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The Role of an Innovative ICT-Based Entrepreneurial Evolution on Africa's Development: The Case of University-Based Incubators

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Overview

Technology has not only changed the world, it has also increased its potential (Figueres 2003). Innovative ICT, coupled with globalisation and the role of societal norms, values and cultures, is constantly affecting societies around the world and helping to transform many aspects of life, whether at the personal or professional level. It is forcing organisations and corporations to rethink and re-engineer the way they manage their operations and resources and face competition both locally and globally. Moreover, it is having a major impact on the way development and competition are taking place. It is fair to claim that the processes of globalisation are increasingly dependent on ICT (Musa 2006). This situation has generated new forms and structures of economic, business and social organisations that are no longer affected by geographic or time

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constraints but depend mainly on teleworking, which is emerging as the platform for business and socio-economic development in the twenty-first century. Examples of such organisations include the growing platform of incubators and accelerators that are spreading round the world, Africa included, in order to support, nurture, mentor and help develop tech start-up companies offering a variety of products and services that are innovation-based and that cater for today's mobile marketplace. Today, there are a number of innovative ways to do business in Africa that cannot be found in other countries, all of which are enabled through cutting-edge ICTs. African tech-savvy entrepreneurs are coming up with original, innovative ways to do business, and consequently a lot of intellectual property is being developed in Africa (Arlove 2016).

Africa, a continent with many resources and a variety of economies in transition, has been investing in building its ICT infrastructure for many decades in order to overcome its status as the most unconnected continent when it comes to ICT, although it faces a broad spectrum of developmental challenges (Figueres 2003). The deployment of emerging ICT infrastructure in the African continent can also benefit from a unique opportunity by capitalising on the experiences and learning from the lessons of the past witnessed by other nations in the developed world. In that respect, ICT can lead to an industrial and societal evolution based on information acquisition as well as knowledge creation and dissemination, allowing the creation of an emerging information-based society with innovative means of communication that could help increase competitiveness for individuals, organisations and societies (Branscomb 1994).

In 2015, the African population reached 1.1 billion people and is expected to reach 2 billion by 2050. It is by far the youngest continent in the world, with over 50 % of the population under the age of 19, and is known for its huge and young labour force, multiple languages and dialects and diversified cultures. Algeria is the largest country in terms of land, and Nigeria has the largest population. In terms of trading, as an example of the changes that are taking place, Chinese exports to the continent increased from US$11 billion to US$166 billion during the period 2006–2016. Economically, Africa has been the second-fastest-growing continent (Leke 2016). In other words, the transformation

process is taking place but is not yet complete. There is still a lot that is taking place in terms of building and completing the infrastructure, improving government laws and regulations, as well as investing in human capital whether in training, vocational development, education or lifelong learning at large.

During the 1990s, there was an unprecedented link between the technological innovation process and economic and social organisations. Moreover, as the links between economic development, productivity and the availability of information resources became invaluable, governments round the world started to invest heavily in building their National Information Infrastructure (NII) (Petrazzini and Harindranath 1997). This led to major changes and transformations in the activities and relationships of individuals and organisations within the society, leading to the evolution of the information society, where the services provided by ICT represent a set of challenges and opportunities for the global society. However, it is important to note that although access to ICT is a prerequisite to its use, individual differences in time and space as well as capabilities and choice may play a role in the use, value and application of ICT (Alampay et al. 2003). Many African countries are facing massive challenges, including poverty and unemployment, yet again the continent is becoming, since the 1990s, home to many of the fastest-growing economies in the world, in many ways due to the growing number of entrepreneurs that are capitalising on tech start-ups that address the needs of the continent. The full impact has not yet been realised, but with sustainability, and scalability, the real impact will be felt across the continent in the years to come.

In general, the ICT infrastructure makes information more accessible, with more benefits for society (Shapiro and Varian 1999), which puts more pressure on firms round the world to exploit all possible opportunities to leverage productivity and efficiency. Businesses are becoming increasingly aware of the indispensability of ICT to stay competitive, with other global implications for productivity, employment and profits to the extent that organisational operations are becoming unthinkable without the effective and efficient use of ICT, especially in a global society, where information travels across national boundaries (Branscomb 1994). Therefore, many nations in Africa have taken concrete measures in

that direction, such as Egypt, South Africa, Tunisia, Morocco and Kenya, which have restructured initiatives in telecommunications and informatics as part of an overall strategy that targets socio-economic development in the continent and where small and medium-sized (SMEs) enterprises play a vital role. This includes deregulation, encouraging private investment and foreign direct investments (FDI), and the use of tools such as public–private partnerships (Kamel 2009a). In the information age, ICT is an opportunity for the development of Africa because it is a powerful tool for economic growth, social inclusion and poverty eradication, which can facilitate the integration of African nations into the emerging, digital global marketplace (Annan 2003). Africa stands to gain a great deal from participating in the globally connected economy. However, it must first establish the necessary ICT infrastructure, and government and economic conditions to attract and maintain an effective position in the global economy (Ajayi 2004). Moreover, the legal and regulatory environment for those companies should be put in place to enable the proliferation of innovative and impact-driven start-ups as well as their scalability and sustainability. The African continent, with 54 countries and massive diversity across different countries, stands on the brink of a massive rise-up that can turn its fortunes around. According to the World Bank, six of the 12 fastest-growing economies in the world from 2014 to 2017 will be in Africa. They include Ethiopia, Democratic Republic of Congo, Mozambique, Tanzania, Côte D'Ivoire and Rwanda. It is important to note that, since 2015, Africa has been attracting some of the biggest names in international finance, whether state-owned funds such as China Investment Corporation, or private equity groups such as Blackstone and the Carlyle Group, or institutional investors such as Goldman Sachs.

More than one decade into the twenty-first century, the world is becoming smaller and the public is rapidly gaining access to new and dramatically faster ICT (Shapiro and Varian 1999). Moreover, the gradual move towards establishing the information society is irreversible and will have implications for all aspects of society. The formulation of information-based companies and societies at large will positively contribute to the creation of the global information society and will lead to the creation of a powerful platform for knowledge dissemination and

sharing that is mobile, dynamic and iterative (Kamel 2009b). Moreover, the above-mentioned high-tech directions will result in further investments in telecommunications and infrastructure, as well as digital platforms such as eGovernment, eCommerce and many more digital initiatives that began to appear in the mid-1990s (Sorensen and Sayegh 2007). In 2016, in sub-Saharan Africa alone there were more than 42 top digital platforms. The advantage of Africa is the diversification of its economies across different countries. The misconception is that Africa is one country and is homogeneous, which is not the case. Africa is big and has similarities across its nations, but also many differences. It is worth noting that the world's financial crisis in 2008 turned the attention of many investors away from the traditional markets and destinations of investments and toward the African continent (Arlove 2016). This represents a unique opportunity for Africa, and home-grown talents and initiatives should take the necessary measures to capitalise on that. Some of those companies are gradually making the news, such as Africa's first tech unicorn, the Africa Internet Group (AIG), which is a privately held technology company valued at US$1 billion or more. AIG is the parent to a network of more than ten consumer-driven Internet businesses, including but not limited to Jumia and eCommerce platform; Zando, focused on shoes and clothing; Hellofood, a food delivery platform; Laymu, an online resale marketspace; Lamudi, a real estate platform; EasyTaxi, a cab service; and more (Knowledge@Wharton 2016).

