Working Papers Showcase on Green Entrepreneurship in SA

19 FEBRUARY 2019

Gordon Institute of Business Science
Entrepreneurship Development Academy

J.P.Morgan

Contents

Foreword

Entrepreneurs play an important role in bringing new goods and services to enable the essential greening of our world. Fostering entrepreneurship is core to our GIBS vision to enable African prosperity. Our Entrepreneurship Development Academy is dedicated to not only serving the needs of current and prospective entrepreneurs, but also to developing thought leadership about entrepreneurship in our African context. Generous funding from J.P. Morgan has enabled us to offer developmental initiatives to entrepreneurs in the green economy and to also conduct research in this domain. It's a pleasure to introduce two recently authored thought leadership pieces. The first working paper authored by Dr Mira Slavova showcases how green energy contributes to the creation of shared value. In the second piece, Doctors Anastacia Mamobolo and Kerrin Myers report on the results from a study on skills development of green entrepreneurs.

I would like to take this opportunity to thank J.P. Morgan for their support. I trust you will find value in these contributions.

NICOLA KLEYN
DEAN: Gordon Institute of Business Science

Introduction

For South Africa, the green economy presents a sustainable development path geared towards economic growth with a central focus on investments, employment and skills development, while facilitating positive social and economic outcomes. This is echoed in the National Development Plan (NDP) which aims to reduce inequality, unemployment and poverty, while simultaneously transitioning the country to a just society and a low-carbon and climate-resilient economy.

Within the context of a national thrust towards growing the green economy, as well as increasing demand from consumers for more environmentally friendly goods and services, green entrepreneurship is emerging as a growing movement, especially among young and emerging entrepreneurs.

The GIBS Entrepreneurship Development Academy (EDA) has had the privilege of partnering with J.P. Morgan in deploying four training programmes for entrepreneurs in the green economy, with the first of these commencing in 2016. Alongside funding allocated to practical business training and mentorship programmes, the J.P. Morgan Foundation also made funds available for research to be conducted by GIBS in the area of green entrepreneurship in South Africa. It is our great pleasure to present the findings of these studies in this publication. We hope that both theoretical and practical outcomes that can bolster the local green economy emerge from these studies, and that the results of these research endeavours may catalyse both dialogue and targeted action that will propel the South African green economy forward.

We wish to extend our thanks and appreciation to the J.P. Morgan Foundation for enabling this work. We would also like to acknowledge the contributions made by the researchers, Dr Mira Slavova, Dr Anastacia Mamabolo and Dr Kerrin Myres.

MIRANDA SIMRIE
Director: Entrepreneurship Development Academy, GIBS

Shared Value through Energy Entrepreneurship in South Africa

DR MIRA SLAVOVA

Background

Historical setting

Energy entrepreneurship and renewable energy generation have a long history in South Africa. *See Table 1.* As early as the 1800s, the extensive energy needs of mining operators in the country were being met by a number of independent power companies, often relying on hydroelectric power generation. For example, the privately-owned Victoria Falls Power Company was set up in 1906 and it remained the leading supplier for the mining sector until its nationalization. The Electricity Supply Commission of South Africa (Escom) was established in 1923 in order to coordinate the generation and the distribution of the electricity. In later years, during the age of Apartheid, Escom was to become state-owned and to gain a monopoly over generation, transmission and provision of electricity.

In South Africa, electricity has also always been seen as an issue of social significance. In the Electricity Act (No. 42 of 1922) electricity was seen as a good provided in the public interest. The Act specified that the Escom should operate 'neither at a profit nor at a loss'. During the years of Apartheid, efforts were set in place to extend electricity provision to the black majority of the population leading up to a constitutional provision for entitlement to electricity for the indigenous population (McDonald, 2008). With the downfall of the apartheid regime, Eskom took up the mandate of expanding electrification to the previously marginalised. Its non-profit status was maintained until the later years of Apartheid, when reforms started impacting the electricity sector. The Eskom Act of 1987 not only changed the name of the company but it also marked a move towards strengthening its market orientation. The Act embarked on the corporatisation of Eskom by acknowledging that consumers' electricity needs will 'be satisfied in the most cost-effective manner, subject to resource constraints and the national interest'. Nonetheless, the strong social functions of Eskom and electricity provision in South Africa have persisted. For example, in 2003 the introduction of 50kWh of free basic electricity for indigent households was launched by the government[1]. Free basic electricity is delivered to households through agreements between Eskom and municipalities.

1 http://www.eskom.co.za/news/Pages/Apr18.aspx

Energy crises

After the end of Apartheid, South Africa enjoyed a healthy surplus in power generation capacity. Eskom operations involved carbon-intensive generation of electricity, integrated with the management of the transmission network and the distribution of electricity to municipalities and direct customers. In the period between 2003 and 2005, the electricity reserve margin in the country started shrinking and it became evident that Eskom will not be able to meet demand. Thus, load shifting initiatives focused on municipal ripple control and industrial load control started being introduced (Frost and Sullivan, 2010). Several energy-efficiency initiatives were launched to address the energy shortage. For example, there were large-scale rollouts of compact fluorescent lights (CFL) in the residential sector, and a power alert system was introduced to inform the population of the severity of energy shortage.

In the later months of 2007, South Africa started experiencing its first 'load-shedding crisis' where electricity generation fell behind demand, resulting in widespread rolling blackouts. Estimates of the financial impact of this crisis on the South African economy come up to ZAR 50 billion[2]. Meanwhile, the National Energy Act 34 of 2008 committed the government of South Africa to developing ways for increasing access to energy and access to free electricity. As the crisis was attributed to insufficient generation capacity and the aging generation fleet, Eskom urgently sought to increase its generation capacity. Two new generation units were commissioned at Medupi in Limpopo province and at Kusile in Mpumalanga Province, near the country's coal supplies. The construction both power stations has ran over time and over budget[3]. With an urgent need to secure energy generation, the government of South Africa turned to renewable energy as a solution. In-line with National Development Plan 2030 (NDP) and the Integrated Resources Plan (IRP), the objectives to renewable energy policies emphasized diversification of energy generation, improved energy security and reduction of carbon emissions.

In 2011 the Department of Energy (DoE) and Eskom established the Renewable Energy Independent Power Producer Procurement (REIPPP) programme. Most of the resulting new renewable installed capacity is supplied by Independent Power Producers (IPPs), who are classified as entrepreneurs in the South African energy industry. As Eskom has remained the single buyer of the generated electricity, entrepreneurs have not been able to access the transmission and distribution segments. As of April 2018, approximately 3 500 MW (installed capacity) of renewable (solar PV, solar CSP, wind and biomass) energy were being fed into the national grid (Deloitte, 2017). Nonetheless, in recent years the country has continued to be plagued by energy crises. Those have included more load-shedding (2014- 2015) as well as over supply (2016). The recurrent crises, coupled with elevated levels of electricity theft and non-payment, as well as many customers going off-the-grid; have severely damaged Eskom's profitability. Eskom has had to increase its prices, amid decreasing revenues – a phenomenon described by Costello and Hemphill (2014) as a "death spiral".

At the end of 2018, Eskom has had to face a new load-shedding crisis. The reasons behind it include a perfect storm of state capture, poor infrastructure, untrustworthy contractors, lack of coal, and equipment breakdowns[4][5]. While Eskom has announced organisational changes to avoid collapse[6], many commentators have suggested that this is the beginning of the end of Eskom's monopoly[7]. In fact, the Democratic Alliance has brought to parliament a bill from 2011, proposing the set up of an Independent System and Market Operator (ISMO)[8]. Thus, leading to the deregulation of the industry. The proposed liberalization of the energy market, and the emergence of cheaper renewable energy alternatives have opened the sector for entrepreneurship. In the South African energy sector, opportunities to enter the highly regulated energy market are opening up to a much broader and diverse set of stakeholders (e.g. municipalities, technology consultancies, and independent power producers i.e. IPPs).

As the brief historic overview of the energy sector in South Africa illustrates, there is a deep-seated concern in this sector with delivering social value. As the liberalization agenda is under way, we set out to understand how such concerns are replicated in the private sector by exploring the notion of shared value. Shared value is defined as "policies and operating principles that enhance the competitiveness of a company while simultaneously advancing the economic and social condition in the communities in which it operates" (Porter & Kramer, 2011).

As the brief historic overview of the energy sector in South Africa illustrates, there is a deep-seated concern in this sector with delivering social value.

2 https://www.fin24.com/Companies/Industrial/The-lowdown-on-load-shedding-20130423
3 https://www.dailymaverick.co.za/article/2016-07-07-medupi-kusile-and-the-massive-costtime-overrun/#.WmY-LN-WaUk
4 http://www.702.co.za/podcasts/176/the-best-of-breakfast-with-bongani-bingwa/165654/loadshedding-eskom-hits-crisis-mode
5 https://www.timeslive.co.za/news/south-africa/2018-12-06-breakdowns-not-a-coal-shortage-is-reason-for-load-shedding-eskom/
6 https://www.iol.co.za/business-report/companies/eskom-flattens-executive-structure-to-save-troubled-utility-from-collapse-18184734
7 https://www.moneyweb.co.za/news/south-africa/the-beginning-of-the-end-of-eskoms-monopoly/
8 https://mg.co.za/article/2018-10-29-da-seeks-to-revive-old-anc-bill-to-end-eskom-monopoly

Table 1:
Brief history of events in the South African energy sector [9]

	Year	Event
Segregation: Electrification in the period of segregation. ESCOM as state regulator of private and municipal electricity generation and distribution companies.	1800s	Electrification shaped by the energy needs of the mining industry. Power stations owned by mining companies and private power companies.
	1882	Electricity first publicly supplied in South Africa when the diamond city of Kimberley switches street lights. Johannesburg (1891), Durban and Cape Town (1893).
	1906	Victoria Falls Power set up. Principal supplier of electricity to the mines until 1948.
	1922	Electricity Act (No. 42 of 1922) specifies that electricity should be provided 'in the public interest' and the Commission should operate 'neither at a profit nor at a loss'.
	1923	ESCOM is established. Supplier of electricity to the rail network and municipalities.
Apartheid: Escom becomes state monopoly over generation, transmission and provision.	1948 - 1972	Grand apartheid, years of consolidation when demand for electricity soars.
	1973	National grid and unified control room in Simmerpan.
	mid 1970s	The years of expansion and change.
Reforms: Reformed apartheid and the period after its end offer electricity for all. Corporatisation and neo-liberal restructuring. Reducing energy surplus.	1987	ESKOM Act (No. 41 of 1987) specifies that 'electricity needs of the consumer may be satisfied in the most cost-effective manner, subject to resource constraints and the national interest'.
	1994	Multiracial elections.
	1994 - 2000	Discussions of transformation, privatisation and deregulation.
	2000	Announcement of 50kWh free basic electricity to indigent households.
	2001	Eskom Conversion Act: Eskom is listed on the Johannesburg Stock Exchange.
	2003 - 2005	Energy surplus starts to diminish.
	2006	Energy efficiency initiatives of curtailment and control are launched to address the energy shortage.
The Beginning of the End? Universal access and free basic electricity. Eskom caters to growing 'shareholder value'. Recurrent shortages and pursuit of private sector engagement. Influx of renewable and smart energy technologies.	Dec 2007	First load-shedding crisis.
	2007	Construction of Kusile and Medupi coal fired power stations is initiated.
	2008	National Energy Act 34 of 2008. Integrated Energy Plan (IEP).
	2011	Renewable Energy Independent Power Producers (REIPP) program commences by the Department of Energy (DoE).
	2014 - 2015	Second load-shedding crisis.
	2016	Electricity is oversupplied , Eskom enters 'death spiral'.
	Oct 2016	South African Wind Energy Association (SAWEA) lodges a formal complaint with the National Energy Regulator of South Africa (NERSA) with respect to the refusal by Eskom to sign 37 Power Purchase Agreements (PPAs) for duly procured renewable energy supply contracts from IPPs.
	Oct 2016 – March 2018	Stalemate as Eskom refuses to sign PPAs due to oversupply.
	April 2018	Outstanding PPAs finally signed.
	Nov 2018	Eskom announces organisational changes to avoid collapse.
	Dec 2018	More load-shedding.

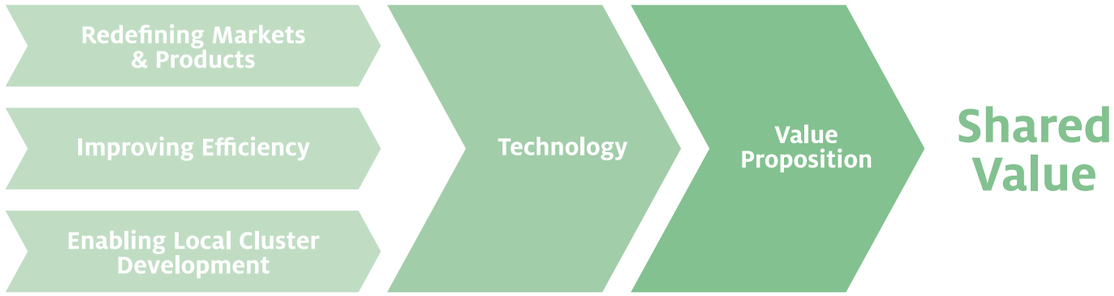
9 Using (McDonald, 2008)

Introducing Shared Value

We understand value to be relational and define it as the benefits (e.g. financial income, social inclusion, environmental impact) relative to costs (e.g. time and resources required) shared between the entrepreneurs and those affected by their ventures. The principle of shared value suggests that business actors are able to create economic value and financial gains while also generating value for society. In introducing the concept Porter and Kramer (2011) suggest that shared value can be created via three strategies: 1) reconceiving products and markets; 2) redefining productivity in the value chain; and by 3) enabling local cluster development.

In understanding energy entrepreneurship in the South African energy sector, we use the model provided in Figure 1. Firstly, we catalogue the technologies – digital and otherwise – used in delivering value. In doing so, we align the technologies used by energy entrepreneurs with the strategies for creating shared value listed above. Secondly, we set out to develop an understanding of the value propositions that entrepreneurs are able to offer their customers. By doing so we are able to understand how technology is used in capturing stakeholder value. Documenting how different technologies are used in redefining markets and products, in improving efficiency and in enabling clustering, we outline the value propositions that entrepreneurs are able to deliver. Thirdly, as energy is a far-reaching issue of social importance within the context of South Africa; we set out to trace how energy entrepreneurs generate shared value. We focus on elements of shared value such as electrification, skills development, employment, environmental rebates and benefits, worker safety and inclusiveness.

