high tech institution, and the government is willing to listen to them, because they have a bit more muscle than individual entrepreneurs. But universities right now, and their current position, they do not have the right human capital to do and champion, to make those kinds of changes (Chukwuemeka Ndukwe, 2021).

The fourth and final organising theme of the network, is labelled other factors. These included component falling outside the Triple Helix model (1998), such as timing, culture and environmental aspects. Several of the participants highlighted the central role that culture plays, in most African countries. There is a need to include culture in the process of venture creation, especially in countries where tradition is heavy imbedded in the industry (Hofstede, 2021; Prim et al, 2016). Agriculture, holds a strong position as the main provider of labour opportunities, and anything outside of these types of traditional profession, may not always be met with high enthusiasm or acceptance (ILO, 2020). Hence, the difficulty to realise industrial mutation (Schumpeter, 1950), by implementing technological innovation, as the tech industry does not have a long history of providing safety and stability (Diop, 2017).

Example 18. But like you also need to understand the culture. Our culture is very strong. It is very strong, like the mindset. When you want to launch a business here, you really need to understand the culture. Even if like, sometimes you can think that, oh, this thing will work ,like it is normal, but then it is not normal for our people. It is very different, like our culture is very different from Western countries (Ada Tapily, 2021).

Example 19. ... and leave some space for things like culture and other things. Because I mean, if you look at the 90s, and people like the PayPal mafia, and all these guys, Elon Musk, and all these people who went on to create companies, before barely had nothing at that time, technology was still very new. But I think they were hungry for it. I think people was supportive, because of what they saw the internet could do. But I think the society also matters. Also, I think the timing matters. And that is even for me, I was trying to really push last year so that we finish the product. Because I kept telling them, you know, COVID is happening right now, everybody is online. If we lose this time, you know, this was one of their most opportune time for people in tech to actually sell their product. So, I think besides from culture and society, the timing. I think that is also important. (Stella Ngugi, 2021).

Example 20. A lot of parents are not necessarily open to that, except if they see results. And that is because, I mean, once you are done with school, people who eventually go to find jobs, they get that steady income coming in. But if you are going to be an entrepreneur, actually, if you have no seed money, or you are not yet very successful in entrepreneurship. The family are not like, very supportive at the beginning stages. So, I think we are in this in-between stage. Because now there is a lot of success stories coming up. So, people are now more open to venture into entrepreneurship early on. And there is now that acceptance and openness to it. But before now, it was like very, it was hard to find young people that wanted to take that risk. But right now, we have a lot more very young people who want to leave school and just start something or even to attend school. So, we are just at the tipping point where people are starting to venture into entrepreneurship at younger age. So yeah, I think now, there is just that green acceptance for entrepreneurship in general, compared to let us say, five years ago. So, I think we are at that tipping point indeed, because there is a lot of success stories now coming up, and show young people doing this thing. So, people feel like they have you know, models that they can follow (Lanre Adeoye, 2021).

The thematic network analysis allowed the researcher to extract and categorise the essential information from the data collection. Furthermore, this chapter as allowed the researcher to conduct a detailed analysis of the results. The findings presented above, propose that entrepreneurship education may indeed have some impact regarding technological innovation in Africa. However, to which extent, will be discussed in the final chapter of this thesis.

5. CONCLUSION

The focus of this study has been on how entrepreneurship education can enhance technological innovation in Africa. To build the fundament to investigate this distinct topic, the researcher put forward a systematic literature review in chapter 2, covering a range of literature and theories related to the key themes of the research question, including: 1) issues related to the present status of technological innovation across Africa; 2) theories linked to the entrepreneurial ecosystems; and 3) literature explicitly concerning entrepreneurship education and its societal impact. What is more, the empirical data was collected through conducting in-depth interviews with a handful of entrepreneurs from different African countries. Then in the previous chapter, the results and analysis was put forward, enclosing the key findings of the respective study. In the upcoming chapter, the significance and implications of these findings will be put forward by comparing them to the theoretical findings, that has been covered by the aforementioned literature review. Finally, the limitations of the study will be acknowledged, followed by recommendations for future studies.

5.1 The Significance and Implications of the Findings

As the last part of this thesis has shown, the results indicated that entrepreneurship education can boost technological innovation in Africa. That said, the point at issue is how indeed this can be archived. To further investigate this, the researcher will discuss the two main findings of this research: First, by putting forward the major challenges Africa are facing in terms of improving technological innovation. Second, debate the manners in which entrepreneurship education can accomplish enhancement.