The information society is becoming a global force and a fundamental element of change in the global society (Garito 1996). The information infrastructure (infostructure) is a factor for socio-economic improvement and represents a major support mechanism that can assist African nations in leapfrogging stages of development towards achieving a better standard of living and quality of life. In the current competitive context, access to and mobilisation of information are becoming the central aspects of productivity and competitiveness, and the investment required to set up ICT infrastructures directly supports growth and contributes to structural improvements in various services and industries (Kamel 2009a). The move towards an information society, and the opportunities it provides, will eventually be as important as the first industrial revolution (Kamel 1995a). It is difficult to predict the pace at which this change will take

place, but the economies that will be the first to succeed in completing this change satisfactorily will have major competitive advantages. There are examples to demonstrate such development, such as Kenya, where the business environment is much further advanced as a result of having improved the legal and regulatory framework that can enable such development (Arlove 2016).

ICT and Socio-Economic Change

Change, transformation, competition, innovation, collaborative work and partnerships could be institutionalised through customised strategies targeting the diffusion of best practices and the development of ICT applications, which are the fundamental objectives in view of the contribution they can make to leveraging development and growth as well as strengthening competitiveness. Such a process should include the liberalisation of the telecommunications sector, the provision of a regulatory framework, the provision of a broad range of attractive tariff options for users, and the organisation of specialised training and human resources development programmes focusing on the needs of ICT industries and rendering information to be timely, shared and publicly available (Branscomb 1994). This is because the lack of a basic telecommunications infrastructure is a severe hindrance to the growth of the Internet in many countries (Mbarika 2002), especially where most of the development is taking place in the capitals and major cities (Kamel 2005). For example, the developments taking place in Africa in the space of mobile payments are all interesting to follow in order to analyse their impact on the economy and the society at large (Arlove 2016). There are multiple ways to look at such new spaces, with various recent additions including FinTech.

During the 1990s, ICT became a vital platform for business and socio-economic development with the growing role of the Internet (Kamel 1995b). This led to the development of the global information society, with new global trends and challenges such as competing in time, time to market, customer-oriented services, the online society, smart communities, social inclusion, eReadiness, the market economy, intellectual

capital, investing in human resources and the sharing of information and knowledge. Therefore, the Internet and open data networks at large became major driving forces of change in the global marketplace (Kamel 1999). Changes are taking place globally, and the move towards an information age, coupled with emerging ICT innovations since the 1980s, has led to rapidly falling costs for ICT and major managerial, economic and organisational transformations, as well as the creation of a window of opportunity for massive developments and a chance to accelerate business and socio-economic growth in Africa. With the increasing high-level commitment from African leaders to bring about change in the way ICT is perceived, more ICT-enabled entrepreneurial initiatives could transform the way business is done in Africa and consequently positively affect societies across the continent. It is perceived that such a trend represents a unique opportunity for Africa's younger and growing generations to adapt and adopt new tools and techniques using state-of-the-art ICT. Africa, more than ever, is prepared to capitalise on the capacities enabled by emerging ICT to help leverage its development process and engage actively in the global information society, by transforming its societies into being more socially inclusive, digitally connected and electronically ready. Today Africa is a cash-based economy, but it is gradually becoming a digital economy (Sinare 2016).

ICT Evolution in Africa

Few doubt the significance of ICT for African economic and social development (Odedra-Straub 1993). Three major development goals have been articulated by African leaders who represent the driving force behind the embarkation on ICT evolution across the continent. The primary target is improving the quality of life for every African, working on the integration of the economies of the different African nations and leveraging trade linkages with other regions outside Africa based on mutual development purposes and growth targets. Consequently, building the African Information Infrastructure (AII) has become essential for the future of Africa, since it is perceived to form the backbone of the comprehensive socio-economic development plans for the continent in

the twenty-first century and beyond. ICT is perceived to have the ability to improve the lives of people with low incomes who have limited access to services such as health care and education (Qureshi 2007). ICT is an invaluable platform for the creation of opportunities for underprivileged communities and societies, especially in a global community transformed through mobility. Moreover, ICT holds the promise of development by connecting people to more accurate and up-to-date sources of information and knowledge (Ahmed 2007).

Moreover, a number of civil society initiatives are under way, with the informal sector playing a major role through non-governmental organisations (NGOs) in contributing to ICT development in Africa. NGOs are very active in contributing to the eradication of poverty, to the social, educational and political empowerment of the underprivileged with a focus on women and children, and to universal access to ICT services through innovative and affordable technologies (Okpaku 2003a). Many are also involved in mentoring entrepreneurs across the continent, including in Egypt, such as Injaz (Junior Achievement). There are also industry-based initiatives such as the digital factory, which aims to create capacity in Africa for the development of software applications at global standards to support the global ICT industry as well as, and more importantly, to meet the indigenous continental demand (Okpaku 2003b). Some ICT introduction and diffusion initiatives have been nation-based, such as those in Egypt, Rwanda, Cameroon and Kenya. For example, the Free-Internet model was formulated in Egypt and migrated to a number of developing nations in both Africa and beyond. In the case of Rwanda, with its ambitious Vision 2020 programme approved in 2000, ICT has been anchored into broader economic, social and development policies and strategies in the form of the National Information and Communication Infrastructure (NICI) plan. The essence of the programme is to help build the Rwandan information society and to start integrating it into the global information society.

In the case of Cameroon, an integrated national ICT strategy was developed, initiated by the United Nations Economic Commission for Africa (UNECA) and supported by the United Nations Development Programme (UNDP). The strategy benefited from the input of all stakeholders in the marketplace including the government, the private sector

and civil society. It is always important to engage and empower all stakeholders. In the case of Kenya, the approach was different because, while the private sector took the lead, the government was reluctant at first to embrace ICT for socio-economic development. However, momentum built up in a later stage and was embedded in the nation's poverty reduction strategy, which positioned ICT at the core of the national development plan. Currently, an integrated ICT-driven socio-economic development plan for Kenya has gone from being supported and driven only by the private sector to becoming the cornerstone for the development of the Kenyan information society (UNECA 2003). Recently, Kenya produced M-Pesa, which is setting the pace when it comes to mobile payments in Kenya and beyond. It is a mobile phone-based money transfer and micro finance service that was launched in 2007. It then expanded to Tanzania, South Africa, India and Eastern Europe. In general, the diffusion of ICT across Africa aims at supporting and accelerating business and socio-economic development across the continent.

