

Harnessing power at the edge- A Case of MBISSA Energy Systems, a socio-tech venture from Africa

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Dr. Aparna Venugopal is the corresponding author*. This case is not an endorsement for MBISSA energy systems, a source of primary data on MBISSA energy systems or an illustration of the effective or ineffective management of MBISSA. This study was approved by the UNB Research Ethics Board under file no REB 2017-090, as a study that entails in depth examination of human subjects. Please do not share or distribute in part or in full without the permission of the corresponding author.

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Introduction

Mbissa is an island on Lake Bamendjing. It is a part of the village of Bambalang. Bambalang is the language spoken by 20,000 people on the Ndop Plains, in rural Cameroon, Africa. It is a rural community existing on subsistence living. They manage to get food from the land and the lake and their few leftovers help them tide over the seasonal famines. Life on the island is not easy. Mbissa Energy Systems makes a difference in Bambalang. They develop and deploy sustainable and renewable energy systems for use in areas such as Mbissa.

MBISSA energy systems has two goals:

- To produce electricity that will act as foundations on which future development efforts in the fields of business, agriculture, education, healthcare and communication may be built.
- To empower rural Africans with the knowledge needed to use the advantages that energy brings forth and reduce their poverty.¹

MBISSA Energy Systems offers low cost homemade wind and solar solutions to remote communities in Cameroon, Africa. They target poorer off-grid areas in the region first and energy is created on micro-grid scales by villagers who are given appropriate training to do so. The company aims to provide clean, affordable energy solutions and transform lives in the targeted rural communities of Africa. At present, MBISSA energy systems provides off-grid solar power solutions to the 3000 residents on the remote island of Mbissa off the coast of

¹ MBISSA energy systems. Retrieved from <https://www.f6s.com/mbissaenergysystems> in July 2019

Cameroon. Earlier, the residents of this island like the majority in sub-Saharan Africa relied on flashlights, kerosene lamps, candles, and torches to meet their lighting needs.

Genesis

Caleb Grove had grown up in Cameroon as the son of Canadian Missionaries working in Africa. As a young boy, Caleb had visited the island of Mbissa off the coast of Cameroon. Caleb was deeply affected by this remote island blessed with abundant rains and winds but with zero access to electricity. As a youth, when pursuing an education in engineering in Canada, Caleb started nurturing a dream to build a renewable and sustainable power source in this remote island. Exhibit 1 demonstrates Caleb's nature of work in Cameroon.

"I grew up in Cameroon, West Africa. We moved over there in 2008. I came back in 2009 after graduating from high school. During my time there, we would go down to the lake by the village where I used to live, and there was this island called MBISSA that we would see.. there is about 3000 people on the island. They live by subsistence living, just working the soil and the lake for food. But every rainy season, these great big storms would come down through..between the mountains..they would come across the lake and right over MBISSA. So, even though most of the village won't have all the rain in rainy season, MBISSA almost always has rain and wind. I thought as I talked to other people, what if they could have wind energy? Because there is no way they would have electricity. They are very poor. The grid can't go there because there is no way for them to get on the lake. So, I just had this dream, I guess of the people of MBISSA being able to use wind energy. This is a very remote community. There really isn't much that goes on in the area. The grid is state owned, but it is mainly focused on urban centres. So, for them to go out into a village like that...and then go to the island...it would not happen in 10-20-50 years. So, I just thought about that." Caleb Grove. Founder of MBISSA Energy Systems.

Product iterations

MBISSA Energy Systems' first prototype in rural west Africa explored the option of exploring wind energy for residential use. However, Caleb soon found out that wind energy is not a reliable or efficient source of energy in his chosen context of study. He then realigned his focus on capturing solar energy via panels mounted on housetops and storing the power in batteries for small-scale residential use. MBISSA Energy Systems is a not for profit organization.