Figure 1:
Creating shared value, using (Porter & Kramer, 2011)



10 https://www.dailymaverick.co.za/article/2017-04-02-op-ed-eskoms-electricity-surplus-and-self-inflicted-death-spiral/
11 http://www.ee.co.za/article/no-end-sight-eskom-delays-signing-renewable-energy-ppas.html

Methodology

In order to study energy entrepreneurship in South Africa, we engaged with the participants in the Entrepreneurship Development Academy (EDA) program at Gordon Institute of Business Science (GIBS). We were able to access a sample of 10 entrepreneurs during the period December, 2018 – January, 2019. The interviews were conducted using a semi-structured questionnaire where participants were asked to articulate the unique value proposition of their business and how value is derived for different stakeholders (e.g. customers, business partners, communities of operation, employees). They were asked to provide evidence (e.g. testimonials, anecdotes, measurements) for their claims. Participants provided accounts of their personal stories and the actions they had to take in order to enter their current line of business. Attention was drawn to enablers and barriers to entry in the renewable energy entrepreneurship space. Furthermore, entrepreneurs described the technologies they employ – digital or otherwise -- in order to create value for their stakeholders.

Table 2:
Participants

	Full-time Employees	Date Established	Number of Shareholders	Activities
Participant 1	4	2015	5	Energy efficiency audits, solar PV installation
Participant 2	8	2015	3	Energy efficiency audits, solar PV installation
Participant 3	5	2010	1	Production and sales of solar geysers
Participant 4	1	2012	1	Energy efficiency audits, solar PV installation
Participant 5	1 - 5	2014	2	Implementing Internet of Things
Participant 6	7 - 12 full-time staff and 14 graduate interns	2012	2	Energy efficiency audits, solar PV installation
Participant 7	1 - 8 (3 drivers, 2 office, 3 roof builders)	2010	1	Transparent roofing, energy efficient lighting
Participant 8	19	2008	3	Electrification
Participant 9	2	2016	2	Energy consulting (management and efficiency), smart utility solutions
Participant 10	1	2015	1	Audit of energy saving, energy metering and measurement

Findings

Table 3 summarises the main findings from our fieldwork, and links them to the strategies for creating shared value identified by Porter & Kramer (2011). Strategies for redefining products and markets were enabled by renewable energy generation technologies, resulting in projects for the engineering, procurement and construction of renewable facilities. Strategies for improving efficiency relied on technologies such as energy-saving light bulbs, or on technologies that substituted the need for electricity power on the grid. By generating efficiency such technologies resulted in immediate financial savings. Lastly, the strategy for enabling cluster development was facilitated by digital technologies, as by using the Internet protocol they allowed diverse stakeholders to share information about energy use and energy credits. Such information fuelled emerging models for shared savings and asset management.

Table 3:
Findings overview

	Technologies	Value Propositions	Share Value
Redefining Markets & Products	Renewable energy generation & storage technologies • Solar PV • Batteries	Engineering, procurement & construction	• Electrification • Work safety & lighting • Training & skills • Employment • Local content • Local ownership / BBBEE • Environmental benefits • Crisis management
Improving Efficiency	Energy saving & energy substitution technologies • CFL & LED lights •Transparent roofing • Solar water heater	Energy efficiency	
Enabling Local Cluster Development	Energy as a digital subvertical • Internet of things • Smart meters	Shared savings & asset management	

Our findings with respect to the generation of shared value showed a range of value generated by the activities of energy entrepreneurs. The main areas where shared value emerged were electrification, training, skills and employment. Yet, there was a recognition of broader impacts such as environmental benefits and improved capacity to manage resource crises. Overall, our findings about shared value align with the assertion of one of the interviewees who insisted that *"everybody needs to play a role in the changes […] [and] everybody in the space, wherever he is, needs to be responsible in terms of addressing the issue that we're currently facing" [P7].*

We found that entrepreneurs were very aware of the social significance of the electricity sector in South Africa and were often motivated in their work by social needs and concerns. Entrepreneurs expressed regret that currently the viable segments of the market are limited to commercial, industrial and affluent residential customers, as these was not necessarily the segments where the needs were seen as most pressing:

"I want to do more projects that are driving change, less projects that are helping [rich] people save money because I believe we don't need more successful people in the world, we need to actually start solving our problems." [P5]

Technologies

Renewable Energy Generation and Storage

The market for energy generation technologies and for energy storage technologies has been booming in recent years. While the trend of falling prices for solar is well documented in the USA[12], the market in South Africa has followed similar dynamics. As the prices of solar photovoltaic units have continued to decline, entrepreneurs in South Africa have been able to leverage this technology in their businesses.

Interviewees suggested that *"around 2014/15 [the price of] solar became very attractive" [P6]* in South Africa. Consequently, companies that entered the sector afterwards have been able to deliver competitive value propositions and stay in business. Whereas previously "there was really no market" [P6]. The value propositions of companies that were active in the sector used to emphasize the environmental benefits being generated, and *"they were really selling based on how green the products were as compared to carbon emission from coal" [P6].* The price declines of solar power generation has made it available to the public:

"The quality of the stuff you're getting is a lot better and the prices have dropped enough to make it available to the general public. Whereas five years ago a solar panel would cost you 5,000 Rand, now it's 1,200-1,300 which makes it a lot more affordable for more people." [P4]

Nonetheless, there is a wide recognition that the availability of power generation technologies is not sufficient in order to adequately address energy security in the country. Entrepreneurs commented on the inclination of consumers to make emotional decisions in the space, motivated by the unreliable supply from Eskom. Nonetheless, the energy solutions currently available are not able to provide energy security as they are not fully off-grid and do not have storage capacity. Instead, they rely on the grid for back-up:

"Solar energy doesn't give you security of supply, it generates and it gives you no security of supply unless you're looking at an off-grid solution with batteries etc but you reducing your reliance on them by producing some of your own electricity and if you build it in phases you can add backup and battery banks and things and take yourself off-grid completely. And that's most of our clients' ultimate objective once battery storage becomes more feasible […]." [P2]

Only energy systems integrating sufficient energy storage capacity are able to provide secure electricity supply. This remains true at the household level, at the levels of commercial buildings and municipalities, as well as at the national level:

"Everyone can handle producing electricity […] [laughs]. But no one has been able to […] store the energy for the time that it will [be used] … The emergence of energy storage is the thing that has been the answer and not only at household level or at single commercial building level but at municipal level, at large utility national level, you need storage, you need ways to keep the energy long enough to a point whereby it's required it will be released. If we had great storage system in our grid we wouldn't be having load shedding currently." [P6]

Unfortunately, the price of storage remains prohibitive and storage is not yet seen as a good investment for the moment. Nonetheless, there is optimism that *"[the price of] all these technologies [is] actually reducing quite drastically" [P9].*

In the absence of storage capacity, entrepreneurs in the energy sector who install alternative energy generation solutions are often interested in offering their clients *"to sort of push back into the grid" [P9]* and get compensated for it. Entrepreneurs recognized that enabling feed-in tariffs can have an impact on the renewable energy sector, comparable to that of further technological improvements. Feed-in tariffs are able to increase considerably the financial viability of solar solutions:

"I mean, on the solar side if you're using the electricity five days a week your weekends are wasted because we don't have feed-in tariffs implemented in the majority of the country so if they use it five days a week or seasonally, only six months of the year or something along those lines, then the opportunities are less." [P2]

In summary, while the price of solar generation technologies has improved their accessibility; the affordability of storage solutions remains low. Furthermore, households and companies who generate excess energy are very rarely able to receive compensation for it by feeding it into the grid. Even if they are able to feed into the grid, risks of non-payment are present. This has resulted in a very risk-averse strategy in the deployment of energy generation solutions where such solutions are designed so that they meet customers' minimal requirements and do not generate excess power:

"[…] initially design it that any excess power is throttled, that it doesn't go back into the grid and you then get the benefit of everything that you produce you must use [it] internally with your customers. And then you've got no risk from the municipality or from ESKOM not paying you or not giving you the credits due." [P2]

12 https://newscenter.lbl.gov/2016/08/24/median-installed-price-solar-united-states-fell-5-12-2015/

Efficiency-Saving Technologies and Alternatives to Energy

In improving energy efficiency, entrepreneurs were open to a wide range of technologies and suggested that their technology choices are *"completely situation dependent" [P2]*. Energy efficient light bulbs were often cited by entrepreneurs as a technology used in order to improve the efficiency of customers' energy use. Entrepreneurs voiced a preference for light-emitting diode (LED) which are known to last up to 10 times longer than compact fluorescent lights (CFL), and 40 times longer than typical incandescent bulbs. The preference for LED solutions was based on their consistent performance and their short payback periods. Interviewees reported that in particular cases, replacing existing lights with LED ones is able to generate *"approximately 70% energy savings" [P9]:*

"We do, we specialise in energy efficient LED lighting. Those projects tend to have a very short payback period. We've done projects that the payback periods can be just over a year to around 2 and a half years and at the most three years." [P1]

Meanwhile, in a bid to lower demand pressures on the national power grid, Eskom has promoted CFL solutions as using up to 80% less energy than incandescent light bulbs and lasting up to 8 times longer [13]. Entrepreneurs could be highly critical of such technologies, their environmental impact and their appropriateness to the South African context.

"A couple of years ago ESKOM ran a project where they gave 31 million CFL bulbs, those compact fluorescent lights to the general public. They went out and installed them in the home. […] And initially I thought wow, this is awesome, this is, you know, such a good idea. And then I realised about halfway through the project that a giant multinational had basically sold a product that was hazardous, inefficient, expensive. Basically dumped all their stock from the rest of the world, brought it here, tied it up in a pretty bow and sold us crap." [P4]

While there was a preference for smart technologies that improved efficiency, often entrepreneurs were able to devise technologies that substituted for energy consumed from the national grid, or substituted for energy use altogether. For example, one of the enterprises offered as energy efficiency solution that consisted of the substitution of existing roof sheets with transparent roofing:

"We are providing a transparent roofing. So if you've got an existing structure we change it and do some transformation and put our own sheets […] in the living areas, […] so that during the day you won't have to light up the electricity. The light may directly access your house through the roofing." [P7]

Similarly, in another example entrepreneurs were able to substitute for energy consumed on the grid by manufacturing solar powered water heaters. Such water heaters are able to deliver savings to consumers by reducing their electricity consumption and *"generating hot water from the sun" [P3]*. Such technologies were able not only to deliver consumers *"the comfort of hot water at night" [P3]* in a situation of rolling blackouts but also it has been claimed that solar water heating systems are capable of reducing electricity bills by up to 24%.

Energy as a Digital Sub-Vertical

Even though energy entrepreneurs focused on renewable and energy efficiency technologies as best suited to the present environment in South Africa, they were fully aware of digital solutions and able to project them into the future. Developments in the world of digital technology were seen as *"the biggest improvement"* in the sector, offering *"the ability to be sitting here and knowing that your system is not working or knowing that you are getting this much energy, therefore you might not or you might want to remove your non-essentials from the grid" [P6]*. In fact, one entrepreneur was able to articulate a vision of 'smart energy' as a sub-vertical of companies' digital transformation:

"The way I see it is, you've got your Internet of Things holistic view and then within that IOT play and there's a sub-vertical under it [for] all of the different elements that make up an organisation. So […] energy [is] just one element of a bigger picture in the discussion that we're having now with the same customer." [P5]

The key role of digital technology was seen as its ability to *"turn a dumb device into a smart device" [P5]*, and to integrate energy information from different processes and devices. In doing so, digital technologies offered the capability to optimize energy generation and energy use, and to monitor via dashboards:

"[…] it can take existing [energy] intelligence tech and get them all to communicate in one protocol and structure your data and then automate the workflow. So whether it's an energy meter or whether it's a fuel generator, whether it's a gas cylinder, you can get them all to talk into one platform and manage it with predictive maintenance, predictive alerts, threshold alerts. So really just kind of normalising and structuring your data in a way that makes it usable and in a way that you can apply deep learning principles to it." [P5]

The main digital artefact that entrepreneurs were able to integrate within their value proposition was the smart meter. Entrepreneurs expressed a preference to "measure and monitor as much as possible" [P2], in order to improve energy managements. Yet, the current limitations of the human factor were acknowledged as "human beings are [not] equipped to manage energy instantaneously" [P10] and the key role of information systems going forward was recognised. Energy entrepreneurs valued smart meters because the technology facilitates energy management through very accurate measurement of energy consumption:

"the beauty part about it is the management systems that enables you to manage to extract data at any time. The end user and the supplier can assess the data and it's basically on time data so it's live information that can be seen at any point in time. Very accurate as well." [P9]

Entrepreneurs focusing on energy efficiency, shared that putting in smart meters dedicated to specific activity areas within an industrial property allowed them to *"better understand how electricity is being used" [P1]*. Furthermore, after introducing energy efficiency upgrades dedicated smart meters allowed them to account for any improvements. Otherwise, *"if you are reliant on just the one main big energy meter […], improvement gets corrupted in the noise of what's happening in the rest of the factory" [P1]*. Smart meters allowed entrepreneurs to visually display for their clients energy consumption via dashboards, so they could monitor energy use and *"identify themselves where they're peaking or where the machinery is running over weekends etc." [P2]*. Furthermore, the remote monitoring of energy use that smart meters enabled allowed entrepreneurs to deliver additional value for their clients by understanding the data and offering feedback based on their expertise.