The impact of emerging ICT is no longer confined to the technology domain. It is predicted that by 2020 over 12 billion, if not more, computing facilities will be connected to the global information infrastructure. However, as per the reports of UNECA, there are a number of priority challenges which hinder development in Africa and the opportunities that ICT offers African nations. They mainly relate to job creation, health, education and research, culture, trade and commerce, tourism and food security, among others. It is important to note that the main challenge facing African nations is to formulate effective strategies to bridge the gap between the penetration, use and effective implications of ICT within the African continent when compared to other regions in the world. In that respect, the New Partnership for Africa's Development (NEPAD) has set a number of ICT development objectives that address this challenge. They include doubling teledensity to two lines per 100 people, reaching an adequate level of access per household, lowering cost and improving reliability of service, achieving electronic readiness for all African nations, developing a pool of ICT-proficient youth from which Africa can draw trainees, software developers and engineers, and developing local content based on local culture (Okpaku 2003a). It is important to note that since the 1990s, many of these elements were realised and

more are expected to do so moving forward. Universal access to ICT and the Internet is really coming into place across the African continent. In 2014, the number of Internet users in Africa reached 205 million, representing 18 % of the population, and the number of mobile phone users reached 750 million, representing 67 % of the total population, according to the International Telecommunications Union.

Universal access is an important element in introducing and diffusing ICT within the community and minimising the inter- and intra-digital divide, with an emphasis on rural and underprivileged areas and communities, where around 70 % of the population in developing nations lives (World Bank 2007). Improving public access is an important step in the development of the information society for Africa. This could be realised by setting up universal access funds to encourage infrastructure development in rural communities, and establishing community access centres and telecentres, as is the case in Egypt, where IT access centres have had major implications for remote locations, reaching thousands of access locations. Clearly, this could also be replicated in other African nations. Moreover, public–private partnerships (PPP) could prove to be effective in the ICT space. In Ethiopia, for example, low-cost personal computers (PCs) are being supplied to the community to help increase the penetration rate and usage levels (World Bank 2007). Additionally, in Egypt, multiple PPP programmes and initiatives have been introduced, such as Egypt PC 2010, IT clubs, mobile IT units and free Internet, with effective outcomes. This also applies to mobile telephony, which is constantly on the rise across the continent.

Role of Human Capital in Development

The transformational change could be realised through the proper investment in human capital. In today's economic, business and social space, communities around the world face a set of challenges related to growing unemployment, changing market dynamics and tough business conditions, among others. However, they are also regularly presented with a variety of opportunities given the development of new markets, the growing role of ICT, the rapid population growth especially in African

economies, and their associated prospects and implications for global markets. While the pressures of those challenges will affect investments in different socio-economic directions, it should not affect the continuous investments in both human capital and in developing the proper infrastructure needed to help promote and create SMEs and start-ups, given the size and the demographics of the population in many of the emerging markets around the world. For example, one of the largest African nations, Egypt, with 58 % of its population under the age of 25, presents entrepreneurship with a unique opportunity to thrive. Thus, policy- and decision-makers, including the primary stakeholders—the government, the private sector and civil society—should collaborate and synchronise their strategies and plans and focus on how to optimise the use of the various limited resources to cater for the growing lifelong learning needs that could help establish an enabling environment for an agile and competitive entrepreneurial culture. In a nutshell, investing in people is investing in the future of Africa.

Consequently, the formulation of innovative strategies, clear objectives and nationwide training and professional development policies that can support the overall build-up of business culture becomes extremely invaluable in addressing market and industry needs in terms of providing human capital with the much-needed skills and capacities that can positively influence business and economic development and growth. Do more entrepreneurs mean more jobs and consequently a better economy? How can that happen? What is the infrastructure required? What is needed to entice youth and job seekers in general to engage with the private sector? How can we change the culture from looking for employment to looking to be self-employed? Is the environment ready to help create a start-up culture? Are the skills and capacities that could turn the society entrepreneurial available? What can be the role of ICT-based start-ups? Is entrepreneurial education and lifelong learning embedded in the curricula? The answer to all these questions and more relate directly to the way education and knowledge is being disseminated and shared, and the manner in which the culture in the community perceives business as a profession and entrepreneurship as the way to go. This too relates to the future of Africa and Africans. Investing in human capital through awareness and lifelong learning paves the way to the development of skills

and capacities that are becoming increasingly important to prepare future generations to grow into agents of change and transform their society.

Investing in people is investing in the future and making the individual, the organisation and the community at large more agile, more competitive and ready to compete in a changing and dynamic global marketplace. It is important to note that while access to capital, among other factors, is key for entrepreneurs, human capital is the primary building block in creating an entrepreneurial culture and hence a strong private sector that can turn around the economy. Therefore, lifelong learning, with its different forms and means, should be considered as the engine of socio-economic development and the base for a start-up culture and a start-up continent. In every region of the world, Africa included, investing in youth specifically and in human capital at large helps unlock the society's potential for socio-economic development and growth. They want to learn, unlearn and relearn in a world that is constantly changing to be able to make a difference. Human capital remains the game changer and is gradually becoming the deciding factor in both emerging and developed societies. In many ways, in my view, human capital is the oil of the twenty-first century and represents the most invaluable resource in countries round the world.

In 2013, the emerging markets' total gross domestic product was US$44.4 trillion compared to the US$42.8 trillion generated by developed markets. Having said that, there is never one size that fits all; the process of adoption, diffusion and adaptation varies across different countries. Therefore, the content, the approach, the set-up and the tools to educate a community vary based on culture, norms, values, work patterns and the way business is conducted. Clearly, it is not only academic degrees, or even extended experiences and diversified exposure, for that matter, that will enable entrepreneurship to flourish. Rather, the community will become more entrepreneurial if the environment provides opportunities for everyone to think differently and have the space and time to act creatively and attempt to follow their passion, take risks and accept failures, all as part of the continuous learning process. It is important to understand that in entrepreneurship, mistakes represent opportunities for learning and improvement.

The required education–knowledge–experience infrastructure, in other words lifelong learning, goes beyond the boundaries of the classroom, school

or university. It is the market knowledge and experience that counts, and the way the community prepares its current and future generations to be ready to unleash their potential. It is more related to openness, innovation, forward-looking and moving from the traditional and the predictive mindset into the unconventional and the uncertain. The knowledge shared should embed creative and timely content using cutting-edge methodologies and critical thinking and should be driven and focused on catering for the global job market requirements. Universities and professional institutions round the world offer entrepreneurship programmes to nurture an entrepreneurial spirit and provide potential entrepreneurs with the right tools and methodologies to launch their start-ups. This should be well diffused in the 100+ business schools across the African continent. In addition, this should be coupled with multiple informal settings such as advisory sessions, mentorship and awareness campaigns, seminars and networking events. Since 2008, throughout the Middle East and North Africa (MENA), more than 140 programmes, initiatives and organisations have been established to promote the culture of entrepreneurship. These include university-based incubators and accelerators, non-governmental organisations, private set-ups and funds, and chapters of international students and youth associations.

The entrepreneurial culture needs to be nurtured throughout the education system and beyond. It is time to establish additional university-based incubators. There also needs to be more focus on and encouragement toward the private sector in schools, teaching youth about entrepreneurship throughout the curricula as well as developing the appropriate policies and directions to ensure an impact-oriented entrepreneurial education. This should include exposure to business successes and failures and role models in the society as well as extracurricular activities that promote innovation and creativity. There is a need for a transformational change in the societal mindset by appreciating more the role of the private sector and demonstrating the role it plays that complements the role of the public sector and the civil society. They all contribute in different ways to the welfare of the community and that notion needs to be disseminated through degree and non-degree programmes as well as orientation and awareness seminars and the media. The community needs expertise in idea generation, leadership, governance, responsible business, business ethics, problem identification and solving, project management and more.