5.1.1 *The Challenges that Needs to be Overcome*

Firstly, one significant factor preventing innovation from reaching its potential in many African countries, is due to aspects related to the government. Studies by WEF, Cohen and Neck et al (2014; 2006; 2004), all suggest that the government is one of the key components in enabling a sustainable entrepreneurial ecosystem. Federal, regional and local governments can encourage or cease the development of innovation through tax rates and incentives, subsidies and grants, and eliminating the bureaucratic ‘red tape’ (Siegel et al., 2003). In countries such as the US, the government have facilitated a number of arrangements, such as the Bayh dole act (1980), that fosters entrepreneurs to realise new

business ideas. On the contrary, many African countries have strict regulations and policies put in place, which not necessary favour entrepreneurial activities. Furthermore, the governance differs from state to state, which then again makes it challenging for small business owners to expand their product or company or across borders.

Secondly, in order to for innovation to thrive, there is a need for accessible markets, next to support from the local industry. First of all, accessible markets means the potential opportunity or customers on the market place (WEF, 2014). For new ideas and product to emerge, there must be a desire or pull from the respective community for change or new solutions to occur. Moreover, in order to realise new ventures and to develop entrepreneurial ecosystems, there is a prerequisite for start-up capital such as venture capital or angel investors (Neck et al, 2004). However, there is not that many capital services offered across Africa at the moment, and entrepreneurs often have difficulties in finding investors who understand their businesses and share their values. Thus, specialised ‘green investors’ are sought after (Schick et al., 2002).

Thirdly, a reoccurring theme within the findings was the number of cultural barriers to overcome when embarking on a business venture across Africa. In order to support this statement, it seems appropriate to refer to the literature concerning the role of cultural aspects in relation to innovation. For instance, the study by Prim et al (2016) suggest that culture is a principal factor that needs to be acknowledged in order to understand the level of innovation that takes place within a country. The study found that there was a correlation between the level to which a country score on the different cultural dimensions by Hofstede (2010), and the level of innovation outputs. What is more, according to the same study, a overweighing number of the states within the sub-Saharan region of Africa, score reasonably comparable in the 6 cultural dimensions, where their overall culture was labelled either ‘hierarchical’ or ‘benevolent’. Both falling whin culture types that are not necessarily associated with high outputs of innovation. That said, the findings also proposed that due to the technological development whin Africa, the culture are slowly staring du adjust to the new ways of doing things.

Fourth and finally, challenges related to the environment, such has the lack of fundamental needs, was brought forward as noteworthy in the findings. Currently, many African countries struggle with having a less than optimal form of infrastructure. Even in fairly advanced countries, such as South Africa, the electricity is known to be very unstable, furthermore, the population is used to having lengthy periods every day without it. This

makes it fairly difficult to work within industries such as tech, that are dependent on having a strong and stable internet (Bramann, 2017). The only way to ensure the opposite is to acquire a generator. However, this is relatively expensive, especially for aspiring entrepreneurs with a deficiency of most resources.

5.1.2 Boosting Innovation through Entrepreneurship Education

As indicated in the results of this study, entrepreneurship education is suggested to go beyond increasing the knowledge-level of the individual attending such a program. Compared to the traditional university, institutions such as MEST have a rather pragmatic approach of education, where the central mission is to graduate entrepreneurs that potentially can have a more direct contribution to society. The entrepreneurial university provides the necessary environment, tools and resources, as aforementioned, to enable students to jump-start their business ventures. Furthermore, these type of programs can oftentimes bridge a collaborative relationship between the university, government and industry, as these social actors all play a crucial role in establishing a sustainable entrepreneurial ecosystem, and share the common objective of boosting innovation in the community. Finally, cultural acceptance towards entrepreneurial activity may come as an additional outcome in areas where innovation contributes to socio-economic growth.

The first example, refers to the studies by Adams and WEF (2005; 2014), which has already been covered in the literature review. These studies argue that major universities found in the US, such as Stanford and Berkeley have been instrumental in the growth of entrepreneurship and technological innovation in their respective region. Companies such as Yahoo, Cisco Systems and Google, just to mention a few, were all founded by former students and professors at Stanford university, and were substantial in making Silicon Valley into the world's foremost incubator of high-tech entrepreneurship. Though, the study by Adams (2005) argues that a solid academic anchor is the heart behind elements connected to innovation, such as concentration of brains, an entrepreneurial culture, and an infrastructure supportive of high-tech and entrepreneurial activity, the research by WEF (2014) points out that universities alone cannot facilitate a sustainable entrepreneurial ecosystem. The research propose that there is also a requisite for social actors that invests in, and welcome entrepreneurship as a legitimate and appreciated activity.