While doing his engineering at the University of New Brunswick, Caleb started taking a few courses with the University's Centre for Technology Management and Entrepreneurship (TME) just for fun. He was always excited about innovation and the idea of creating something new. Somewhere at the back of his mind, he did think that it would be great if he could do a project exploring the potential of accessing wind energy. He started exploring this idea as part of his TME course project in a group of four. With the encouragement of their course instructor, Prof. Dharendra Shukla, they slowly took this project further. In 2013 they presented their idea at a pitch competition organized by TME and the Royal Bank of Canada. They received the prize for the best sustainable social entrepreneurship idea. However, after the competition the group disbanded and everyone went their own way. The idea stuck with Caleb though. His mentor, Dr. Shukla suggested that he keep the project alive while pursuing his undergraduate degree. At first, Caleb was not really convinced about the business feasibility of the ideas. When he talked to his family members and local contacts in Cameroon, he started envisioning a path forward. He created the first prototype to harness wind energy in 2014. He continued taking several TME courses to educate himself about the different facets of entrepreneurship. Caleb travelled to the island of MBISSA in 2015 with the intent of pursuing a wind energy project. As a first step in this endeavour, he installed a 10 metre tower atop a hill in the island to measure wind speed and check the feasibility of his business idea. He went on to develop four different prototypes to capture wind energy in the subsequent years. However, having analyzed the performance of the prototypes, Caleb and his team identified that solar resource was much more readily available. Therefore, MBISSA Energy Systems started its first solar power installation pilot project in the island of MBISSA in 2016. By the end of 2017, they had implemented 7 installations in the island with

3000 inhabitants. These installations varied in their purpose. While some providing energy support to businesses so that they could extend their evening business hours, some others provided basic illumination in houses and enhanced the household's quality of life in the evenings. Some installations were also used to aid small scale industries. The pilot reaffirmed the viability of their business idea and the market opportunity they had anticipated.

Caleb Grove, Founder of MBISSA Energy Systems: “....but I realized during my time there many people were coming and asking ‘Will you come to my home..Will you come to my village from all over Cameroon..even from all over Africa..and so..I realized there is an opportunity there..I want to understand how to provide people with sustainable electricity..”

Incubator Affiliation and Venture Fund Pipeline

MBISSA Energy system was affiliated with University of New Brunswick's energy based incubator, Energia Ventures. They received a venture support of 15,000 CAD (11,400 USD) from Energia. This helped them further their first pilot on the island of Mbissa. Further, in the initial stages of development Caleb had received a funding support of 10,000 CAD (7,600 USD) from the University of New Brunswick. Caleb has also sourced crowdfunding support with a gofundme account. In an interview given to CBC's Ms. Catherine Harrop in 2017, Caleb says



Figure 1. Caleb's solar powered micro home in Douglas, Canada

Source. Canadian broadcasting corporation, 2017. ²

that he received over 30,000 CAD in funding support from various UNB agencies.² To garner more local support, financial aid and business credibility he built a micro home 8 feet wide and 12 feet long in Douglas, NB, Canada in 2017. This micro-home showcased how he could build a cheap, scalable completely solar powered power set-up. He appreciates the mentorship received with his association with the incubator.

Caleb Grove, Founder of MBISSA Energy Systems: “I do not yet know how to think properly. So, when I hear about market intelligence, or different topics. I become aware of what I need to be thinking about. So, I will often take the resources. I don’t know maybe by the time someone is at their 4th or 5th venture, maybe it won’t be as useful because I already have that knowledge, but having the connection (helps), because I often find those connections lead to others”.

Friends, collaborators and the team

MBISSA was incorporated in 2015 and has a tiny team of 4 people. In addition to the founder Caleb Grove, the team consists of three installation technicians on the ground in Mbissa, Africa. These are people who Caleb had known since he was a young boy growing up in Cameroon. Caleb’s family had close ties with the local *Sil* at Cameroon.³ Caleb found people who operate in different capacities inside the Sils. His connections in the Sils opened doors to access varied business capacities such as legal aspects, market research, technology assessment, and personnel recruitment. He found many of his previous connections very useful in his business as well. In addition, Caleb received extensive business and technical mentorship from mentors at the University of New Brunswick and the New Brunswick Research and Productivity Council.

Early on in his business, Caleb found that the local villagers called his venture ‘*munong micra*’ or the ‘the fire of the foreigner’. This led him to decide that he would always train and

² Harrop. C (2017). Canadian Broadcasting Corporation. Retrieved from <https://www.cbc.ca/news/canada/new-brunswick/micro-home-power-system-1.4440658> in July 2019.

³ Sils are groups of people who do primarily linguistics and translation into mother tongue materials and they especially focus on the Bible.



Figure 2. Caleb with his team testing equipment at the only health clinic on the island of Mbissa, Cameroon.

Source. Company.

employ local men and women to deploy the units. He wanted his business to be a sustainable solution that the villagers would have the tools to access, the knowledge to build and implement, even if the foreigner did not exist. He insisted on calling his business '*munong Mbissa*' or the 'the fire of Mbissa'.