Given the demographics in emerging economies such as most of Africa, as well as the need to enlarge the private sector through the proliferation of SMEs, economies in many ways will be shaped by how effective entrepreneurial education is developed and integrated universally across the different communities. Some would argue that entrepreneurship cannot be taught and that it is a gift or talent; I would argue otherwise. While some definitely are born with more talent than others in some respects, everything can be improved and fine-tuned through proper education, mentorship, exposure and the opportunity to showcase one's own capacities and skills. The key strategic objectives of entrepreneurial lifelong learning include, but are not limited to, fostering innovation, leveraging responsible business, introducing business and management skills and techniques, helping develop high-growth SMEs, commercialisation of ideas, empowering and engaging youth, and more. Identifying talent should be universally based across different communities, unlike the conventional wisdom in emerging economies that everything happens in the capital and the big cities. Talent is everywhere, and more often than not it is found in remote locations and small villages and towns, where the need for change and a better life encourages youth to think differently and creatively to develop solutions and ideas that could transform their communities—further proof that it is not just academic degrees, but the overall educational experience and knowledge dissemination in both its explicit and tacit ways, that can make a difference.

For example, among Egypt's 85 million citizens, 7.1 million work as civil servants. That leaves a huge population ready for a more robust private sector. It would be a big mistake for Egypt not to utilise its most precious resource, human capital, to establish a strong private sector. The preparation of future leaders and entrepreneurs in Egypt should be aiming at realising sustainability, societal impact and scalability to accommodate the fast-growing population. The ICT platform will be driven by an incredibly passionate youth contingent that is technology-savvy, reaching 100 million (117%) mobile users and more than 40 million (47%) in 2015. This youth contingent possesses the creative minds and innovative solutions needed to help transform the society while focusing on the incredible number of untapped opportunities across a variety of sectors. The notions of productivity, velocity, accuracy and consistency

should be at the core of the learning process, since they will be among the deciding factors in preparing the entrepreneurs who will have the ability and stamina to handle the pressure and market dynamics while continuing to make a difference. The future of Egypt, and consequently Africa, depends on the next generation of business leaders and entrepreneurs being able to transform the economy through the creation of a robust and competitive start-up Egypt. It is invaluable to understand that what really counts is human capital, and that they are ready and engaged to influence the economy. The process of building a start-up culture would eventually lead to creating a start-up society and consequently a start-up nation, which would in many ways help create an ecosystem in which more entrepreneurs lead to more jobs and a better economy.

The Impact of University-Based Incubators/ Accelerators

The development of an entrepreneurial culture should follow a bottom-up approach that spreads across the community and becomes embedded in the way people think, plan, work, study and go about doing different things in business and society. The stakeholders in the entrepreneurial ecosystem are many and diverse; each plays an important role in developing, institutionalising and promoting entrepreneurship and innovation. One of the growing and invaluable key stakeholders in the ecosystem that provides the rich and much-needed body of knowledge associated with the academic set-up that supports entrepreneurs is the university-based incubator (UBI). The concept of campus incubators is spreading, and they are growing in number, impact and role when it comes to the entrepreneurial ecosystem in the society. Generally, campus incubators are widely perceived as platforms providing a nurturing environment for new business ventures and business start-ups that stem from ideas generated and developed by university undergraduate and graduate students (Kamel 2013a). To support such a growing community, some universities, in addition to developing an incubator, either open offices to support entrepreneurship or establish technology tracking offices that are focused on promoting innovation and helping start-ups, especially those

that are technology-based. Some define the university incubators as the equivalent of a career office, where the ultimate outcome for entrepreneurs is a gateway to the marketplace with all the support, opportunities, mentorship and funding possible (Kamel 2014). Incubators could be the gateway to the marketplace with the right idea and a value proposition to the society.

Entrepreneurial universities in general are increasingly becoming essential agents in generating knowledge and innovation while capitalising on emerging ICTs. Such a mandate serves their purpose as academic institutions focused on research and education, but also supports their quest to fortify their invaluable role in knowledge creation, dissemination and transfer as well as the commercialisation of innovative ideas, especially through technology-based ventures and the creation of start-ups (Kitagawa and Robertson 2012). Universities could be teaching and researching entrepreneurship, rather than being entrepreneurial themselves in everything they do. The latter are those who really have an impact on creating the entrepreneurial culture in the society (Kamel 2014). It is not just about teaching entrepreneurship in the classroom; it is all about the case studies, extracurricular activities, the teaching method, the interaction with industry and business, and the blending of course content and the amalgamation between theory and practice. It is the mindset and the culture that need to be created and embedded in campus life (Kamel 2012).

The importance of having UBIs is invaluable for the formulation of a vision and a strategy for the promotion of innovative research in technology-based start-ups, which is becoming increasingly important in today's global competitive economies, and more important for emerging economies such as most of the African economies that are looking for a platform to make a difference and realise socio-economic development (Scaramuzzi 2002). Unlike stand-alone business incubators that mainly provide the incubation, funding and mentorship required by new business start-ups in a classical environment, the ones located on university campuses play an important role in developing solid and effective relationships between the academic establishment and different businesses and industries across the society (Kamel 2013b). UBIs are intended to link ICTs, resources and human capital to entrepreneurial talent for the objectives of accelerating the development of start-ups and consequently

accelerating the commercialisation of technology. Respectively, multiple universities around the world started establishing their incubators, providing policymakers and aspiring entrepreneurs insights into the various facility design, management policy, and value-added aspects of this emerging tool employed by some entrepreneurial universities as a strategy for supporting the development of new start-ups and helping economies at large (Kamel 2014). Such evolution needs to occur in Africa too; the potential is huge and the resources, ideas, passion and need are there.

UBIs offer many advantages, including access to university facilities, faculty, staff, mentors, library resources and student support; entrepreneurial clinics provide free advice and counselling on campus 24/7 and are often buzzing with students and mentors (Robertson and Kitagawa 2011). The growing interest in and passion for UBIs stem from the significant potential of the interdisciplinary nature of the environment that could be created from among the academic disciplines offered on campus, including business, engineering, chemistry, biotechnology, art and more, and the diverse groups of stakeholders off campus involved and engaged in the ecosystem (Kamel 2013a). In addition, the research outcome that could result from assessing the incubated start-ups becomes increasingly important for businesses, industries and entrepreneurs across different sectors in today's competitive and changing global marketplace (Manimala and Vijay 2012). The learning environment on campus provides the proper context for the creation of the entrepreneurial culture among the youth—the future leaders and entrepreneurs, the ultimate agents of change.