The argument made by WEF (2014) is backed by several former studies. One example being the study by Neck et al and Cohen (2004; 2006), that propose that aspects

related to the government and local market are the most crucial components in order to build a sustainable entrepreneurial ecosystem, regardless of country. In addition, research conducted by Etzkowitz & Leydesdorff (1998), argues that in a knowledge based society, the collaboration between the university, industry and government is the source in terms of innovation and development. Nevertheless, when taking a look onto the African context, the collaboration amongst the three aforementioned social actors, are close to non-existent. This due to the fact that the university has been consistently excluded from development strategies and policies (Etzkowitz et al, 2007). Moreover, the previous study claims that the university, especially the entrepreneurial university, may be the driver behind future economic development in regions such as Africa. The reason for this, is because of the central role that the entrepreneurial university plays in regards to research, next to the vast potential of the human resources created from the students that attend such educational institutions. Both factors are strongly corelated to innovation.

In conclusion, schools like MEST, are created based upon the principle of the entrepreneurial university by Etzkowitz & Leydesdorff (1998), where the common goal are indeed to produce innovators, not only human resources. As already noted, in addition to providing students with the a the proper education, they also offer the tools, services, collaborations and funding, all the components needed to create an environment that support the early stages of an entrepreneur's business venture. Therefore, it can be argued that establishing more institutions like MEST, next to expanding the educational alternatives offered at the present universities in Africa, may contribute to build a sustainable entrepreneurial ecosystem, which in consequence may boost innovation and socio-economic development across the African continent.

5.2 Limitations to the Study

Both the theoretical and empirical data collected in this research provided valuable information related to entrepreneurship education and its impact. That said, there were some limitations that the researcher encountered while conducting the research, which are imperative to critically address as they have affected the findings and conclusion of this thesis. First and foremost, it is essential to make note of the issues related to the methodology applied in this study. For one, as the population of this study was restricted to the MEST alumni, in addition to collecting a rather small sample of 10 individuals, it can be argued that the results reflect a slightly homologous viewpoint. That said, due to the scope and time

restrictions of this master thesis, targeting a bigger population and sample size would have been difficult.

Secondly, as the participants of this study were all located in sub-Saharan Africa, and the researcher in Norway, the in-depth interviews had to be conducted through an online video communications tool. Seeing that the majority of the interviewees had faulty internet connection, the investigator experienced some difficulty in executing the interviews. Furthermore, as a consequence of finalising all 10 interviews prior to performing the transcription, it proved challenging to analyse and extract the accurate report of certain statements made by the participants. Thus, the researcher had to interpret some of the content based on her own perception of what had been discussed, as reaching the graduates after concluding the interviews failed to be accomplished.

What is more, there are some limitations linked to the theoretical framework that needs to be addressed. For instance, it can be argued that the researcher has utilised a rather exclusive number of literature and theories to build the fundament of this study. Hence, the theoretical findings reflect a rather small selection of scholarship out there, where the empirical findings could have been debated more comprehensively and critically by including greater volume of literature.

5.3 Recommendations for Future Research

Though the researcher recognises that there are some limitations to the overall study, the findings clearly suggest that entrepreneurship education plays a significant role in improving innovation and socio-economic development across Africa. To further explore the topic in question, the researcher would like to put forward a few recommendations for potential future studies. Firstly, MEST enrolls circa 50 out of a 1000 applicants a year, meaning that very few get the opportunity to attend their highly-regarded program. To enable more representable results related to entrepreneurship education across Africa, it would be an idea to widen the research population to a certain degree. One suggestion would be to interview students from other schools and programs as well, such as the African leadership university and the Akilah institute for women. In addition to this, investigating some of the tech hubs, accelerators and incubators, that were mentioned by some of the interviewees and the ones referred to in the literature review, could possibly provide some valuable information. Secondly, the researcher would propose to further the study by Etzkowitz (2007) concerning the interactions between the entrepreneurial university, industry and the

government in the African context, as this relationship was reflected highly significant in both the theoretical and empirical findings.

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APPENDICES

Appendix A: Topic Guide

From 1 to 5 → 1 =Not at all significant, 2=Slightly significant, 3=significant, 4=Fairly significant, 5 Very significant

1. *Can you please introduce yourself a bit (examples below):*

- Name
- Age
- Nationality and City
- Family situation
- Education
- Current occupation/Company

2. *Can you please share your story with MEST?*

- How did you hear about them?
- When and how did you get in contact with them?
- Why MEST (What motivated you to apply)?