13 https://learn.eartheasy.com/guides/energy-efficient-lighting/
14 http://www.eskom.co.za/sites/idm/Residential/Pages/FAQCFLRes.aspx

"[...] you can have pretty pictures and graphs and things but if you don't have an engineer or someone with the know-how to interpret the data things go unchecked. So our approach is to baseline the operation [...] and then look to report regularly and assist them with a plan [...], not purely, here's [a smart meter report], giving them feedback information that they choose not to use." [P2]

In addition to being key enablers for energy efficiency value propositions, smart meters were seen as vital to strengthening the financial viability of value propositions focused on renewable energy generation. Since energy meters are critical for instrumenting energy trading, the rollout of smart meter infrastructures to municipalities and residential customers, which were often inadequate for energy trading, was seen as a key obstacle. Such infrastructures often did not support feed-in tariffs and thereby failed to strengthen the incentives for households and companies to invest in renewable generation:

"A feed-in tariff has to come into place but we've got so much issues with smart meters being rolled out that aren't actually smart, [because] there's no way to reverse the charge. Also, prepaid meters are prolific in the country. It's growing daily. I mean, we've got another tender that went just out now for 236,000 smart meters to be rolled out in the city of Johannesburg. And those smart meters work off a credit system. Because tariffs are different at different times of the day it's impossible to reconcile an amount, a random amount that you can feedback or reverse to. So on the old meters those can run backwards technically but in the new meters that have just been installed it can't." [P4]

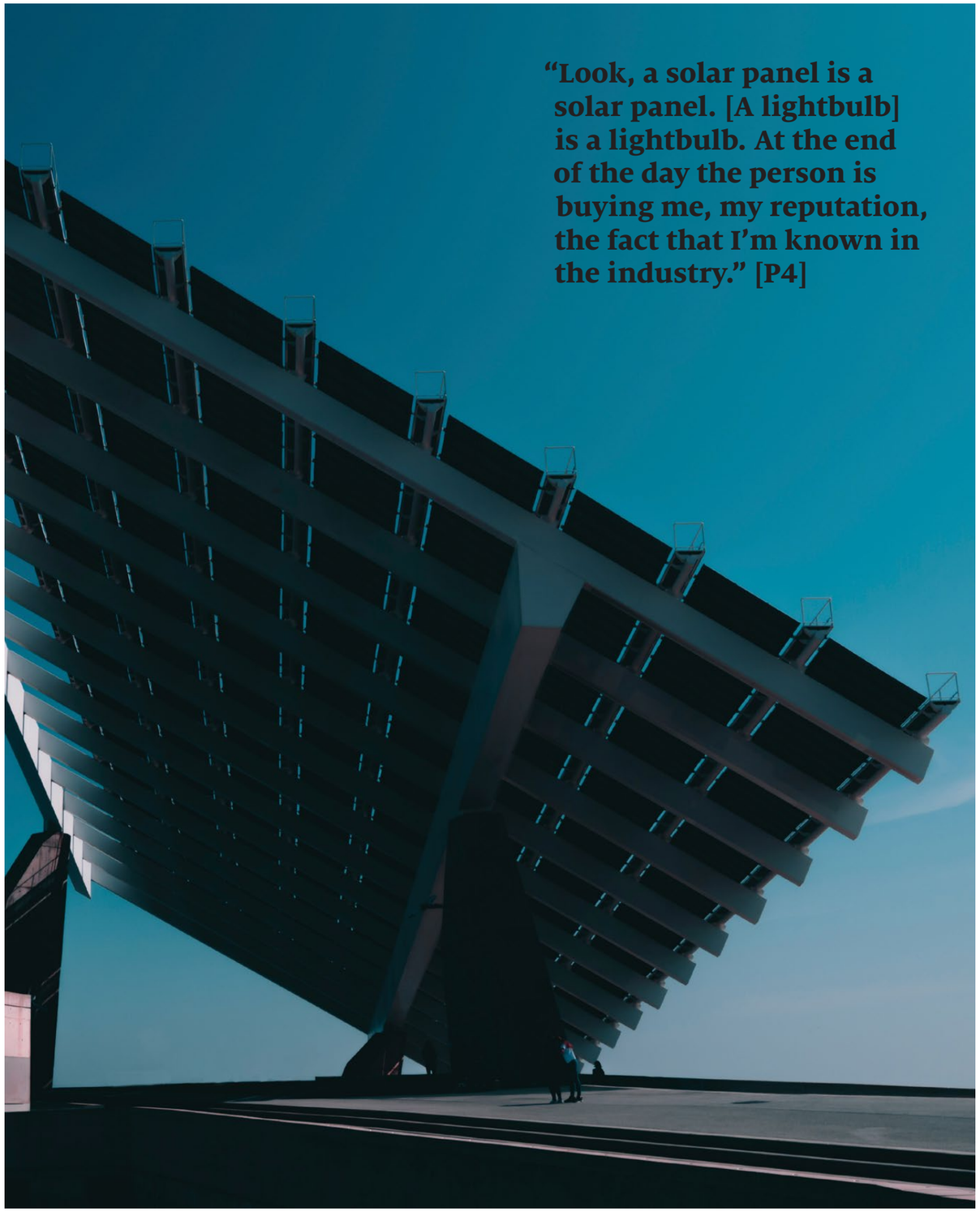
Entrepreneurs pointed to confusion in labelling prepaid meters as 'smart' and considerable lack of capacity in the country to make use of smart infrastructure. It was suggested that for the time being smart meter infrastructures are viable predominantly in the commercial and industrial sectors, and much less so in the municipal and residential space. Smart meter infrastructures were seen as viable for businesses who have shown an appetite for introducing energy management systems, smart buildings, sensors and solar solutions. The immediate potential of smart meter infrastructures was recognised in *"bigger metropoles but not the country at large." [P4]*

Value propositions

Engineering, Procurement and Construction

With the improved availability and affordability of new technologies in the energy space, one of the leading value propositions of entrepreneurs centred on the engineering, procurement and construction (EPC) of alternative energy solutions. The entrepreneurs' narratives about the gaps in the market they were addressing often followed the rise and fall in popularity of different technologies. For example, entrepreneurs started to work on developing solar solutions once *"LED bulbs started becoming more commonplace" [P4]:*

"[...] I saw another opening to go into the renewables market. And the technology has grown a lot in the last five years. [...] That's why we've seen a lot of solar, independent solar shops opening. [...] I've got a workforce that I have to keep in place so I have to keep looking for those gaps in the market where we can continue growing our business to keep the wheels turning." [P4]



In responding to the opportunities in the energy space of South Africa, entrepreneurs have often sought to create shared value by reconceiving energy products and the market for energy. Products have evolved and they have been reconfigured accordingly. For example, lighting bulbs have been reinvented through the introduction of energy-saving lighting; and geysers have been reconceived as solar-powered appliances. Similarly, while previously consumers used to be focused exclusively on buying electricity, they are increasingly looking at products for independent energy generation such as solar panels. Thus, consumers are increasingly being seen as producers or 'prosumers' due to the increased availability and affordability of alternative energy generation solutions, especially solar. Nonetheless, entrepreneurs recognised the limitations of selling new products, and saw the delivery of additional value as the core of their businesses:

"Look, a solar panel is a solar panel. [A lightbulb] is a lightbulb. At the end of the day the person is buying me, my reputation, the fact that I'm known in the industry." [P4]

While the availability of new technologies (e.g. solar panels, energy-saving lightbulbs, solar geysers, etc.) has been the main driver for such developments of the market, there is a clear understanding that 'pushing boxes is not the solution'. The value propositions of entrepreneurs are very much shaped by the quality of the installation and maintenance services they are able to provide, alongside their alternative and renewable solutions. Thus, not only products are reconceived from lightbulbs to energy saving light bulbs, from geysers to solar geysers, etc. But the market is reconceived from a market about acquiring specific appliances e.g. solar panels to a market where the appliances come with associated 'de-risking' services.

"A lot of guys got into the industry when the rolling blackouts started, thinking that it's a money racket. And you've got your fly-by-night guys that just saw that we can install 200 geysers and we can make 40,000 Rand or 400,000 Rand and Bob is your uncle. That's not the solution. […] It's giving a turnkey solution that's sustainable and that's the only reason why we're still in there, in business." [P3]

Engineering, procurement and construction initiatives can be seen as risky as the customers' outlay is immediate and the benefits are only projected into the future. As the technologies are new and developing, they are seen as risky investments. Consequently, entrepreneurs differentiated themselves in terms of quality of the workmanship and the installations. Thus, de-risking the investments is a key strategy of entrepreneurs in marketing their products and services. Entrepreneurs assured their customers by *"giving guarantees, after guarantees, after guarantees" [P6]* not only about their workmanship but also about the output performance and the financial sustainability of the systems they offer:

"[…] that has been one of the unique things that we offer. Our competition, sure, they can focus on commercial or financial models which might be better than ours but we always focus on the technical part. We guarantee the output and if you can guarantee an output then you give people peace of mind. If you come up with a cheap system, what if it doesn't work. You haven't de-risked enough." [P6]

Among the additional business drivers in the sector for alternative energy were the increased potential threat from load-shedding due to the electricity generation difficulties faced by Eskom and the rapid increase in electricity prices. The market for solar among home owners was also driven by electricity price hikes and the disturbances brought about by load-shedding.

Entrepreneurs reported that since energy prices have gone up by 60% in the last seven years it has become "really, really, really expensive to just be on the grid" [P4].

Still, even though there were multiple drivers for the market in alternative energy solutions, it also faced two significant obstacles. Firstly, the need for immediate investment meant that this space was open to only highly creditworthy individuals and businesses. The availability of financing for the procurement of such solutions was seen as insufficient. Entrepreneurs often found it necessary to expand their cash models and to offer financing opportunities for their clients. Energy enterprises were often required to provide additional services for their customers and support them in securing financing.

"So if the customer can't afford it we arrange finance for them and then they pay monthly. With ESKOM being the way it is right now the market is growing. The problem is that it's cash intensive and I think about 60% of our population is no longer credit worthy so even if they wanted to go for a financed option they wouldn't get it. So we're trying to find a balance in that model." [P4]

Secondly, entrepreneurs recognized that the implementation of renewable energy systems required as a prerequisite that energy consumption is reduced to a minimum. Thus, the high complementarity between energy efficiency solutions and the installation of alternative energy generation solution was well acknowledged. Often entrepreneurs sequentially offered both services. Unlike renewable energy installations, energy efficiency solutions often relied purely on changes in behaviour and allowed for immediate savings from clients' electricity bills. The offering of energy efficiency services was led by the recognition that both industrial and residential customers' major pain is *"actually now and immediate in terms of how much they are paying for their electricity […] and need assistance with energy saving" [P1].*

Energy Efficiency Consulting

Creating value by improving the energy efficiency of production value chains as well as the energy efficiency of electricity consumption was another value proposition that energy entrepreneurs were able to offer. Many of them explained that historically the cost of electricity in South Africa has been very low. Consequently, there has never been an incentive for producers to buy energy efficient equipment and to develop energy efficient plants and processes. Similarly, there has not been an incentive for consumers to moderate their energy use and to ensure buildings' energy efficient. The core energy efficiency value proposition of the entrepreneurs interviewed consisted of acting in a consulting capacity and providing input into energy efficiency improvement plans. Such plans delivered key immediate financial benefits such as reduced energy bills and tax rebates. The opportunity for marketing such services was shaped by the recognition of limited skills with regards to measures to improve energy efficiency. Industrial clients included enterprises with some scale who were yet not able to develop in-house process engineering or energy teams. Whereas businesses were well-informed about assessing the productivity and managing their other resources, they were often not able to assess the productivity of their energy resources:

"[…] a lot of people just pay electricity bills and don't actually understand what they're paying for and how they could use it better. […] [Efficiency] until this point has been overlooked I guess because power has been freely available and cheap in this country and now that's becoming more expensive and more of an issue it's becoming a focus area and we slot into that space." [P2]

Entrepreneurs tended to prefer the industrial market to the market of residential customers. Close relationships and detailed understandings of industrial clients' needs were essential in realizing and delivering value to them. Entrepreneurs conducted extensive research into companies who could benefit from energy efficiency services and adopted a marketing approach driven by comprehensive understandings of their needs. Meanwhile, the drivers for residential customers were less clear. While they often sought to economize on energy bills, they often placed value on subsequent conversion to renewables, being independent and going off the grid. Unfortunately, the sales cycle for such residential clients was seen as very long and laborious. Furthermore, their level of indebtedness was high and focusing on this market was seen as particularly risky.

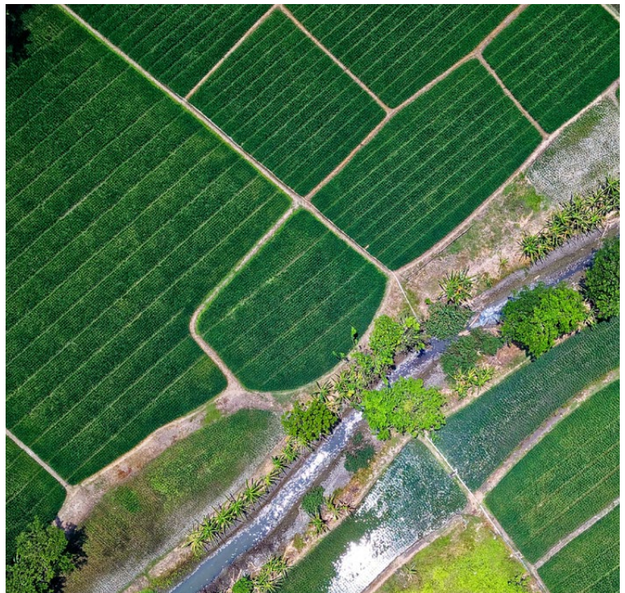
Even though entrepreneurs' personal journeys often involved highly technical backgrounds, with degrees in engineering and certifications in energy management; they consistently articulated their value propositions not as technical solutions but as financial solutions. As consultants, entrepreneurs took away the burden of understanding the energy efficiency space, the improvements possible and the changes necessary to achieve them.

" […] our solution specifies what's your return on the investment that you're making, what's your IRR [internal rate of return] on the investment. What's your pay back period that you should expect in terms of time for your investment. What we offer you is an integrated solution that should give you peace of mind." [P1]

Financial solution: Asset Management, Shared Savings or Mini utility

Framing the value proposition as a financial solution, allowed for the emergence of a 'shared savings' or 'asset management' models. While 'shared savings' models were focused primarily on energy efficiency value propositions, the primary focus of 'asset management' models was the generation of renewable energy via dedicated assets. Shared savings models allowed the emergence of municipalities as another potential client for energy efficiency solutions. Engagements with municipalities were arranged so that a number of parties were able to cooperate in generating the savings (e.g. consultant, client, supplier, financier, municipalities) and subsequently the parties involved were able to get *"small portion of the savings" [P4]* I so that *"everybody eats off the savings that are achieved" [P4]*. One entrepreneur described a shared savings model where the savings were derived by replacing energy inefficient with energy-saving lighting:

Key to implementing shared savings models where any savings were redistributed among participants was the measurement of efficiency and the ability to audit those measurements. This led some entrepreneurs to focus on the measurement element in particular. They recognized the need to *"have a plan in place that talks about what the savings are going to be and then compare them to what the actual savings are" [P10]*. Such entrepreneurs focused on measuring the post-implementation savings, resulting from energy efficiency interventions.