As early as the 1980s, more than 50 universities in the United States had established business and technology UBIs. Since then the concept has spread worldwide across different regions, with a growing number of universities funding UBIs as an integral element of the educational experience to leverage their research, teaching and service outcomes. Moreover, the partnership between universities, industries and businesses represents another effective platform that can contribute to socio-economic development, productivity and growth (Kamel 2013b). Campus incubators are a great fit for the learning process: they relate theory and practice and can effectively guide the interested students not only to become knowledgeable about entrepreneurship but also to become entrepreneurial themselves (Mian and Oswego 1996). UBIs encourage innovative new

businesses, help disseminate knowledge (which schools specialise in), and complement the teaching of entrepreneurship in the classroom by closing the gap between academia and the business world. With SMEs growing in number and impact in driving both developed and emerging economies, universities can stimulate the economy by supporting the proliferation of start-ups (Scaramuzzi 2002). This is the way to create an entrepreneurial mindset that can help create the required culture for a start-up nation, one that can have a positive impact with respect to job and wealth creation (Kamel 2012).

In general, UBIs are perceived as an important venue for research through theoretical inquiry and access to faculty and different facilities as well as for helping foster university–industry and business entrepreneurial linkages and partnerships to support the development and growth of the incubated start-ups (Mian and Oswego 1996). The model differs across different universities. Experience clearly indicates that no one size fits all. Some have accelerators that are profit-oriented, others develop their own incubators or labs that are purpose-oriented, and some establish their own centres or institutes (Robertson and Kitagawa 2011). However, the one thing all universities are focused on is leveraging their entrepreneurial education with hands-on experience that can provide their students and different stakeholders with a platform to apply theory to practice. The ultimate strategic objective is to create a societal impact on the economy and contribute to the betterment of society (Manimala and Vijay 2012).

The Entrepreneurial Ecosystem

In this pivotal time for Egypt, the notion of start-ups, a strong entrepreneurial culture and an innovative mindset is needed more than ever to become the driver and catalyst to rebuild Egypt on strong, solid and sustainable foundations. Entrepreneurship is not new to Egypt. Egyptians throughout history have been known as successful entrepreneurs across different sectors, including trading, agro-business and the textile industry, moving between provinces in Egypt and across nations in Africa, actively involved in establishing and growing businesses in different sectors. This mindset shifted some time ago, however, so that the aspiration of many

Egyptians more recently has been to work for the government or in the public sector, to secure a job with minimal risk and challenge. A culture developed in which the primary focus was on securing a safe job regardless of the opportunities that presented themselves elsewhere in the marketplace (Rizk and Kamel 2013). However, that mindset gradually started to change in the late 1990s with a growing young population that is technologically savvy, better educated, more exposed and willing to venture into the business world at a younger age. In 2008, such change started to take a more definite shape with the proliferation of business associations, organisations and business plan competitions supported by investors, mentors, local companies and multinationals (Kamel 2014).

Consequently, since 2010, more than 140 organisations in Egypt and the region were established and/or started to provide different types of support, whether financial or non-financial, to the entrepreneurial ecosystem. Several factors contributed to the change, including, but not limited to, an average population growth rate of 2.1 % per annum in Egypt, in a population of 85 million that is overwhelmingly young, with 58 % under the age of 25, coupled with a growing belief that the nation's future can only be improved with a more agile and competitive private sector (Kamel 2011). Moreover, the change was also assisted by the growing diffusion of ICT usage and increasing investment in entrepreneurial awareness campaigns and educational and training programmes. Accordingly, over the last decade many cases have emerged in Africa of promising entrepreneurs who have great ideas for start-ups that can have positive implications for the societies of the region. Given the demographics of Africa, and with a growing and young population increasingly exposed through various technology and social media platforms, there is no shortage of ideas that can spawn start-ups in different sectors and industries such as health, environment, tourism, education, agriculture, energy, recycling, music, entertainment and more.

In Egypt, the government has developed several strategies to encourage entrepreneurship. They include training programmes, financing opportunities and technical support (Hattab 2010). Rules and regulations have also seen some shifts. Regarding the ease of doing business, Egypt was considered one of the top global reformers when it came to simplification of administrative work in 2007 (OECD 2009). For example, the

creation of 'one-stop shops' to consolidate government services in one location have helped streamline and facilitate the process of starting a new business (IBRD 2012). However, most of these reforms have targeted large investors and corporations, rather than small start-up companies. The government has also supported entrepreneurship (albeit mostly SMEs, rather than high-growth innovative entrepreneurship) through financial opportunities. For example, public banks such as the National Bank of Egypt, Banque du Caire, Banque Misr and the Bank of Alexandria have created departments to address the particular needs of SMEs (AFDB 2009). Moreover, the Social Fund for Development and the Industrial Modernization Center, both quasi-governmental entities, have created SME support programmes (AFDB 2009). Looking at the entrepreneurial ecosystem holistically, El Dahshan, Tolba and Badreldin (2010) identified some of the most active organisations in Egypt that support entrepreneurship. These organisations include the Information Technology Industry Development Agency (ITIDA), the Middle East Council for Small Business and Entrepreneurship, Nahdet El Mahrousa, Ashoka, Entrepreneurs Business Forum, Endeavor, Alashanek ya Baladi, the Egyptian Junior Business Association, the American University in Cairo and the Center for Entrepreneurship at Cairo University. There are also many others including Cairo Angels and the American Chamber of Commerce in Egypt. However, this is a dynamic space that needs to be monitored on a regular basis given its fluid nature and the continuous changes that take place as players come on board or leave the ecosystem. The American University in Cairo since 2009 has tried to help build the entrepreneurial ecosystem by engaging different players and becoming their educational partners, and by bringing everyone together to contribute what can really be a game changer for Egypt.

Building a University-Based Entrepreneurial Ecosystem: The Case of the AUC Venture Lab

Within the context of emerging economies, UBIs are gradually growing in numbers to cater for the needs of their societies, especially those with demographics that are predominantly young and that are interested in

establishing a solid, diverse and competitive private sector. In the case of Egypt, entrepreneurship and investment in human capital for the creation of a competitive private sector is key. There is a youth population that is interested in creating a start-up culture that could transform the society (Kamel 2014).

Therefore, in 2013, the American University in Cairo (AUC) organised the soft launch of the first full-fledged UBI in Egypt—the Venture Lab (V-Lab), aiming to translate technologies and innovations developed by selected start-ups across the country into commercially viable ventures. The V-Lab is managed by the Entrepreneurship and Innovation Program (EIP) of the AUC School of Business, established in 2010 as part of the school's 2010–2015 strategy aimed at promoting and supporting a growing entrepreneurial culture in Egypt. The strategy was focused on helping to create an entrepreneurial culture supported by three distinct pillars: innovation, leadership and responsible business (Ismail and Kamel 2013). EIP was transformed in 2014 into the Center for Entrepreneurship and Innovation (CEI), which identifies and assists mentors, as well as incubates, connects and supports talented youth and facilitates their success beyond AUC, into Egypt, Africa and the Middle East. The V-Lab capitalises on the resources and reach of the university at large and its state-of-the-art campus facilities in terms of people, knowledge and technology infrastructure (Ismail and Kamel 2013).