3. *Can you please explain the method of education applied at MEST?*

- How was the study program set up?
- Which courses did you have (mandatory, selective)?
- Which assistance and tools were you supplied with? - What was the ratio between theoretical and practical courses?

4. *May you please tell me about the role MEST played in your business journey?*

- When did you come up with your business idea?
- How did meltwater contribute in realizing your business ideas/ventures?
- How has your business venture played out following your time at MEST?
- What were the most important components, in terms of personal and professional gain, MEST provided you with?
- If you could have given the school/administration any advice in terms of improving the program(s) and education, what would that be?

- On a scale from 1 to 5, how would you rank the significance of MEST's role in your business journey?
5. *Would you please give your insights and opinions on Entrepreneurship Education in general?*
- What are your thoughts on this specific type of training and/or educational institutions and programs, in terms of value creation?
 - Which benefits do you believe this type of education gives the individual (student)?
 - What role/importance do you believe Educational Institutions (Universities) have in society?
 - On a scale from 1 to 5, how would you rank the significance of entrepreneurship education?
6. *Can you please share your line of thinking in terms of venture creation in the African market?*
- What are the major opportunities and challenges in your opinion?
 - Which elements do you believe are necessary in terms of enhancing technological innovation in the African context?
7. *In what way do you believe entrepreneurship education can contribute to technological innovation?*
- What impact may training programs/educational institutions have on other components such as the government, market/industry and culture (related to enhancing innovation)?
 - On a scale from 1 to 5, how would you rank the significance of entrepreneurship education's impact on technological innovation?
8. *If you have any other experiences, stories, thoughts/ideas to share, do not hesitate to do so.*

Appendix B: Interview Consent Form

Ingrid Myklebost. Midtunheia 27, 5224 Norway. IngridMyklebost@student.eur.nl. +47 48 12 03 77

You are invited to participate in a research concerning entrepreneurship education and technological innovation. The purpose of the study is to specifically understand how entrepreneurship education can boost technological innovation in Africa.

Your acceptance to participate in this study means that you accept to participate in an in-debt interview concerning your personal experience and perceptions.

- the questions of the interview will be related to Entrepreneurship Education and Technological Innovation in Africa

Unless you prefer that no recordings are made, I will exclude any usage of any audio recorder for the interview.

You are always free not to answer any particular question, and/or stop participating at any point.

RISKS AND BENEFITS

I am aware that the possibility of identifying the people who participate in this study may involve risks for certain professional or personal risks. For that reason—unless you prefer to be identified fully (first name, last name, occupation, etc.)—I will not keep any information that may lead to the identification of those involved in the study. I will only pseudonyms to identify participants.

I will use the material from the interviews and my observation exclusively for academic work, such as further research, academic meetings and publications.

TIME INVOLVEMENT

Your participation in this study will take approximate 45 to 60 min. You may interrupt your participation at any time.

If you have decided to accept to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. You have the right to refuse to answer particular questions. If you prefer, your identity will be made known in all written data resulting from the study. Otherwise, your individual privacy will be maintained in all published and written data resulting from the study.

PAYMENT

There will be no monetary compensation for your participation.

PARTICIPANTS RIGHTS

If you have decided to accept to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time

without penalty. You have the right to refuse to answer particular questions. If you prefer, your identity will be made known in all written data resulting from the study. Otherwise, your individual privacy will be maintained in all published and written data resulting from the study.

CONTACT AND QUESTIONS

If you have questions about your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact –anonymously, if you wish— Dr. Payal Arora - Erasmus School of History, Culture & Communication, email: arora@esphil.eur.nl.

SIGNING THE CONSENT FORM

If you sign this consent form, your signature will be the only documentation of your identity. Thus, you **DO NOT NEED** to sign this form. In order to minimize risks and protect your identity, you may prefer to consent orally. Your oral consent is sufficient.

I give consent to be audiotaped during this study:

Name	Signature	Date
------	-----------	------

I prefer my identity to be revealed in all written data resulting from this study:

Name	Signature	Date
------	-----------	------

This copy of the consent form is for you to keep.

Appendix C: Interview Transcriptions

The complete version of all 10 interview transcriptions can be found in a separate file, labelled: *MA Thesis Interview Transcriptions (I.M - 575046)*.