Within the space of engineering, procurement and construction projects for renewable energy generation, the model that emerged as capable of integrating the interests and constraints of multiple parties was the 'asset management' model. In this case multiple parties come together in order to realize a solar power plant installation. Such parties would include energy consumers with sustained energy needs (e.g. residential households or industrial), entrepreneurs who can design and implement the project, financial institutions who could find it, and others. Subsequently, through power purchase agreements the consumers receive energy at a lower price. Meanwhile the managers of the power producing assets get a constant monthly return or an annuity, and so do any financial institutions involved. Comparing the asset management model to established project-based models of engineering, procurement and construction, interviewees emphasized the significance of predictability:

"I think it's obvious that the asset management one is, it's one that makes sense. Firstly for growth because all of a sudden if you're getting money in every month or every three months it allows for growth so you have to raise more finance for growth, which is easy because there is predictability of how the income is coming into your bank account […]. On the EPC side, the opposite happens, you never know when the projects are going to come in. When the project comes it's large sums, 15 million Rand, 10 million Rand, 30 million Rand and so on and so forth. Which it's great at that particular moment but there's no predictability So it becomes difficult to get funding for growth. So at the end of the day the asset management of the business makes more sense." [P6]

Through models such as 'shared savings' and 'asset management' the space of energy entrepreneurship is becoming accessible to financial institutions. Entrepreneurs testified to the increased interest of banks to invest in this space. Banks are *"learning as they go and developing their risk appetites" [P2]*. So far the projects with multiple and strong off-takers in the corporate space are seen as particularly bankable. So are government-back projects. By contrast, residential consumers can find it difficult to find favorable financing. Building on the asset management model, entrepreneurs offered a future vision of their businesses as 'mini utilities'. They saw themselves as building up *"a fund of solar plants where we manage and run them, we sell the power, [we] rent the systems over [to you], [or] you rent the roof over your [house to us]" [P2]*. Thus, entrepreneurs could grow a portfolio and develop an asset base with proven cash flows, they could work with the banks to refinance their portfolio and they could redeploy their capital. As one of the entrepreneurs summed it up:

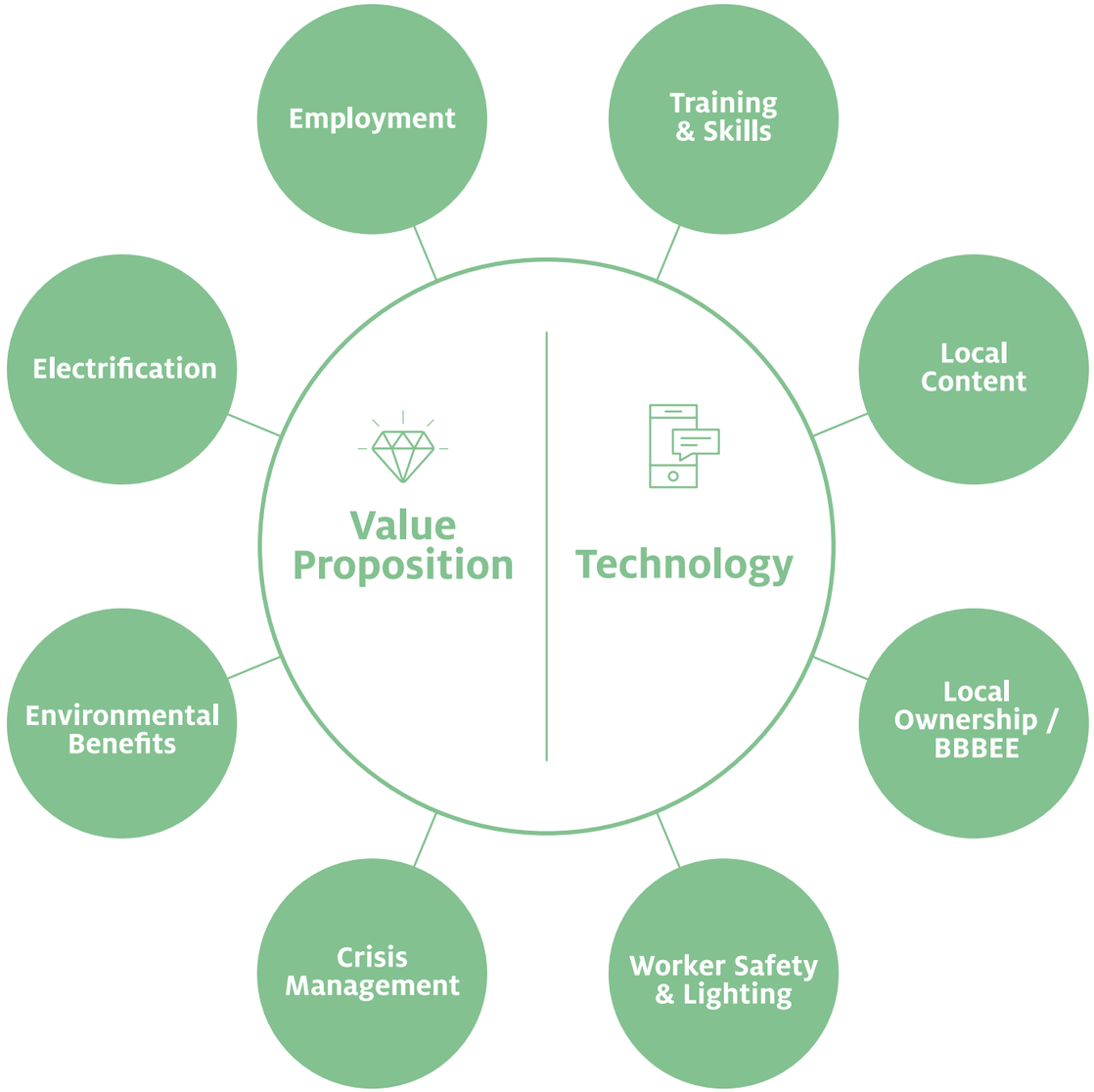
"If we're not thinking of becoming a mini-utility ourselves [we] would be crazy [...]." [P6]

Shared Value

Looking at the energy sector, entrepreneurs were able to identify multiple dimensions of shared value that were generated through their work. Figure 2 presents some of those. As energy is such a critical resource in the modern times, one entrepreneur suggested that there are 'ripple effects' from his activities:

"So you save energy and [...] you reduce [...] your dependency on ESKOM. And your reduction of what you consume from ESKOM [...], reduces the amount of power that ESKOM has to produce or the amount of coal that they have to consume and the amount of emissions [...], that comes out of their power stations going into the atmosphere. And [...] your energy supply improves, especially [...] if we put in solar because then, you're going to be less dependent on the grid. And if there's any power interruptions, [...] you're to a large extent immune from that." [P1]

Figure 2:
Shared value



Electrification

Energy entrepreneurs considered electrification through renewables the biggest shared benefit that their activities could generate. Through their efforts they were motivated through electrification to bring opportunities to communities that previously did not have them.

"[…] the number one barrier to social community development is the lack of electricity, sustainable communities actually need electricity for hospitals, schools, for their water, and you name it. So at the centre, at the pinnacle we believe that the number one barrier is the lack of electricity and that's what we're hoping to [address]…" [P6]

While electrification linked to solar engineering, procurement and construction projects can be seen as corporate social responsibility, energy entrepreneurs saw it as a competitive advantage. For example, this is how an entrepreneur described his engagement in electrification through the installation of solar for a mining operation:

"I also try to bring an additional factor in. […] We not only did the mine, we said fine, 'we'll do the mine but we'll also do all the flats where the miners live for free as an added benefit'. Now those miners lived there with their wives, their kids and so forth. And a lot of them have no power, a lot of those units have no power at all. […] You can't leave these people living like this. So let us convert the mine to solar power and we will do a renewable space for those flats to keep them all powered up. And it's that little bit extra that we offer that keeps people coming back to me." [P4]

Other entrepreneurs, saw their role in electrification through close partnerships with Eskom. As funds for electrification were made available by the Department of Energy for Eskom, entrepreneurs sought out those projects and leveraged their position with Eskom as preferred suppliers in order to support Eskom in delivering "electrification to the people" [P8] and "fulfilling Mandela's promises" [P8]. Starting from the entry level, the relationship with Eskom was nurtured over the years by working in disadvantaged and challenging areas.

Employment, Trainings and Skills

In addition to the employment opportunities arising as a result of the growth of their own companies, entrepreneurs were actively involved in partnering with government agencies and departments (e.g. SETA, Department for Public Works) in creating employment. Entrepreneurs were willing to take on students as part of government work programmes. Such trainees were paid a stipend by the government while they also received performance-based pay from the energy companies. Trainees received instruction on a variety of topics including sales techniques, entrepreneurship, installation and maintenance of solar systems. Such programs often led to certification and future employment:

"So they started off as trainees for the first six months. We then were able to give them certificates through the Energy and Water SETA which allowed them to keep on working for the next three years. They're still working for the Department of Public Works maintaining all the sites. So it's created employment for 32 people right now. We only take projects where there is some form of upliftment where there is an actual benefit, not just to the company but to the stakeholders, all the stakeholders at large." [P4]

A number of entrepreneurs cited engagement with clients and engagement with the communities where they were looking to install solar energy or solar water heating solutions, as a key element of their value propositions. Such partnerships were geared towards ensuring that the necessary local skills are available in order to carry out the installation and future maintenance of new equipment. Entrepreneurs found that getting involved in capacitating local youth, students, or residents enhanced the appeal of their products. Such models were seen as generating a competitive advantage by strengthening the local links and the local relevance of the products, especially when project received public financing. For example, producers of solar water heaters offered free training, free of charge with their product:

"The solution, the technology is the technology. […] The biggest thing that we compete with that the other companies do not necessarily get right is the training solution. […] When a site gets entered, let's say for example you go to an RDP site in Mamelodi, then you go and speak to the councillor. The councillor then chooses fifteen youth, […] and they get then sent to our training to give them skills and then they also get used on site. So the community is happy with the product and if the community is happy then the contractor feels comfort. [If] the community is not happy then they will vandalise your houses. It's a model that works …" [P3]

Another entrepreneur reported plans for 8 MW solar plant where he had a preliminary agreement with the municipality that for "at least about 65% of staff to be local" [P9] because the solar plant would need maintenance over the next twenty years. Training plans involved educating four to five different sets of electricians every two years.

Local content/ ownership and BBBEE

While it was recognised that there are significant benefits to disadvantaged communities from energy entrepreneurship, it was also acknowledged that breaking into the sector can be particularly challenging for entrepreneurs from disadvantaged backgrounds. Whenever possible, interviewees were proud to claim *"90% local content product" [P3], "100% black board" [P1] or "level 1B company, 60% black board" [P9]*. While entrepreneurs were often reluctant to approach the topic of racial inequality in the industry and hesitated to be seen as *"selling [their] skin colour" [P1]*, some of them were prepared to acknowledge the challenges. It was not uncommon for entrepreneurs from disadvantaged backgrounds to see themselves as having made it against the odds:

"Ma'am, the fact that we're here is already a 1% chance of success. Because this is a white dominated industry historically. I am, I'd rather be honest and say. […] [laughs] If your competition rocks up in a helicopter what are you going to do? This guy has a jet. What are you going to do?" [P8]

Many companies in the sector sat with BBBEE scores at level five or level four, therefore entrepreneurs with high BBBEE scores were prepared to see black ownership as a competitive advantage. While some jokingly suggested that as part of their sales negotiations they were ready to point out to clients that *"the electricity [they] buy from ESKOM does not come with BEE points" [P1];* others insisted that unfortunate as it is, a high BBBEE score *"doesn't necessarily […] mean that you will get work" [P9]*.

Other benefits: Work safety, Environmental

Entrepreneurs' activities had a range of other benefits. For example, they included improved work safety and lighting. Interviewees reported that in conducting energy efficiency audits they often had to do health and safety lighting surveys. Such surveys were capable of unveiling if industrial spaces have the required safe lighting levels. Thus, improved work safety was often a consequence of energy efficient lighting installations. In addition, improved safety and security and improved crisis management capacity were cited as benefits of smart metering interventions. Through their interfaces, smart meters were often able to alert technicians of potential dangers on the power lines. They were also capable of monitoring energy use and of generating alerts in the event of insufficient energy supply to meet the required load.

Environmental benefits are the obvious results of renewable projects. Entrepreneurs were able to frame such benefits as part of their comparative advantage as many of their industrial clients were "reliant on exports and there's increasing pressure from overseas for green initiatives [...]" [P2]. Alternatively, energy entrepreneurs were able to support their client in receiving tax rebates for energy efficiency. Entrepreneurs pointed out that over and above the immediate energy savings generated by introducing energy efficiency improvements, clients were able to get "a rebate linked to your KW/hours that you're saving that equates to another Rand value that you write off from your profitable tax exposure" [P10]. Tax rebates were made available from local governments, provided that businesses were able to get certified measurements of the savings by a third party.

Discussion and Conclusion

Our study explored the technologies available to energy entrepreneurs in South Africa and the value propositions they were able to deliver to their customers, as well as the shared value for society more broadly that was generated. We found strong links between the increased availability of solar technologies and engineering, procurement and construction value propositions. We also encountered strong links between energy-saving technologies and energy efficiency value propositions. We were able to identify a view of energy as a digital sub-vertical with significance for the development of 'shared savings' and 'asset management' models where clusters of stakeholders were able to integrate and cooperate in the green generation and in the efficient use of electricity. More broadly, we find that new renewable and digital technologies were key in opening up entrepreneurial opportunities in the energy space.