At the early stages of building the EIP ecosystem, discussions and meetings were held with various stakeholders sharing a common entrepreneurial passion. These conversations involved faculty, students, alumni and business leaders with specific interest in the area. To formalise these discussions, the school established the Entrepreneurship and Innovation Council to act as an advisory body, which had among its members faculty and business leaders with an interest in entrepreneurship. Over time, they became judges and mentors in competitions, acted as angel investors and provided advice in designing the various EIP programmes and activities. EIP also established a network of practitioners, business executives and academics interested in mentoring and coaching entrepreneurs at various stages of their start-up journeys (Ismail and Kamel 2013). EIP takes a comprehensive ecosystem approach in designing its action framework, focusing its activities on six key areas: entrepreneurs, ideas, networks,

mentors, funding and start-up ventures. The programme focuses especially on partnerships with other organisations associated with entrepreneurship to implement its activities. Table 3.1 demonstrates the primary focus areas of the framework. Working with young entrepreneurs highlighted the need for providing additional in-depth services to serious early-stage entrepreneurs/start-ups as they worked through their business modelling and planning, fundraising, and setting up their operations and partnerships. These services are best provided to a smaller number of start-ups through an acceleration/incubation programme. This provided the motivation to expand the scope of the entrepreneurship ecosystem at AUC by establishing the AUC V-Lab, as already indicated.

Since 2008, EIP activities have supported more than 5,000 entrepreneurs from several provinces in Egypt including Cairo, Giza, Mansoura, Alexandria and Aswan as well as from other countries in MENA such as Lebanon and the United Arab Emirates. Since its inception, EIP positioned itself in the entrepreneurship ecosystem as the educational partner, becoming the primary platform for knowledge sharing and dissemination in the space of entrepreneurship and innovation and collaborating with the different main stakeholders in the ecosystem, including Injaz Egypt, Flat6Labs, Endeavor Egypt, Enactus and others. As indicated previously, AUC V-Lab, as a university-based incubator, was established to provide in-depth support services for a small number of serious entrepreneurs and their start-ups. The findings from background research conducted on start-ups in Egypt demonstrated that there is a huge 'white space' in the market (Ismail and Abdallah 2013). Many start-ups were in need of services that could easily be offered by a university-based incubator, such as mentorship and coaching, networking and connections, and access to university facilities, faculty and students.

The business model of the V-lab was based on research on other university-based incubators in the world (Ismail and Abdallah 2013). This provided insights into the various business models of university-based incubators, which helped shape the V-Lab business model. Globally, for example, universities tended to select companies that matched their own internal competencies. Many indicated a significant interest in technology, and the time period between affiliation and incubation ranged from several months to several years. Many also offered

Table 3.1 EIP primary focus areas

Focus area	Description
Entrepreneurs	Raising awareness about entrepreneurship among different participants. They vary in terms of education, demographics, socio-economic background and age group. This stage acts as a catalyst for start-up team formation and exposes the entrepreneurs to the venture process and the entrepreneurial ecosystem
Ideas	Generating attractive ideas, conceptualising business opportunities and developing business plans; all responding to market needs in Egypt. Leadership panels, partnerships with incubators and summer camps represent the major activities of this area
Network creation	Collaborating with 28 universities, companies and international institutions and the involvement of business executives from a variety of sectors where participants are exposed to real-life examples of entrepreneurship. Meetings and discussions are carried out between like-minded entrepreneurs, industry experts and local leaders
Mentorship	Coaching and mentoring potential entrepreneurs through the development of their business plans and launch of their start-ups. Furthermore, mentors provide internships in start-ups. The mentoring process is done through the university mentors' network, and supported by faculty advice, workshops and training
Start-up ventures	Encouraging entrepreneurs to seek funds. They are connected to venture capitalists, angel investors and potential investment partners. EIP also offers financial awards through start-up competitions. Consequently, some entrepreneurs are admitted to business incubators and others are assisted in promoting their ideas to the market. This is done by connecting start-ups to incubators and accelerators, supporting incubated start-ups in partner organisations or providing visibility and access to start-ups

multiple incubator types and stages, allowing a diversity of entrepreneurs to enter their programmes. Compared to the United States, emerging market programmes tended to offer longer incubation periods (up to 18 months), and university faculty also tended to demonstrate a more intimate, one-on-one relationship with the incubated entrepreneurs. It was also found that short-term incubators were a double-edged sword: on the one hand, they might push entrepreneurs to get their products to market more quickly, but they might also rush products that need

more time to develop (Ismail and Shabana 2013). AUC V-Lab was established to operate in addition to all the above-mentioned EIP activities and programmes, and offers a few serious entrepreneurs a variety of services aimed at assisting the start-up process, increasing business survival rates and providing avenues for access to funding from angel investors, venture capitalists or other sources. The V-Lab utilises the university's capabilities (knowledge, faculty, staff, facilities, space, brand name and services) to help companies with strong growth potential launch successfully. AUC V-Lab offers workspace, facilities including the library, as well as engineering, multimedia, and technical labs, funding, business skills training, seminars, business plan competitions, networking events, mentorship, coaching, and assistance through professional services such as human resources, recruitment, communication, marketing and legal assistance. In addition to access to faculty members, students and facilities of the university, but also unique to the V-Lab, is access to students for product testing, class projects and internships. Moreover, the V-Lab organises two regular events: a weekly event where the university community is invited to meet the start-ups and give feedback on the products or services, as well as a biweekly event where mentors are invited to share experiences, both successes and failures, with the entrepreneurs of the start-ups being incubated.

To date, multiple rounds have been completed, with over 23 start-ups incubated since the inception of the V-Lab. Initially, over 500 applications were presented, but only the short-listed start-ups were given around US$3,000 each, in return for zero equity. The incubation cycle is designed to last for eight months. The initial cycle included six start-ups from diverse sectors with products ranging from wearable gadgets to mobile applications. The V-Lab is funded through sponsorships and the school budget. UBIs are usually sponsored by different businesses and industries. In the case of the V-Lab, SODIC, one of the leading real estate development companies in Egypt, and the Arab African International Bank (AAIB) are the primary sponsors. It is important to have earmarked sponsors to provide sustainable financial support to the start-ups in their initial phase. The V-Lab enables the entrepreneurs of the incubated start-ups to capitalise on AUC's world-class facilities and knowledge base, connecting them to the university's alumni network and fostering a thriving

ecosystem of innovation, education and business. The V-Lab provides a space for young, passionate and promising Egyptian entrepreneurs to develop innovative business ideas and solutions to some of the most pressing problems in the community. Participants are not supposed to be primarily AUC students, since the model was developed from the start to serve Egypt's young and promising entrepreneurs regardless of where they are from. In that context, AUC is determined to provide the mentorship and support network that will give these talented young people an opportunity to make their dreams a reality. UBIs are established to empower entrepreneurs and foster innovation in an attempt to contribute to socio-economic development through the creation of jobs, and if the proposed ideas can be translated into successful products and services, the economy will be in much better shape (Scaramuzzi 2002). Innovation and entrepreneurship can be a key driver for competitiveness of the economy and for accelerating inclusive economic growth. In that sense, this is exactly what the V-Lab was established to realise, with an additional mission to help fill the existing gaps in the emerging entrepreneurial ecosystem in Egypt. One of the primary strategic objectives is to capitalise on AUC's intellectual capital and world-class resources, select a few high-potential innovative start-ups and help transform these teams into scalable start-ups.

A number of promising start-ups were incubated during the early incubation cycles, including Mubser, a technology-based start-up providing cutting-edge technology for the visually impaired around the world through a wearable gadget that can be integrated into a smartphone or through the device's customised pocket computer. With the help of algorithms, it can detect the obstacles in front of the user and notify him/her through a vibration bracelet in the user's hand and/or through a Bluetooth headset in the user's ear. It is important to note that in 2013, Mubser won first place in the ICT track at the Idea to Product competition held in Brazil. Other start-ups incubated at the V-Lab covered ideas related to media and news, edutainment, transportation logistics and textiles. A number of the V-Lab incubated start-ups and their founders have been recognised by a variety of international awards, including candidates among the 30 most promising young entrepreneurs in Africa by Forbes. While UBIs are popping up everywhere,

AUC's programme seems to be the first incubator in the region to support entrepreneurs across the community. While some are limited to specific technologies, others only serve their own students. The V-lab prides itself on being open to entrepreneurs from across Egypt. With several different models on which to base the V-Lab operations, the key here is to find a strategy that is right for Egypt, one that can help bring the different stakeholders in the ecosystem together and help realise a scalable and sustainable impact.

The V-lab has adopted best practices from global university and private incubators alike, but the team is forging ahead with their own adapted and localised model, one that can help optimally realise the strategic objectives it was initially created for. The longer incubation option, welcoming applications from across the country and two start-up competitions a year are all elements that the AUC School of Business has chosen in order to maximise its ability to support job creation in Egypt. The model is gradually being adapted with continuous efforts to improve the management and governance structure. To assess the success of the V-Lab, the university has developed a number of key performance indicators (KPIs). The main indicators of success are the number of start-ups the V-Lab creates in addition to the number of entrepreneurs trained through the V-Lab learning programme, the number of start-ups incubated and supported by services offered, and the number of start-ups able to access funding (and the amount of funding) as a result of the V-Lab incubation.

In 2013, a new Swedish organisation was established to provide international ranking for university-based incubators and to help establish standards and best practices for their operations. UBI Index ubi-global.com provides benchmarking and best practice sharing services to university-based incubators, as well as advice to corporations and governments on how to best support these programmes. In 2014, AUC V-Lab was selected as one of the five most promising university incubators in Africa, based on the first round of incubation. As V-Lab develops its programmes, it is learning from the benchmarking exercise and also joining an international network of peers. It is important to note that UBIs are increasingly becoming the ultimate resource base and the most convenient environment conducive to the development of successful technology-based start-ups and hence promoting technology-based

entrepreneurship. However, there are issues that remain of primary importance for continuous research, relating to different entrepreneurial elements in the equation: the individual, the process, the organisation and the environment.

The experience of the V-Lab resulted in a number of accumulated experiences that could be summarised in the following: (a) the importance of using partnership models when collaborating with different stakeholders in the ecosystem including the venture capital funds, the angel investor networks, and the providers of training and professional development including non-profit organisations is a critical success factor; (b) the importance of building on the resources and facilities on campus, including utilising available services across the university such as faculty, labs, research centres and students and focusing on areas where the start-ups could benefit from being incubated within a university, is invaluable. For example, the first two start-ups incubated at the V-Lab were created by AUC professors and alumni; both were based on innovations in science and engineering in the areas of biotechnology and solar energy. In each case, the start-up was working with AUC students to improve their business plan, implement marketing research, conduct additional technical research and connect with the AUC network of funders and mentors. Through this integration with the university, these start-ups benefited tremendously and contributed to both university and students. This relationship makes a university-based incubator distinctive from any off-campus incubator; (c) the use of an iterative experimental approach in growing the scope of activities, by creating awareness about entrepreneurship across the campus among faculty, students and alumni, followed by the creation of partnerships with key actors in the ecosystem and expansion of the number of activities, followed by the phase of building the UBI, then creating a vehicle to fund the incubated start-ups. Such an approach provides the ability to experiment and learn, to build a stronger network with key stakeholders and to invest the resources efficiently; (d) the creation of locally engaged stakeholders helps build a solid support base and lay a foundation for long-term sustainability. Individuals and institutions who are engaged in the process, whether they are from within or outside the university, tend to have greater interest (Ismail and Kamel 2013). These stakeholders become

strong long-term supporters of the UBI, which is invaluable for a scalable and sustainable impact on the entrepreneurial ecosystem coupled with the invaluable role that entrepreneurs play in advancing a country's economy (AFDB 2009), which in many ways points to the important role of universities in fostering and promoting an ecosystem for innovation and entrepreneurship.

The V-Lab Business Model

The V-Lab targets start-ups after the idea stage and prior to entering the market. This phase fits well with the university-based incubator model, as at this point entrepreneurs have a general idea of what their product or service will look like and a prototype or pilot, but still require a significant amount of technical and business support. Start-ups entering the programme must have or be working on a prototype, pilot or proof of concept for their product or service. The V-Lab is sector-agnostic, but requires that entrepreneurs have an innovative approach to solving or filling existing demand with a unique value proposition. Through its partners, the V-Lab has reached out to students in all 17 public universities in Egypt to ensure a diverse and interesting pool of applicants. Start-ups go through a rigid two-month selection process that includes a detailed application, initial presentations and finally the pitching of ideas to a panel of seasoned entrepreneurs and investors. The selection criteria cover three main areas: firstly, the business opportunity or idea must be original, impact on a problem, fill a market gap, be innovative and fit with the V-Lab service offerings; secondly, the business must have passed the idea stage and have developed a prototype, and the viability of its revenue model and cash burning rate will be examined; thirdly, the entrepreneur must demonstrate commitment to the business, managerial capabilities and an acceptance of feedback. The selection process is designed to add value to the entrepreneurs, even if they are not selected for incubation. Before the final presentations on demo day, all companies are required to attend an interactive training programme that focuses on building business skills. This also enables the V-Lab to work closely with each

entrepreneur and evaluate his or her talents, abilities and motivation. The programme is designed and led by AUC faculty, business practitioners and executives selected from our mentors' network.

Based on the selection process, start-ups are admitted into a four-month acceleration programme. During this period, the V-Lab educates start-ups on basic business skills, works with them to finalise business models and develop functioning prototypes of products or services, and connects them to business leaders and mentors. A 'start-up boot camp' training programme explores basics business principles, as coaching and mentorship is offered in tandem. Facilities including labs, theatres and mass communications are offered, as well as workspaces. Entrepreneurs are offered help in recruiting other students, especially interns, to join their projects. The acceleration phase provides training to students in five areas of business management. Firstly, they are taught the basics of planning a business, including the business model, market, product and value proposition. They are introduced to project planning tools and taught how to create a business plan. The second aspect involves developing a 'product that works'. Next, launching that product requires skills in marketing, advertising and sales. Financial management explores aspects such as equity management, financing, budget and cash flow management, as well as accounting and taxes. Finally, training on 'organising for growth' helps start-ups learn how to manage people, as well as organisational values/culture, in an early-stage organisation. Upon finishing the four-month cycle, start-ups are expected to have a finalised business plan, a working product or prototype and a financial plan.