As our understanding of value is relational, we find that the value generated and delivered by energy entrepreneurs is inextricably linked to the fate of the state-owned monopoly Eskom. Entrepreneurs found that the reliability and load-shedding issues faced by Eskom often "made the conversation [about efficiency and renewables] more relevant" [P2]. Yet, it was recognized that the constantly changing fortunes of Eskom have a significant impact on the alignment of incentives in the energy space. Thus, making meaningful business growth in the sector very difficult to achieve:

> *"The amount of sun we get means that we should have solar panels everywhere. [...] The problem is ESKOM is a business that sells electricity. Now they're in a situation where they're saying okay, please reduce energy usage [...], our systems are being updated. But tomorrow they're going to be hoping that you go back to your high usage because that's how they generate an income. ESKOM needs to diversify and change the way it's being run. [...] we need to get more competitors into that space that will allow for competition and prices to change, and systems and structures to change. Because that monopoly is not going to work for long. That's why it's crumbling." [P4]*

References

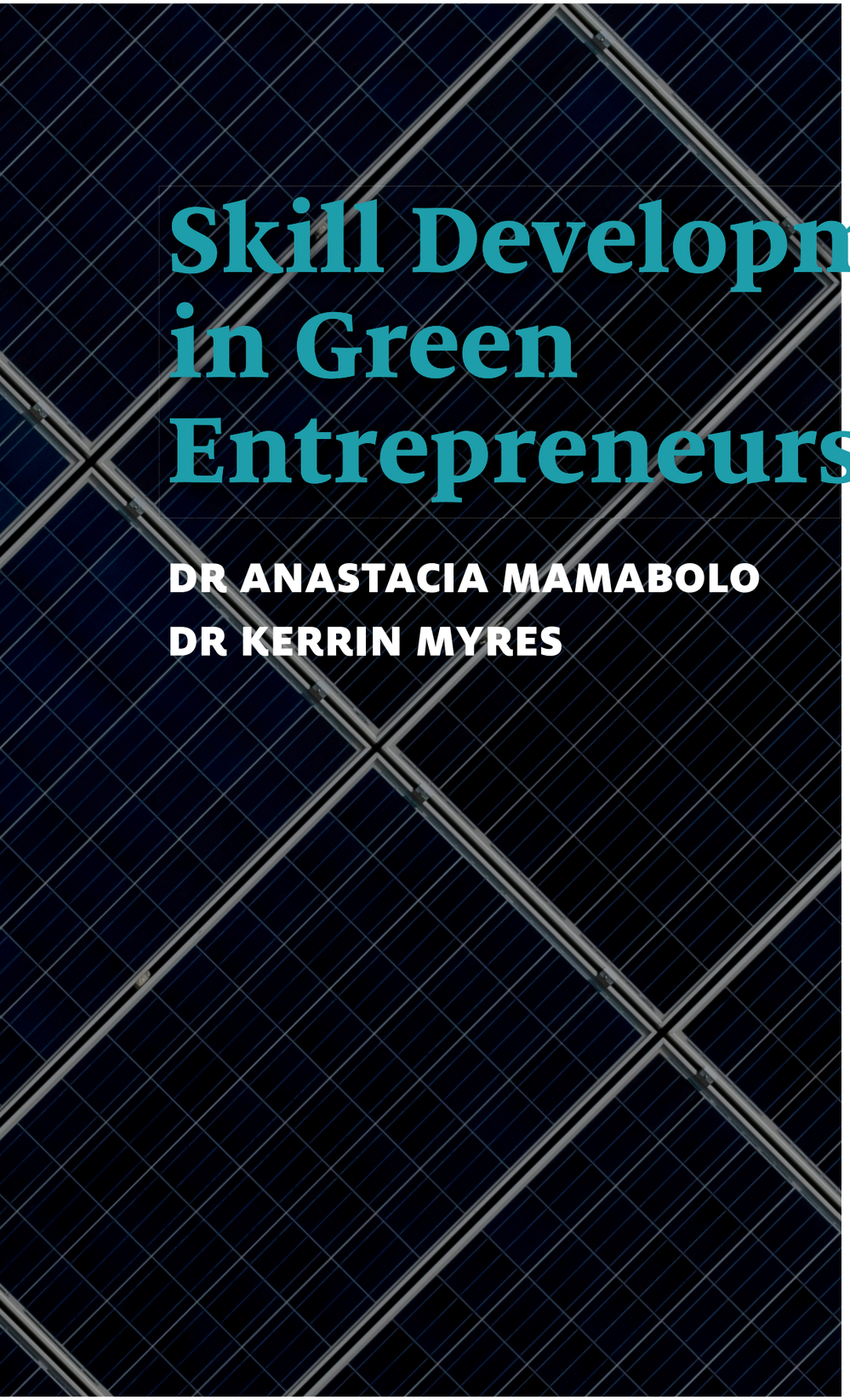
Costello, K. W., & Hemphill, R. C. (2014). Electric Utilities' 'Death Spiral': Hyperbole or Reality? The Electricity Journal, 27(10), 7–26. https://doi.org/10.1016/j.tej.2014.09.011

Deloitte. (2017). An overview of electricity consumption and pricing in South Africa. Retrieved from http://www.eskom.co.za/Documents/EcoOverviewElectricitySA-2017.pdf

Frost and Sullivan. (2010). An Analysis of Energy Efficiency Initiatives in South Africa. South Africa.

McDonald, D. A. (Ed.). (2008). Electric Capitalism: Recolonising Africa on the Power Grid (1 edition). London ; Sterling, VA : Cape Town: Routledge.

Porter, M. E., & Kramer, M. R. (2011). The big idea: Creating shared value. Harvard Business Review, 89(1), 2.



Skill Development in Green Entrepreneurs

DR ANASTACIA MAMABOLO
DR KERRIN MYRES

1. Rationale for the study

The need to be proactively involved in the development of 'greener' economies has long been recognised by governments across the globe. In South Africa the development of the green economy is seen as having the potential to: Improve well-being and social equity; alleviate poverty and enhance socio-economic development; reduce environmental risks and promote sustainable growth.

The Green Economy Accord between government, labour and business notes the variety of opportunities created by the shift towards a greener society. The Accord notes that "the Green Economy involves largely new economic activities and must provide an important entry-point for broad-based black economic empowerment, addressing the needs of women and youth entrepreneurs and offering opportunities for enterprises in the social economy". However, a recent report (Page, 2017) acknowledges the rapid growth in green enterprises but notes that existing green economy activities and investment will have to be considerably expanded and up-scaled to meet national targets.

The development of a greener economy is constrained by the lack of green skills and the relatively slow development of small green businesses. The available studies on skills have focused on the generic skills which are not industry specific (Mamabolo, Myres, & Kele, 2017). In order to stimulate the growth of sustainable small enterprises in the Green Economy that can create opportunities, especially for young entrepreneurs, who remain the group that are least likely to be employed in the mainstream economy, we need to know the kind of skills that green entrepreneurs need for successful business venturing. It is also important to know how green entrepreneurs develop these skills and the role that traditional class-room interventions play in this process.

Therefore, the overall research objective of this study is:

To explore how entrepreneurs who have been through the green entrepreneurship training and mentoring developed green entrepreneurial skills required to grow and sustain their businesses.

2. Literature review

This section discusses the literature on skills. The focus is on how entrepreneurs learn skills followed by the human capital theory as the theoretical anchor of the study. This theory suggests that human capital investments such as formal education, entrepreneurship education, work experience and industry experience are sources of skill. Mentoring is also presented as one of the mechanisms that contributes to the development of skills. Finally, the skills required by entrepreneurs are discussed, concluded by how skills have impact on the business performance.

2.1

How entrepreneurs learn

During new venture creation, entrepreneurs learn from their own experience and they learn vicariously, both by observing the behaviour of other entrepreneurs and through advice and assistance from a network of business and social relationships. Such networks are in effect learning systems (Cope, 2005). Entrepreneurs are not necessarily good students in a formal sense (Sexton, Upton, Wacholtz, & McDougall, 1997). However, in terms of formal development programmes, entrepreneurs prefer short bursts of information that are highly specific to their context, and prefer to learn from other entrepreneurs (Sexton et al., 1997).

Scholars note that it is important to distinguish between the 'stock' of skills, experience and abilities with which an entrepreneur enters the entrepreneurial process and the learning that takes place during and as a result of the new venture-creation process (Cope, 2005). With respect to the 'stock' of learning the entrepreneur brings to new venture creation, management, industry and start-up experience is relevant (Politis, 2005). This effectively indicates the level of preparedness of an individual to embark on entrepreneurship (Cope, 2005). Experience provides tacit knowledge that facilitates decision making under uncertainty and time pressure (Politis, 2005; Sternberg, 2004), and facilitates creativity (Cohen & Levinthal, 1990).

Learning helps entrepreneurs to identify new opportunities because they can consider a wider possible range and more readily detect the most promising. The probability of successful exploitation is also increased because the cost of doing so is lowered (Politis, 2005). Learning also provides methods and heuristics that help individuals to solve complex problems more effectively (Cohen & Levinthal, 1990) and more quickly. Increased knowledge in a particular field also helps the entrepreneur to focus attention on what is most important and facilitates the integration and accumulation of new knowledge (Shepherd & DeTienne, 2005).

2.2

Human capital investments as sources of skills required by entrepreneurs

Human capital theory is based on the assumption that formal education and work experience should be considered general human capital investments that yield outcomes, i.e. knowledge and skills (Becker, 1964). Unger, Rauch, Frese, and Rosenbusch (2011) argued that outcomes of human capital investments (knowledge and skills) have a greater impact on performance than human capital investments themselves (education and work experience). The reason is that education and work experience are indirect indicators of human capital while knowledge and skills are direct indicators. In entrepreneurship, entrepreneurs with higher quality human capital investments are expected to have superior entrepreneurial outcomes (Becker, 1964; Davidsson & Honig, 2003).

There is growing acceptance that human capital theory (Becker, 1964) emphasises that the more specific an investment is to current tasks, the higher the expected returns. Among other specific investments in human capital are those that are industry-specific and entrepreneurship-specific. An industry-specific investment is of value inside the industry in which the business is started while an entrepreneurship-specific investment is of value inside the entrepreneurial process (Bosma, van Praag, Thurik & de Wit, 2004; Ucbasaran, Westhead, & Wright, 2008). Empirical evidence indicated that entrepreneurship-specific human capital investments, such as earlier experience in starting a business, entrepreneurship education and membership of an association for small business founders, generate more promising start-ups and enhance performance (Bosma et al., 2004). Therefore, it is crucial for entrepreneurs to invest in both entrepreneurship-specific human capital and industry-specific human capital so that the outcomes will be specific to entrepreneurship.

2.3

Mentoring as a mechanism for developing skills

In spite of its broad application in the entrepreneurial development process, research into the mentoring of entrepreneurs has tended to be patchy and incomplete (McKevitt & Marshall, 2015). As a result, there is little consensus on the definition of mentoring and its differences and similarities to other similar processes such as coaching and consulting.

In the South African context, mentoring is typically regarded as being focussed on the development of the business, while coaching is typically regarded as being focussed on the development of the entrepreneur. This confirms the conceptualisation put forward by recent studies which conform that, while coaching contributes to the personal development of entrepreneurs, mentoring assists in developing skills associated with starting and running the business (Brinkley, 2008).

Prior studies have shed light on the roles that mentors play in the development of entrepreneurial businesses, arguing that these may differ depending on the businesses stage of development but including opportunity identification and enactment (McKevitt & Marshall, 2015). However, it is not clear what the influence of this activity might be on the performance of the entrepreneurial business.

2.4

Entrepreneurial skills required by entrepreneurs

Drawing insights from the human capital theory, skills can be defined as 'the proficiency in performance of a task, as a result of human capital investments (formal and education, entrepreneurial education, work, industry and entrepreneurship experiences) and can be improved by training, practice and development' (Mamabolo et al., 2017).

The entrepreneurial skills will then be 'the proficiency in performing tasks in the entrepreneurial phases as a result of human capital investments (formal and education, entrepreneurial education, work, industry and entrepreneurship experiences) and can be improved by training, practice and development'. The categories of skills are start-up, technical, core business, and social and interpersonal skills. A study by Mamabolo et al. (2017) identified the following categories of skills constructs and their sub-skills:

Start-up skills are necessary for the identification and exploitation of a business opportunity. They include growth planning, environmental scanning, innovation, calculated risk taking and opportunity recognition.

Technical skills use to perform key operations of the business like managing operations, managing supplies and supply chains, production space skills, managing plant and equipment, technology and production processes.

Core business skills is a cluster of business management, financial, marketing and human resource management skills required to run the business on a day to day basis.

- Business management: planning, problem solving, business modelling, legal skill, decision-making, delegation, business development and strategic competence
- Marketing: market researching, benchmarking competition, business positioning and selling
- Financial management: pricing products, cash flow management, calculating costs and reading financial statements
- Human resource management: recruitment, employees' skills assessment, defining job specs, performance management and payment of salaries

Personal and leadership skills is a cluster of social and interpersonal, leadership and personal skills that focus on leading employees to achieve maximum results and interaction with stakeholders.

- Leadership: crafting vision, inspiring employees, sharing the vision, cultivating excellent performance and leading responsibly
- Social and interpersonal: people skills, communication, listening, building relationships and cultural sensitivity
- Personal: hard work, intuition in decision-making and self-motivation

2.5

Skills and business performance

Research has attempted to relate entrepreneurial skills to venture performance. Theoretically and empirically, there is evidence that entrepreneurial skills can lead to venture success (Morales & Marquina, 2013; Unger et al., 2011). Human capital is significant in the success of a venture because it enhances the entrepreneur's ability to identify and exploit business opportunities, in planning the venture, and in obtaining physical and financial resources (Unger et al., 2011). Several of these studies measured venture performance as profitability, venture growth, size and sales growth (Narkhede, Nehete, Rault & Mahajan, 2014). Although skills contribute to the performance of a business venture, the argument regarding this notion is that skills alone may not clearly explain venture performance, especially financial performance, without considering the multitude of other factors that contribute to a venture's success or profitability.

The studies have shown that learning of skills is a dynamic process accompanied by the change in their levels and significance (Kutzhanova, Lyons, & Lichtenstein, 2009). We argue that in addition to the traditional class-room teaching, mentoring can contribute to skills development. Coaching and mentoring will help entrepreneurs to identify problematic areas that needs to be developed. During the coaching process, entrepreneurs are able to reflect and develop self-confidence and self-awareness which are important in skills development (Kutzhanova et al., 2009). Therefore, it is important to know the kind of skills that entrepreneurs learn through the mentoring activities. So, combining the traditional training, coaching and mentoring will be a blended learning approach which will ensure that green entrepreneurs effectively learn skills and improve the performance of their businesses.

3. Methodology

Given the relatively under-developed state of the literature, and the nature of the research questions, a parallel mixed method design was pursued in order to triangulate the data available. This allowed a qualitative exploration of the skills that green entrepreneurs need during exploitation of the business opportunities and how mentoring/training contributed to the development of the skills. At the same time, quantitative data collected at the base-line, 12 month and 24 months was statistically analysed to understand the relationship between skills developed and overall performance of the business during those time periods.

The population for the study was all green entrepreneurs who have been through the GIBS J.P. Morgan training. The sample for the qualitative research was self-selected in that participants in all four cohorts were asked to participate in the interviews – those that agreed were interviewed and were diverse in terms of sector/industry, business size and location, and founder characteristics. There were 10 entrepreneurs who participated in the qualitative interviews and 19 entrepreneurs who were tracked over a period of 24 months, thus before the training, during and after the training.

4. Findings from the study

This section presents the qualitative and quantitative findings from the study. First, the qualitative findings of the skills required by the Green Entrepreneurs in the sample are presented, followed by the sources of their learning and development. Next, the study considers which of the skills identified quantitatively has the most impact on the performance of the business.

4.1

Qualitative Findings

4.1.1 Skills required by entrepreneurs

The key skills required by green entrepreneurs were clustered into business management skills (financial management, human resource management, marketing, customer relations, business planning and administrative skills), technical skills (service or product development), social skills (collaborations and relationships) and personal skills (resilience, courage, emotional intelligence, adaptable and agile, hustling, humility and listening).

a) Business and management skills

Those entrepreneurs who had started their business based on their technical education and work experience, expressed the need for a broad range of business and management skills:

> *I only realised this when I looked back on my journey that I did not have any business skills whatsoever. And as a result I didn't know what's a financial plan, where my goal is, so I was just – I enjoyed what I did but unfortunately due to lack of planning and just trying to future proof your business it was doomed to fail. But it didn't fail per se, it's still there it just took a different life in turn (Respondent 6).*

Perhaps unsurprisingly, skills relating to the task of financial management, accounting and finding funding were most often described as being necessary by green entrepreneurs.