The coaching programme supports the team in areas that do not require deep expertise but rather general management experience. Coaches are selected based on expressed interest, as well as matching during events (for example, speed mentoring). Each start-up is assigned one coach, who is asked to meet with them frequently. Coaches are generally individuals with relevant work experience and a deep interest in the company's idea/business model. They also should have the capability to pitch and/or defend the idea in front of investors. Speaking and networking events are also held on a regular basis. These are open to outside entrepreneurs, and include pitches, speed mentoring, sharing of success

stories and relevant topic-based speeches. In addition, AUC V-Lab assists with fundraising by providing access to an angel network and support in negotiating deals. Promising start-ups may be offered an additional nine-month 'incubation' period. This primarily involves customised support for the start-up, such as workspace, use of facilities and guidance. Entrepreneurs may be advised on human resources and legal support and participate in three- to nine-month mentorship programmes. Table 3.2 lists a sample of the start-ups that have been incubated since the establishment of the V-Lab.

Table 3.2 Sample profile of AUC venture lab start-ups

D-Kimia is the first biotech spin-off from AUC Labs. Based on knowledge, research and technologies developed at AUC, D-Kimia develops novel and affordable diagnostic solutions to detect a broad range of diseases, initially focusing on the identification of the hepatitis C virus
KarmSolar is dedicated to providing innovative off-grid solar energy solutions that are commercially viable and easy to use in the agricultural, industrial and business sectors. Through developing unique approaches to each project, we develop systems that harness the power of the sun and replace diesel-powered processes, thereby producing energy that is affordable, stable, reliable and environmentally friendly
Mubser develops wearable tech to aid visually impaired people in their everyday lives. Mubser's pilot product, Sensify, coordinates the user's smartphone or Mubser pocket computer to detect obstacles and notify the user through vibrations on a bracelet and a Bluetooth headset
Bus Pooling is a subscription-based bus service that transports commuters between home and work. After receiving a request, Bus Pooling matches individuals living in the same area who share the same work location and hours, and supplies a bus and schedule customised to meet their needs
Kashef Labs is developing a ground-penetrating radar capable of detecting the many landmines left by the Axis forces in WWII on Egypt's borderlands. Using an unmanned aerial surveillance tool that is lightweight and utilises minimal power, the radar flies one meter above desert rock and sand to scan the ground
Jozour is working on producing wooden panels from date palm midribs using innovative and unique machines. We design and manufacture our own machines. We also develop different types of wooden boards to be supplied to furniture manufacturers and interior designers
Creative Bits applications provide snowball technology to help people create electronic applications and provides an E-robot kits to teach children programming, electronics and to make their own toys

Conclusion

Based on interviews with the EIP and V-Lab teams, programme beneficiaries and entrepreneurs, four key lessons learned were identified. Firstly, it is very important to use a partnership model to collaborate with other players in the ecosystem. This ensures that synergies are established with outsiders while strengthening the ecosystem. Secondly, it is critical to build on the assets and strengths of universities in designing the programme and establishing the incubator. For example, there is a need to focus on areas where there is interaction between the incubated start-ups, outside students and faculty. In addition, there is a need to link start-ups with the university facilities, labs and services. Thirdly, it is advisable to use an experimental/gradual approach, for example, starting with a small number of start-ups and focusing on their growth. Finally, the creation of local stakeholders within and outside the university is an important factor for the success of the programme.

Partnerships form a base of supporters and stakeholders who care about the programme and seek its success, which is critical in overcoming many of the challenges and risks associated with operating in emerging markets. The V-Lab has developed a number of KPIs to measure its performance and impact. The main KPI is the number of successful start-ups the V-Lab will create; however, additional indicators include the number of entrepreneurs trained, the number of start-up ventures incubated and supported by the V-Lab services, and the percentage of start-ups that access funding (and the amount of that funding) as a result of being incubated. Mentors' ability to link entrepreneurs with business executives and entrepreneurs, as well as the creation of partnerships between start-ups, business, government and educational institutions, are additional indicators of success. Despite the important role of UBIs in initiating new ventures and in part in sustaining start-ups, entrepreneurs must learn not only how to survive, but also how to sustain and scale up on their own.

ICT is transforming the global economy and creating new networks that cross cultures as well as great distances. The progress made by many African nations has been remarkable, but they are still a long way from reaching a competitive stage with the rest of the world on a more scalable level. The transformation from the formulation of policies and directions

to the implementation and institutionalisation of such programmes and projects represents the greatest challenge to strategically deploying ICT in the African continent. Exciting times are coming Africa's way with the changing leadership in the continent. The new leadership is moving the continent forward by helping individuals and organisations achieve their potential by having business take the lead.

One of the most important roles to be played in the information age will be the collaboration among different stakeholders, including the government, the private sector and civil society. This role will be determined by how governance will be exercised in the information-based world. In that respect, while the framework has yet to be defined, information society services will probably be provided by the private sector, with governments providing a supporting regulatory framework based on greater public participation and consensus. Development of the information society in Africa cannot be left to market forces; it deserves and needs the attention of the highest political decision-makers. Thus, nations should prioritise information needs for business and socio-economic development in the same way they do for different sectors such as industry, agriculture and health. Consequently, governments have a responsibility to take a strategic view in facing the coming information-intensive world. These strategies should include creating a shared vision of the new communication era, intensifying the process of information acculturation, developing the required human capacities and accelerating the development of the communications infrastructure. The integration of information, communication and computing developments with other social and economic policy goals is one of the priority issues globally. Table 3.3 demonstrates the path to building a start-up Africa.

African nations will have different priorities in the transformation process and in the use of information for socio-economic and cultural development. These priorities will change over time. However, success in achieving pervasive development lies in the proper design and delivery of applications that would fit the needs and requirements of the sectors targeted. In any case, special attention would have to be directed to human and professional development, especially to the skills and knowledge needed to provide employment in an information society and the incentives needed to provide both the ability and the willingness for

Table 3.3 Start-up Africa matrix

Aiming at	Sustainability	Social impact	Economic impact	Scalability	Nurturing agents of change
Driven by	Youth/passion	Information/ communication technology	Untapped opportunities	Creative minds/ innovative solutions	Building a start-up culture
Focused on	Responsible business	Ethics	Education/ vocational training	Leadership/ governance	Building a start-up community
Targeting	Entrepreneurship	SMEs/start-ups	What really counts is 'human capital'	Innovation is key	**Building a start-up Africa**

citizens to participate in an information society. Unless these prerequisites are available and efficiently maintained, the information society will not yield its targeted objectives. Africa should focus on its youth, be driven by innovation and entrepreneurship, and invest in its future leaders—those who will make a difference and transform society. These are most likely to be those capitalising on the power of technology who are at the same time knowledgeable and have access to timely, relevant and accurate data.

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