> *I think that was one of the bigger challenges to figure out how do you do your finances, what do you keep track of, do invoicing to clients, how do you do that? (Respondent 2).*

> *I would say financing was one of the things that I needed to have to understand financial statements to understand markets (Respondent 5).*

The entrepreneurs in this sample that were from a technical or engineering background felt this lack most acutely. Even after learning the basics of financial management in a formal class-room setting, respondents expressed the need to continue their financial education:

> *I need to make sure that now I polish my financial management skills, that I still need to polish. It's either I hire an expert or I – but the best thing would be for me to do it myself at first so that I understand my numbers and then make sure (Respondent 5).*

Financial management skills were most often learned in a class-room environment and practiced in the business thereafter. However, most respondents expressed the need for further financial and accounting support in the business, which they tended to outsource rather than hire in:

> *I think I need an accountant, an individual that can do budget projections, income targets, the various percentages that tell the story of the business. I need somebody who can set these financial goals because ultimately I'm a very technical person (Respondent 3).*

> *I know why when the cash comes in it goes out immediately. I know why, but that should not be the reason not for the cash to stay. So it means there is something that I'm not doing well and I believe – unfortunately I cannot afford a financial manager at the moment so I use an accountant (Respondent 4).*

Access to Financial management skills were sometimes cited as the reason why the green entrepreneur had taken on a partner in the business:

> *Even the bookkeeping, I mean my friend is a CA and he works for one of the big mine companies. The bookkeeping is done there but we've got auditors. But also he looks to - every month he looks at what our bookkeeper has done so I don't have to worry too much about those functions because he owns that process. So he reports to me to say this is what was done, I think we need to move in this direction, so I get a lot of advice like that (Respondent 7).*

Alongside the financial management skills, the green entrepreneurs in the sample also reported a need for administrative systems and associated administrative skills. It was usually clear, however that the respondents themselves were not eager to develop these in themselves:

> *I need administrative type of skills because the two of us are not very administrative. And then system development. System development we can also do but we need the time to do it because we're busy with all those other things, the administrative stuff. If I didn't have to worry about that admin and accounting stuff...(Respondent 3).*

> *It's just small things like data capturing, financial systems of which I do have like a full-time financial services company that is assisting me with my reporting, financial management (Respondent 6).*

The felt need for financial management skills is many cases extended to the need to find funding for the business. Green entrepreneurs in the sample often reported that their businesses were relatively capital intensive and therefore external funding was often required 'to realise the dream' (Respondent 4). Although respondents seemed aware of the available sources of finance, they believed they needed additional support to access them:

> *And it made me also aware that when it comes to funding it's not about your idea and you just wanting to be funded, the numbers have to make sense. And your business readiness will tell you whether you are ready for your own money or you are ready for other people's money (Respondent 5).*

> *I need to find a way to build up access to finance. Fortunately government institutions are there which they know our problems and they then establish both – they bridge the gap how these people can then be able to get the access to finance irrespective or where industry they want to participate, including in this renewable energy industry (Respondent 8)*

Along with financial skills, marketing skills were also frequently mentioned as being important in the development of green businesses. In particular, respondents referred to the relative novelty of the markets in which they operated, which meant that marketing involved a significant amount of education of potential buyers, which had the effect of complicating and lengthening the marketing process:

> *I probably need more input into a website, I need to market my business better. I told you the accounting part. I think it's just the accounting and the marketing (Respondent 3).*

> *It became challenging at the beginning simply because photovoltaic as it is, or renewable energy, solar energy is totally a different space in terms of our people, especially in South Africa, or in developing countries. Renewable energy is new, people still do not believe in it even the engineers, the most importantly qualified people you find in engineering they still do not know it. And as you go along introducing your technology you also have to educate (Respondent 4).*

In particular, respondents reported that understanding customer concerns was critical in developing the right value proposition for the business:

> *Because if the individual that you're trying to sell the service to doesn't understand your service, or believes that there's something missing from your service you also need to in turn understand what his concerns are or what his issues are that you can help unlock through the basket of services with your offering (Respondent 3).*

> *And here's a thing, and just be interested in people, because if you're interested in me you're interested in my problems and you want to solve them, genuinely, and chances are you might just get it right. And I'm seeing a lot of people – you know entrepreneurs are just not interested, they are just interested in running their own little business (Respondent 6).*

Interestingly, respondents generally felt that marketing skills were less amenable to being learned in a class-room than was the case with financial skills. In contrast, respondents tended to believe that 'trial and error' as the best mechanism for marketing learning.

And I was reading about markets but I didn't have an understanding of how am I going to approach my market so I had to first do my homework. Even though I was doing homework I was doing homework from what other people have written and not what I went through (Respondent 5).

> *So the networking and making sure that clients know that you are out there doing your own thing, I think those – yes, so marketing ... I basically learnt by trial and error. I have not done much marketing in the last three years what must I now do to get more work in. And that's still challenging, I still don't have the answer to that (Respondent 2).*

Experimentation with different marketing modes was regarded as expensive and time-consuming but nevertheless important in order to find the most effective communication media:

> *We started with newspaper and radio. We have then realised that the two did not bring business but it did not bring anything to us. And then we've moved that, we started targeting the estates.... if we advertise or publish on the estate magazines then it means they will read, they will be able to contact us. However, eventually we realised, no, no, they do page through but they do not know the product so that does not make any sense to them, they need to see it. Then we started doing exhibitions (Respondent 4).*

Planning was also considered to play an important role in developing the green business, both as a way of mitigating risk and in considering the best way to manage sales effort:

> *I just need to focus and plan and plan and plan (Respondent 1).*

> *Like how do you plan ahead, how do you make sure that you've got enough work because in our industry it's very difficult to do marketing for your company (Respondent 2)*

> *I've got an implementation plan with deliverables, clear deliverables. I've got a sales plan, I've got a sales pipeline to the value of about 9 million with people that I've built relationships with. So the only thing that we're just waiting for is just the technical part to be on point, to say, yes, this product does work, and then we start selling from there on (Respondent 6).*

It was evident from the data that the entrepreneurs in the sample need skills relating to human resource management. Not only did respondents refer to the difficulties associated with finding the right people for the business, but also how to contract them and delegate to them:

> *The separate issue is just people, and it's a common thing, it's not just me. But it's just really hard to find people who actually deliver, even if you do pay them. (Respondent 6)*

> *I've been getting advice in terms of human resources from GIBS to understand how to truly scale it to a point where it will be fully functional on its own. And I've been looking at contracts and I've been discussing with my board about ...[inaudible] the necessary skills we need in the company and I truly believe by June next year we will have an in-house bookkeeper, we will have an in house legal person, will have a project manager, we will have an administrator. So we will have all those functions sorted out and we're busy just putting them together now so when the time comes we can start looking at those appointments. (Respondent 7)*

> *And that for me was really a change to where I said, okay, I can pull myself out of projects earlier than what I was doing before, and not having that role anymore to go to each and every project meeting and to make sure that they see my face. (Respondent 2)*

Although few of the businesses were large employers concerned with managing human resources, several of the green businesses in the sample outsourced their operations, either partly or in some cases almost completely, either to keep fixed costs low or because the skills needed were relatively scarce. As a result of this practice, the key HR skill required by respondents was the management of an outsourced work-force:

> *We do a lot of outsourcing. Because those skills are very unique so I would rather support another small business with the bigger work and once I've got – if I say to a client I want to put up the roof top and then I have to do an energy audit to understand the demand I pull in a smaller black company to do the energy audit, get the demand, then I pay them. (Respondent 7)*

> *We do not have our own permanent installers however we've got our preferred installers. So whenever we've got a project we have to outsource because we are not 100% financially stable to keep human resource in our office at the moment, in our business at the moment. We outsource most of our jobs, however we provide training. Each and every installer who uses our product they are trained by us. (Respondent 4)*

Finally, although the entrepreneurs in the sample were generally preoccupied with the day to day operations of the business, they were simultaneously thinking about the long term future:

> *So basically what I'm looking at as a business that's going to last for 10 – 20 years. I want to be in it for the long haul and we leave a very nice legacy, not only for the children and the family but basically for everybody that's going to be around me. (Respondent 9)*

> *So we're trying to sort of design our exit strategy although the both of us love the work that we're doing. So I don't think we'll be never involved anymore but most definitely stay involved, but we want it to run so that it's not just us anymore, that the company will be taken over by our employees (Respondent 2)*

Although the class-room learning played an important role in the development of business-and management skills, the application and practice of these skills had an important role to play in strengthening and embedding them. In this regard, mentors could play a stronger role in ensuring that the integration of this learning was effective.

b) Technical skills required

Green industries are generally believed to be relatively technical in nature, and therefore most entrepreneurial businesses were required to prioritise 'keeping up with" technical developments happening globally:

> *What is important is having some form of technical skill because it is a bit of a technical industry so you have to learn really quickly to be able to move, especially because with some of the technologies things change very, very quickly so you need to stay on top of your game at all times. And be aware of what's coming, what's present and what's past (Respondent 1)*

Respondents often referred to the technical dimensions of their products and services as necessary, although usually not as sufficient for future growth and development:

> *I think if you're starting a business and you're selling a service you understand the service from your technical perspective but you then need to be able to understand how that service – what you will need to do to get paid. It's as simple as that (Respondent 3)*

I have to complement my product with a technical aspect. So be able to connect to the internet of things so we can calculate how much water there is and we can actually prove to the client, and that information can be reported to the municipality for water usage. (Respondent 6)

It seems clear that those with highly technical or engineering educational backgrounds seem more likely to be drawn to green businesses:

> *I went to do my Masters research with the CSIR for eight months then back to the Netherlands to graduate for my Masters there. And then basically wanted to come back to South Africa again so I applied for a scholarship to do another Masters at Wits University at Architecture department. At the same time I worked part-time for the CSIR on the green buildings program (Moesh)*

Other entrepreneurs were aware that their technical specialisations had made them poor business people, and to off-set this weakness, had deliberately partnered with more business-oriented individuals

> *Another wise thing that I've done is let me just focus on my strong points which is technical. My business partner has got a background in finance and environmental science, so he's quite clued up, extremely smart and savvy business guy, and I would leave that task to him and we'll take it from there. It's something that we still have to experiment with, yes. But I'm positive that he'll actually pull it off (Respondent 6)*

However, even entrepreneurs whose educational and employment background was in the broader business domain expressed the need to technical knowledge and access to technical skills:

> *I'm going to need a whole lot, a bunch of civil engineers. Look I'm going to need people that are skilled that's for sure. I'm going to need people that understand the rubble industry because I know that for example in just the little bit of research that I've done there's people that take the rubble, crush it and send it to the likes of PPC Cement and what have you (Respondent 9)*

> *Firstly, I need to educate myself to bring my technical skills up, two, to also have a better understanding so that when they come with challenges I will be like okay, this is how we sorted it out. Yes, so those are the two. It's just wanting to do the practical work myself and then having the project management skills as well. And then asking a lot of questions (Respondent 1)*

Interestingly, in spite of the information-rich nature of technical skill, some entrepreneurs believed that both learning new technical skills and keeping up with technical developments, were best achieved by networking with industry experts:

> *So technical stuff, I need to learn. But networking with professionals and industry figures that helps me to learn from them. (Respondent 4)*

The development of technical skills appears to be a propriety for Green Entrepreneurs, whether or not they had prior technical education or technical work experience. Once they are running their green businesses, the technical skills development is ongoing, but mostly achieved through informal means or through buying in the skills required.

c) Social skills required

Respondents appeared to agree that the complexity of green businesses meant that the ability to collaborate and partner with others is a critical success factor in business success:

> *So collaboration for me is number one so that's why I don't feel that there's any competition really with what we're trying to achieve (Respondent 1)*

> *I mean business is way too complicated for one person. So it helps to have people who are established in their particular fields, who are in technical and marketing and finance, just put them together and make something out of that (Respondent 6)*

The establishment of such collaborative and partnerships at start-up was relatively common amongst the green entrepreneurs interviewed, as well as being considered critical for the future development and growth of the business, to ensure the right skills were available to the businesses, to access new markets and funding opportunities:

> *I wasn't willing to do it alone. I then said to them, we're going to be successful in this if we all partner together and I'm willing to share part of the company so at least we all – and they then replied to me and said, no, we want to be active in your board at some stage (Respondent 7)*

I want to collaborate with other people where I can. It's one thing that I realised it would help me to basically build like my market. It will also help me to access funding if I collaborate with people that have already been funded by other people who can help me on who can actually help me on getting closer to my market, number one, getting closer to the funding, number two, and getting closer to resources (Respondent 5)

The development and maintenance of relationships was a skill that was employed to good effect by the green entrepreneurs in this sample right from the very earliest stages of startup, and were particularly productive in terms of gaining early customers:

> *I had many relationships, even the old company that I worked for I went to them when I started working and I said look I provide this service, and they said well thanks, and then that's when I started doing the work, I started doing work for them (Respondent 3)*

> *But having said that I did manage to get a lot of networking opportunities out of that and while I was leaving the company I basically had two options, either work for a similar company just under a different name or start for myself (Respondent 2)*

The Green entrepreneurs in the sample regarded 'having the right relationships' as so important that they were deliberate about establishing them, and frustrated when they could not:

> *So at events I would pinpoint who is doing what and start having conversations with them but I knew what I wanted to get out of them. So those conversations helped me a lot (Respondent 7)*

> *We don't have the link of getting to speak to the right people, you always have the intermediary in between and when you go to the people you end up not speaking to the right people. (Respondent 4)*

It is clear what the social skills required by entrepreneurs are usually developed in the process of actually engaging in relationships with peers, partners and other stakeholders. It is likely that such informal skill development could be supplemented with some class-room learning and input from mentors.

d) Personal skills required

The Green entrepreneurs in this sample noted that, in addition to 'hard' business skills and technical knowledge, a set of personal skills were required for success:

> *I just took my knowledge of business administration, competing business administration, having a business management course and I thought that is enough to run a business. Not realising that in business there is more than that. (Respondent 4)*

Entrepreneurs operating in the green economy need high levels of personal resilience and perseverance in order to be able to recover from setbacks quickly. In some sectors, competition is fierce, to the extent that respondents reported feeling physically threatened:

> *No, look, I needed to be resilient number one, and number two a no give up type of spirit. … but in some instances, I'm being honest with you I've given the business away to say listen, you know what, you'd rather have the business. In Diepsloot … there was a guy there who was doing the business. He basically wanted to work with me but didn't want to work with me. And then he lobbied the community basically if anything to kill me (Respondent 9).*

> *It's all about perseverance, yes, and getting to learn things. And business is all about that, you get knocked down and you get up tomorrow. So I truly believe we have the guts to just get knocked down and get up and let yesterday be yesterday and carry on for tomorrow (Respondent 7)*

In addition to personal resilience, entrepreneurs in this sample referred to the need for personal courage. This quality appeared to refer to the relative novelty of the industry as a whole and therefore the risk associated seemed, at least initially, to be particularly significant:

So I really needed to be brave. It was really attitudinal – a typical attitudinal posture more than anything else. And then trust me since I took that decision I never looked back (Respondent 8)

From start-up, entrepreneurs related the need to develop high levels of emotional intelligence, and what they referred to as 'the right mindset' in order to be able to run their businesses effectively:

> *At the same time my mind-set was not at a good place to start a business. My mind-set, financially so as well emotionally so I was still not ready I still needed to learn more (Respondent 4).*

> *And then today I've learnt how to manage the pain, the frustration, the loneliness and then actually even appreciating it (Respondent 8)*

As entrepreneurs went through the process of establishing their businesses they reported having to actively and energetically carve out opportunities and search for business, an activity generally referred to as 'hustle':

> *So what I did then I then approached the municipality there, the local municipality, I said listen guys, in your area of jurisdiction you've got four cement mining companies, what are you benefiting out of that, let's talk economics now, what is it that you are benefiting. One of the primary revenue driving vehicles is electricity, you guys are not benefiting anything, all the money goes down to Eskom. We are in a renewable energy space we can create our own plant here, we can sell the product to you, we can then be able to sell to these guys who are sitting in your own jurisdiction (Respondent 8)*

> *You need to be an absolute hustler. And I think the biggest thing is, even if you do have finance, but it depends on the industry that you're in because there's sharks out there, people that don't take kindly to competition and as you come in and you're a newcomer in the industry they would want to destroy you, they would want to kill you off the face of whatever is happening in that sector (Respondent 9)*

Respondents in the sample suggested that 'hustle' behaviour was an essential component of finding the right market niche and developing an appropriate business model. This generally involved a trial and error approach:

> *I know people always give this advice of find your niche market and then excel in it. But being an entrepreneur I've found that it's not as easy as just finding your niche market and excelling in it, you have to stumble through different niches to find your niche. So my advice would be don't get frustrated stumbling through those niches to find your one niche (Respondent 1)*

The rapid changes being experienced in the Green Sector required that entrepreneurial businesses be flexible and ready to change direction, sometimes with very little notice. As a result, the entrepreneurs themselves needed to be personally adaptable and agile:

> *Open your eyes, you must always have an alternative, it's almost like a – you must always have a contingency plan. It must exist, it must always co-exist, it must always be sitting somewhere. Pursuing business is very uncomfortable, it's almost like a lion that will go out and hunt a buffalo, it knows if it does not it will die. In the same scenario is how we're supposed to be conducting a business to simply say, if I go and pursue that door would it be able to bring some food come end of the day otherwise I die. I will have been long dead by now if I did not learn quickly and then try and change my gears (Respondent 8).*

As a result of this rapid change in the green economy, the entrepreneurs in this sample were unanimous in referring to their entrepreneurial experience as a learning journey. They felt that they needed to be learning continuously, about the context in which they operate, about the businesses they run, and about themselves. One respondent felt that this involved a certain degree of humility in order to be ready to learn:

> *I think the most important thing is just be a blank slate, don't – if you're smart don't – there's nothing wrong with being smart but just don't be too smart. Listen to people who are ahead, people who have done it and put them together and let there be an incentive for them to be in your table, don't build it by yourself, it's stupid, it's time wasting (Respondent 6)*

> *I think it was just a student mentality, just willing to learn from other people. And I think that's always been the one thing that I've always grasped, that I just need to meet people, learn and adopt. So I think number one student mentality definitely the most important outside of having the mentor and all the other technical and practical skills (Respondent 1)*

> *There is always a place in my personal life – but my personal life is business life, there is always a place to grow. Anything that comes to me I welcome it and I learn (Respondent 4).*

In addition, in order to learn and in order to be able to network effectively, green entrepreneurs in the sample often referred to the ability to listen as a key skill in ensuring that the business functions effectively:

> *I think the most important thing is to listen, and I think people underestimate that. I was doing a lot of research and most of the times I just had to listen to people, and when I was listening I could pick up a whole lot of things. So I think the most basic thing we could ever do is just listen to each other (Respondent 7)*

It was clear from the interviews that respondents were often experiencing significant degrees of stress, with the result that stress management techniques seems important for the management of the business and the personal welfare of the entrepreneurs themselves.

> *There were a couple of new projects beginning but you're in that sort of transition period where new clients are not paying yet and old clients stop paying, and where you really have a headache and you have sleepless nights (Respondent 2).*

4.1.2 Source of learning:
a) Class-room

The class-room experience of the Business Boost programme was initially intimidating for some respondents on the programme:

> *The first time I was like aah, this is not the place for me, it felt like everybody in this room has big things that they are doing and people talking about engineering this, energy management and I'm like, yoh, what am I doing here. But I stayed on and some people really run away from the program for real because I think they felt they were small. And I stayed on (Respondent 5)*

However, the programme was demonstrably instrumental in developing the skills of participants, particularly in financial management. In addition, the class-room was singled out at the source of skills development in the area of negotiation, leadership and strategic decision-making. In particular, respondents celebrated their ability to apply these skills in their own businesses after having learned them in class:

> *I went to GIBS not knowing how to read the balance sheet, that's a fact. And now I can go into my boardroom and just give the report to my board members (Respondent 4)*

> *And I also learnt how to get new business in my company and it was more from a skills perspective, especially with the negotiation skills class. I've used it and it has worked for me and it has never failed me. Like there are contracts that I have gotten simply because I negotiated better this time, I had a framework, before I go anywhere I had a plan (Respondent 5)*

> *with GIBS involved it has enhanced my leadership and my strategic decision making skills, definitely (Respondent 4)*

The facilitators on the programme were referred to as 'experts', who not only shared their subject matter expertise in the class-room, but also acted as supporters to the entrepreneurs outside of the class-room

> *Then when it came to business support that's where GIBS came in through the J.P. Morgan program (Respondent 5).*

> *And also attending the GIBS sessions, meeting or interacting with different facilitators from time to time then we also learn from those people (Respondent 4)*

Less directly, the class-room experience was responsible for learning from peers and industry experts who had been brought in to address the participants on the Business Boost programme:

> *By interacting with my peers, facilitators, those networks give me the opportunity to network with industry figures as well, that has played a major role. I do not run the business like a few years ago (Respondent 4)*

> *For this opportunity I even invited some of my colleagues, three of my colleagues from GIBS, say gentlemen, you know what, let's participate into this thing (Respondent 8).*

b) Non-class-room sources of learning

Entrepreneurs often begin their learning from observing family members running businesses, even when these businesses were relatively small and not the primary source of income:

> *What motivated me is my parents were teachers and I actually grew up a whole lot learning a lot of things from them and they also had small businesses that were running although we were classed more of a middle class type of family (Respondent 5)*

> *Before I even got a job I started my own company which I think it was a learning curve. I started while I was young and not having anything, not having even a background of how to run a company just because I was brought up in a family where we always ran something, where it was a shop at home, there was a piggery at home. So for me business has been in my blood (Respondent 4)*

As noted earlier, entrepreneurs learned a great deal from their experiences, both as employees and as entrepreneurs. Sometimes, the learning occurred because of some kind of failure, and this was often the most painful:

> *Before I used to think that once you've got a contract raising money is easy. Later I found out that once you have a contract it doesn't mean that you will be able to raise money (Respondent 1)*

> *I turned down one project in the first year because I thought I was too busy and that person that I turned down is still haunting me to this day and reminding me that remember in your first year you turned me down (Respondent 2)*

> *I have learnt the hard way, I have gone through very uncomfortable environments, I have gone through pain, I have gone through a journey of loneliness, very lonely, very – and then extremely frustrated, I've been extremely frustrated (Respondent 8).*

Respondents in this sample often deliberately set out to research new technologies or techniques, sometimes for extended periods of time. One respondent even referred to the internet as his mentor:

> *I did a desktop search as well and then I also did a search on micro franchising as a model that fights poverty with profits. And I had to read a lot of material and other people's research, and I had to buy books for development (Respondent 5)*

> *Some new skills that I needed to learn but most of them yes, what do you do, you open the internet, you look for HR policies and such (Respondent 2)*

Sometimes, the best learning was achieved through learning from interacting with others, especially those with particular expertise in the field:

> *And I realised okay fine, and you only get to learn once you engage, otherwise if you don't engage you don't get to learn anything. So I learnt things by engaging (Respondent 8)*

> *So we had to actually hire experts that had more experience within the manufacturing so that's how we ended up hiring the production person that's currently doing production for us (Respondent 5)*

4.1.3 Skills development through mentorship

a) Skills development from informal mentors

The need for support systems for the entrepreneur was widely recognised in this study, even amongst those for whom such support was largely absent:

> *Well running a business is not as easy one could think. And it's a lonely entrepreneurship, it's very lonely and to be honest, we never had any support systems (Respondent 4)*

> *The internet probably was my support system. And I guess when I started out I teamed up with another company on one project and I guess the relationship with that company helped me going as well, yes. (Respondent 2)*

For other entrepreneurs, family acted as the primary support system, often participating in the businesses directly when they were needed:

> *My entire family as we were doing it in our backyard, we used to sort until 12 o'clock midnight depending on volumes and what have you. So they are part and parcel of my business, although they run their own things. I mean my wife is a teacher, my daughter is in TV, the other one is studying at Wits and the other one is a graphic designer. So they do different things but they have interest in what I'm doing, yes (Respondent 9)*

For some, the support came from the entrepreneurial eco-system as a whole, which seems relatively well developed in the Green Sector: possibly as a consequence of the interest of governments in seeing the sector flourish, both in South Africa and globally:

> *The project was also then supported by the United States Department of Energy so they've brought in some international consultants which I feel I was very fortunate to have access to the calibre of people just at the beginning. So that helped us a lot and then we had a few local experts as well that were part of the project and it definitely helped. So the entire system was helpful (Respondent 1)*

> *When we started initially there was quite a lot of support in terms of making sure that we achieve the right quality product. At first we initially put a lot of money into this project and bought machines and bought recipes just to find that it's not about that (Respondent 5)*

However, other entrepreneurs saw the eco-system as being either dysfunctional or absent, and as a result often felt that it actually acted to inhibit entrepreneurial endeavour:

> *I think overall frustrating. Overall frustrating because in South Africa there is no – they don't make it easy for you to become an entrepreneur, nothing makes it easy for you to become an entrepreneur. And by that I mean the environment doesn't lend itself to helping you to survive (Respondent 8)*

In particular, the absence of appropriate policies and frameworks in certain sectors of the green economy was believed to be inhibiting future growth:

> *I think the government is my biggest threat. I think it's just all talk that they are for business, they are actually not. And you just mentioned now if we do install this device I'm going to be the enemy of the municipality, which is true. They see us as the enemy but they have to be mindful of something, there will be 17% less water in 2030 (Respondent 6)*

> *I think the biggest threat we face in this industry right now is just policy, there needs to be direction and there needs to be certainty in policy in countries for such projects to happen. There needs to be direction and a good framework (Respondent 7)*

For most of the entrepreneurs in the sample, an important source of learning was a mentor. Those who had not has access to a mentor as their business developed, felt the lack acutely:

That was a big problem, it was part of the problem that I had no access to people who will guide me and mentor me, and show me the way. And it created anxiety on me (Respondent 8)

Sometimes, the entrepreneur stumbled on a mentoring relationship by chance:

> *it was just by chance that her and I just clicked really well, actually she really liked me, she ended up being my mentor for two years (Respondent 1)*

Other entrepreneurs related situations in which they had been mentored by a customer interested in enhancing the expertise and growing the businesses of those with whom they were doing business:

> *She connected to us was way different to any other municipal manager that I've ever interacted with after her because she understood that in order to get through to people you need to teach them … so she taught us – I still consult her now for other work. (Respondent 7)*

> *I'm busy with the CEO, he has given me homework to say, listen, not only look at South Africa in terms of recycling because we don't know how big it is in terms of rubble recycling, but look at overseas markets as well and I will help you, support you in terms of overseas markets and what is it that they're doing that side that we can bring into South Africa. (Respondent 9)*

Partnerships or collaboration with large established companies also acted as mentoring relationships for the green entrepreneurs in the sample:

> *When we started manufacturing our mentors could show us the tricks as to what happens when this thing becomes watery because this means that you didn't put in enough of this and you have to increase this, all those type of things that basically were the key things in reducing frustration when you are starting production (Respondent 5)*

I go and then partner with this big company because they will teach you how to do A, B, C and D, they will mentor you. So already I go in there with that expectation. And then guess what, I also find out it is not that easy either (Respondent 8)

b) Skills development from formal mentors

The green entrepreneurs who had participated in the Business Boost programme saw it as representing an important support system as well as a skill development process, to the extent that the survival of the business was attributed to the programme:

> *And then came this program, the J.P. Morgan program and GIBS, I've always loved GIBS and when I saw the program was by GIBS I just trusted that this would be it. Because I have attended a lot of accelerators I must say and they didn't really – they were good but I couldn't really use them afterwards (Respondent 5)*

> *And when I joined GIBS - I've managed to get a support system or business background from this program, the J.P. Morgan program. And also connecting with peers, my peers, in such a dynamic setting it helped us a lot. It helped me to actually move this company forward. I do believe that with all that I have sold – or we have sold with my husband, financially, without this emotional and entrepreneurship assistance from GIBS this company as was could have unfolded (Respondent 4)*

As part of the GIBS Business Boost programme, participants participated in a series of group and individual mentoring sessions which were regarded as important and useful because mentors were not only able to offer valuable expertise, but were able to tailor it to the specific needs of the business and encourage the entrepreneur when times were tough:

> *I started realising that this is it, this is what I actually always wanted, to speak to experts, experts that have been there done that who are not doubting what they are talking about, who were also learning from us. Who could troubleshoot when you had a specific issue and they would even see where the problem is in your company and be able to help you out (Respondent 5)*

> *The GIBS mentor has been amazing because it's that moment when I get back to criticising myself, criticising my business, and sing hallelujah to what I have done right. So that opportunity to always look into the business standing outside is also very appreciated (Respondent 7)*

> *The fact that we're still interacting with our mentors also gives us a good platform to converse and to look back into the business. And I think the continuous support and the on-going support plays a very critical role in how we shape our businesses going forward (Respondent 9)*

4.2

Findings from the programme: quantitative

4.2.1 Mentorship experience

At the baseline data collection, participants were asked if they received mentoring. The results showed that 37% received mentoring while 63% never had the exposure. Mentoring was incorporated as part of the J.P. Morgan course design and was compulsory requirement for all students. The students were asked if they thought that the mentorship they received would contribute to growing their businesses.

Descriptive Statistics Mentorship Experience

	N	Minimum	Maximum	Mean	Std. Deviation
Mentorship after 12 months	19	1	5	4.05	1.224
Mentorship after 24 months	19	2	5	4.00	.882
Valid N (listwise)	19				

The analysed data demonstrate that the participants generally thought that the mentorship would contribute to the growth of the business. The mean score after 12 months was higher than 24 months, possibly because the dependence on the mentor declines over time as the entrepreneurs learn from their experience in the business. However, the qualitative data suggests that long-term relationships with mentors are considered to be particularly valuable.

4.2.2 Confidence in skills, knowledge and internal strength to achieve

The participants were asked to indicate toward extent do they agree that they have the skills, knowledge and internal strength to achieve what they want in life.

Descriptive Statistics Confidence in Skills

	N	Minimum	Maximum	Mean	Std. Deviation
Confidence in skills baseline	19	3	5	4.79	.535
Confidence in skills after 12 months	19	4	5	4.84	.375
Confidence in skills after 24 months	19	3	5	4.68	.671
Valid N (listwise)	19				

The findings show that there was an improvement in the level of skills, from a baseline mean of 4.79 to 4.84 after 12 months of being on the course. After 24 months there was a decline in the confidence. The explanation might be that they need new complex skills as the business ventures were entering a new growth phase. This confirms the findings from the qualitative research which revealed that green entrepreneurs are sometimes overly confident at start-up and actually lose confidence as they begin to realise the magnitude of the challenges they face.

4.2.3 Classroom teachings and skills

There are some skills that participants obtained in the classrooms through lecture presentations and assignments. The participants were asked to rate their business, communication, negotiation and leadership/staff management skills on a Likert scale ranging from very poor to excellent.

a) Business skills

The findings show an improvement in the business skills in the three stages of the research. When the participants started with the programme their level of business skills had a mean of 3.84, which improved to 4.05 after 12 months of training. In the 24th month, their level of skills was 4.11. These findings suggest an incremental acquisition of business management skills and that skills are important as the business grows.

Descriptive Statistics Business Skills

	N	Minimum	Maximum	Mean	Std. Deviation
Business skills at baseline	19	2	5	3.84	.898
Business skills after 12 months	19	3	5	4.05	.705
Business skills after 24 months	19	3	5	4.11	.809
Valid N (listwise)	19				

b) Leadership/staff management

One of the important skills required by entrepreneurs is the ability to lead or manage employees. The data show that the participants improved their leadership skills from a mean of 3.42 at baseline to mean of 3.63 after 12 and 24 months of being on the programme. There was no difference between the 12 and 24 months' period, probably due to the notion that they needed new leadership/skills or the skills they had were still sufficient for people management and leadership.

Descriptive Statistics Leadership/staff management skills

	N	Minimum	Maximum	Mean	Std. Deviation
Leadership / Staff management at baseline	19	2	5	3.42	.769
Leadership / Staff management after 12 months	19	3	5	3.63	.831
Leadership / Staff management after 24 months	19	2	5	3.63	.831
Valid N (listwise)	19				

c) Communication skills

The results of the study demonstrate that when the participants came onto the programme their communication skills have a mean of 4.32, which was the highest compared to 12 and 24 months with the same mean score of 4.26. The findings may suggest that they had to learn other sophisticated technological and professional modes of communication as the business developed.

Descriptive Statistics Communication Skills

	N	Minimum	Maximum	Mean	Std. Deviation
Communication at baseline	19	3	5	4.32	.582
Communication after 12 months	19	3	5	4.26	.806
Communication after 24 months	19	3	5	4.26	.806
Valid N (listwise)	19				

d) Negotiation skills

A further look into the data show that the mean scores of negotiation skills were the same at baseline and after 12 months of training. These scores were higher than the 24 months' period which had a mean score of 4.00. The decline in negotiation skills suggests that as the business grows, they need to negotiate for significant amounts of money and contracts, which creates a liability for complex negotiation skills.

Descriptive Statistics Negotiation Skills

	N	Minimum	Maximum	Mean	Std. Deviation
Negotiation at baseline	19	3	5	4.11	.737
Negotiation after 12 months	19	3	5	4.11	.737
Negotiation after 24 months	19	2	5	4.00	.882
Valid N (listwise)	19				

4.2.4 The impact of skills on business profitability

In order to determine the impact of skills on profitability, we selected two skills sets, thus human resources, financial management and technical skills. There was a significant relationship between the technical, human resource and financials and profitability, especially after 12 and 24 months of training.

a) Human resource skills and profitability

With regards to human resource skills, the participants were asked about how they use their skills to implement employment contracts, job descriptions and performance appraisals. At baseline there was no significant relationship between human resource skills and profitability. However, a significant relationship was seen after the 12 ($r=0.749$; $p=0.000 < 0.05$) and 24 ($r=0.646$; $p=0.003 < 0.05$) months' period. The findings suggest that the human resource skills that the participants learnt on the programme contributed to the profitability of their businesses.

b) Financial management skills and profitability

Another essential skill required in managing the business is understanding the finances. The correlation results demonstrate that there was a significant relationship between financial skills and profitability at baseline ($r=0.574$; $p=0.010 < 0.05$), after 12 ($r=0.557$; $p=0.013 < 0.05$) and 24 ($r=0.567$; $p=0.011 < 0.05$) months' period. The findings suggest that financial management skills may contribute to the profitability of the business.

c) Technical skills and profitability

The participants were asked about their basic understanding of the technical requirements and managing their operating capabilities. The results of the study showed that there was a significant correlation between the technical knowledge and profitability after 12 months of being on the programme ($r=0.506$; $p=0.027 < 0.05$). It is clear that the participants obtained and applied the technical skills that may have contributed to the growth of the business. Finally, the results show that their skills to manage the operating capacity may have contributed to profitability after 12 ($r=0.519$; $p=0.023 < 0.05$) and 24 ($r=0.522$; $p=0.022 < 0.05$) months.

5. Summary and conclusion

The qualitative data revealed that the nature of the green economy is such that, in order to pursue the myriad of opportunities that exist, technical skills have primacy and therefore entrepreneurs who already have these skills through education or work experience are at an advantage. Those that do not have technical skills are forced to develop them through research or technical mentorship and partnerships.

Green economy businesses are also relatively capital intensive, which means that financial and funding related skills are important to all green entrepreneurs, and most typically developed through class-room experiences, supplemented by partnerships or outsourced arrangements. Similarly, because of the relative novelty of green economy markets, respondents expressed a clear need for marketing skills, most often developed through trial and error experiments. Social skills seem less deliberately developed, often emerging through relatively informal networking processes and formal partnership arrangements.

Finally, according to the respondents, the personal skills they need evolve through experience over time, rather than being deliberately developed.
The quantitative findings reveal that business and management skills, including human resource management and financial management skills had a noticeable influence on the profitability of the business over time. These skills were typically learned in the class-room but applied under the guidance of informal and formal mentors. The relationship between technical skills and profitability highlights the importance of these in the Green Sector and suggests that formal development programmes need to find a mechanism for including technical skills development, in order to ensure that Green Entrepreneurs can successfully grow their businesses.

The statistical analysis also showed that the significance of skills, especially business and human resource management skills, increase in the different periods of time. As the business grows and becomes more complex, there is a need to improve skills such as communication and negotiation skills.

In conclusion, the data shows that skills such as human resource, technical and financial management can contribute to the profitability of the business. The model below summarises the study's findings:

The three implications for business education drawn from this study are: ***first,*** mentorship, both formal and informal should be incorporated in the curriculum as a way of developing entrepreneurial skills. ***Second,*** in addition, to classroom teaching, entrepreneurs also learn skills outside of the classroom environment. Therefore, training institutions should develop creative ways of teaching skills, for example by incorporating experiential learning and immersions as practical mechanisms for skills development. ***Finally,*** the training institutions should acknowledge that different skills are needed by green entrepreneurs at different points in time. This will ensure that the right skills are taught to the right entrepreneurs when they need them.

References

Becker, G. S. (1964). Human capital theory. Columbia, New York, 1964.

Bosma, N., Van Praag, M., Thurik, R., & De Wit, G. (2004). The value of human and social capital investments for the business performance of startups. Small Business Economics, 23(3), 227-236.

Cohen WM and Levinthal DA, 1990. Absorptive capacity: a new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128-152

Cope, J. (2005). Toward a dynamic learning perspective of entrepreneurship. Entrepreneurship Theory and Practice, 29(4), 373-397.

Creswell, J. W. (2012). Qualitative inquiry and research design: Choosing among five approaches. Sage publications

Davidsson, P., & Honig, B. (2003). The role of social and human capital among nascent entrepreneurs. Journal of Business Venturing, 18(3), 301-331.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. Qualitative health research, 15(9), 1277-1288.

Kutzhanova, N., Lyons, T. S., & Lichtenstein, G. A. (2009). Skill-based development of entrepreneurs and the role of personal and peer group coaching in enterprise development. Economic Development Quarterly, 23(3), 193-210.

Mamabolo, M. A., Kerrin, M., & Kele, T. (2017). Entrepreneurship management skills requirements in an emerging economy: A South African outlook. The Southern African Journal of Entrepreneurship and Small Business Management, 9(1), 1-10.

McKevitt, D. & Marshall, D. (2015). The legitimacy of entrepreneurial mentoring. International Journal of Entrepreneurial Behaviour & Research, 21(2), 263-280

Morales, C., & Marquina, P.C. (2013). Entrepreneurial skills, significant differences between Serbian and German entrepreneurs. The Business and Economics Research Journal, 6(1), 129-141.

Narkhede, B. E., Nehete, R. S., Raut, R. D., & Mahajan, S. K. (2014). Impact of entrepreneurial skills on the firm's performance: Evidence from manufacturing SMEs in India. International Journal of Indian Culture and Business Management, 8(2), 216-236.

PAGE (2017), Green Economy Inventory for South Africa: An Overview. Pretoria. South Africa

Politis, D. (2005). The process of entrepreneurial learning: A conceptual framework. Entrepreneurship Theory and Practice, 29(4), 399-424.

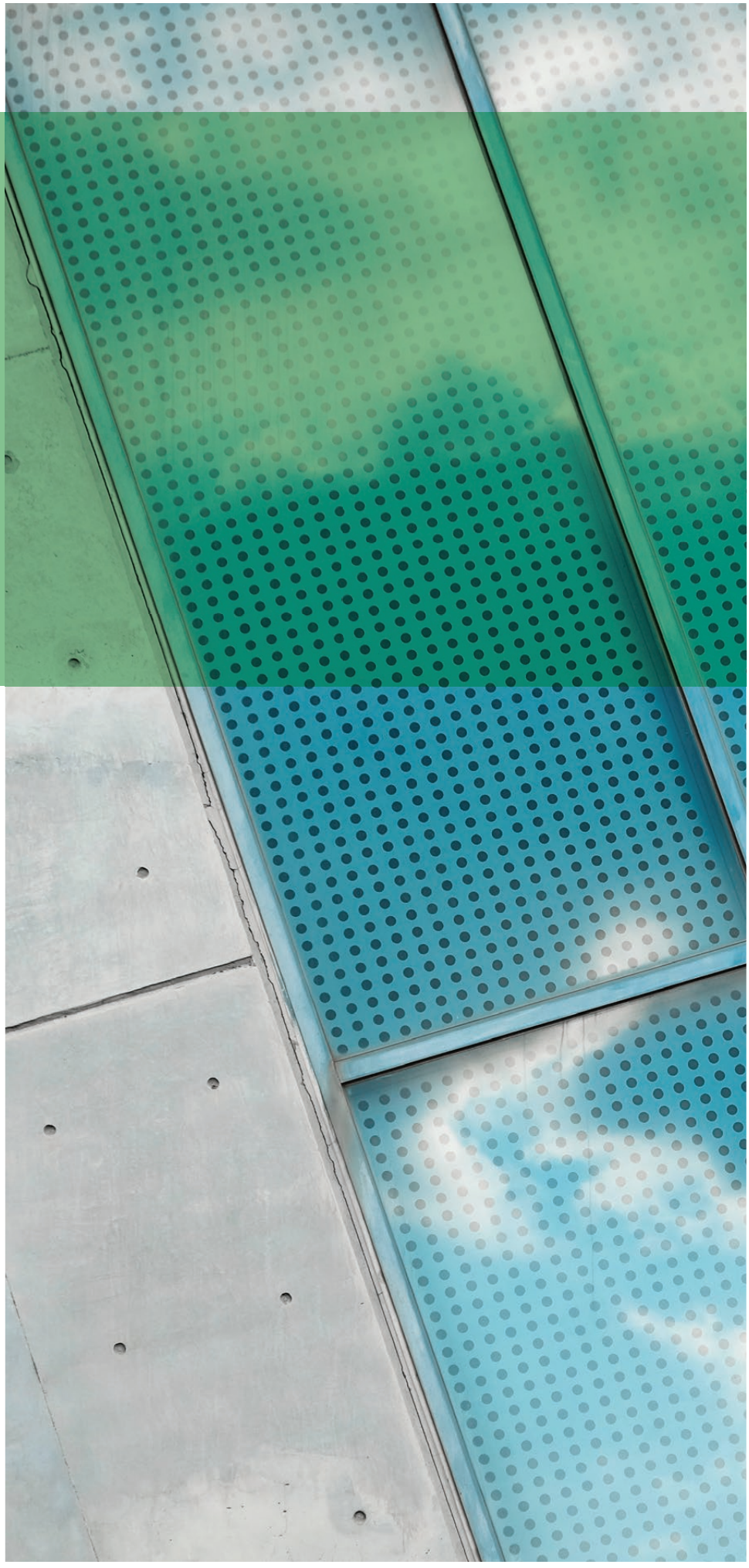
Shepherd, D. A., & DeTienne, D. R. (2005). Prior knowledge, potential financial reward, and opportunity identification. Entrepreneurship Theory and Practice, 29(1), 91-112.

Sexton, D. L., Upton, N. B., Wacholtz, L. E., & McDougall, P. P. (1997). Learning needs of growth-oriented entrepreneurs. Journal of Business Venturing, 12(1), 1-8.

Sternberg, R. J. (2004). Successful intelligence as a basis for entrepreneurship. Journal of Business Venturing, 19(2), 189-201.

Ucbasaran, D., Westhead, P., & Wright, M. (2008). Opportunity identification and pursuit: does an entrepreneur's human capital matter?. Small Business Economics, 30(2), 153-173.

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. Journal of business venturing, 26(3), 341-358.



Gordon Institute of Business Science
Entrepreneurship Development Academy

J.P.Morgan