Impact Measurement

Caleb uses several unorthodox social measures to identify the impact of his venture. Rather than counting the number of installations he has facilitated, he measures the venture's overall impact on the standard of living in Mbissa. For instance, he speaks of the enhanced sense of security and happiness people feel in illuminated rooms in the evenings. Further, he observes how his venture affects education positively through providing internet access in homes, and

helping children study in the evenings. Moreover, his venture's impact is also manifested in the ways in which they facilitate extended business hours and manufacturing in micro-enterprises. Finally, he also sees how his venture helps healthy and safe living in senior's homes when they use the evening lights to keep wild animals away. One of the very first installations was in a health clinic.

Before the advent of MBISSA Energy Systems in the island of Mbissa, the residents had been using kerosene lamps, candles, torches and flashlights. These light sources resulted in higher greenhouse gas emissions, poorer quality of light, higher risks to health, sense of insecurity at night, higher fuel costs, and limited productive hours. MBISSA has enabled the residents of Mbissa to use cleaner energy sources, achieve sustainable higher quality sources of illumination in the evenings, extend their productive hours and reduce the vulnerability of their life.

“What is novel about that is that this is rural Africa, so they are going in about 5-10 years from having nothing but Kerosene lanterns and little flash lights to having solar electricity in their homes, you can have Wi-Fi, 3 G Wi-Fi in your home. I mean, it is crazy the change that is happening. What is innovative about it is how people are figuring out how to go from how to even understanding electricity like the fact that you don't douse out a light because it is not actually a flame it is electricity, to powering their entire villages. And they are coming up with models, they are coming up with the ability to bring all the technology in, they are making it work, where before you wouldn't think that it would work.” Caleb Grove, Founder of MBISSA Energy Systems.

In 2018, Huddle listed MBISSA Energy Systems as one of the seven New Brunswick based startups to look out for.⁴

⁴ Letson, C. (2018). Huddle. Retrieved from <https://huddle.today/seven-new-brunswick-startups-to-watch/> in July 2019.

Competition

“What I realized is that..If I don’t do it, someone else will ..but.. if I don’t do it, chances are that the someone else who does do it will not be doing a social venture. They will be trying to take every last penny they can from the people they are working with...Like many of the other efforts across Africa..where it is almost ruthless business. It is very demanding on the continent itself..It takes a toll..The investment that is coming into the continent, it comes at a price. Often it is at the (cost of) health of the people, often it is at the cost of natural resources, it is at very cheap labor. So, if I don’t do it, someone else will, but if I do do it, I can guarantee that I can give people a vision to improve their own villages from where they are. They don’t have to go the city to work in the factory.” Caleb Grove, Founder of MBISSA Energy Systems.

There are other players in Cameroon providing off the grid solar installations. One of the prominent ones in the area are Lighting Africa. Lighting Africa started off with pilots in Ghana and Kenya in 2009 and is part of the World Bank Group’s contribution to Sustainable Energy for All. In partnership with the Energy Sector Management Assistance Program, the Global Environment Facility and several western governments including the United States of America, Canada and the United Kingdom. However, competitors such as Lighting Africa fail to have the in-depth contextual knowledge and local connections that Caleb has nurtured over time.⁵

Cameroon and the context of energy

Cameroon is in the midst of a brutal civil war now. During world war I, the French and English forces had captured Cameroon from the German. The Francophones of Cameroon gained their independence in 1960 and a new country named ‘La Republique Cameroun’ was founded. The anglophone regions joined the newly formed nation in 1961. At present, 80% of the population comprises of Francophone and around 20% are Anglophone. However, around 200 odd languages are spoken in Cameroon in addition to French and English. The linguistically diverse country has been brought to a violent civil war drawn on language. The roots of the

⁵ Lighting Africa. Retrieved from <https://www.lightingafrica.org/about/> in July 2019

present conflict can be traced to peaceful protests organized by Anglophone human rights leaders, teachers and lawyers. They were protesting against the appointment of Francophone lawyers and teachers to English speaking courts and schools. Most of these activists were imprisoned soon after and the anglophone demands and fighting have escalated since then. With the responsible leadership jailed, the protest fell into the hands of extremists groups who demanded the formation of a new Anglophone country that they call 'Ambazonia'. The government of Cameroon claims that in the spring of 2018 the Anglophone separatist protesters started attacking the military troops and that the government were forced to retaliate. Cameroon has been governed by President Paul Biya since 1982. Paul Biya, a Francophone in his eighties was elected again to a seven year term in October 2018 in a contested election that elicited little participation from Cameroon's Anglophone participation.⁶ Nathalie O'Neil, the outgoing Canadian high commissioner at Canada suggested that Canada would reinforce its economic cooperation and trade with Cameroon in July 2019. She said that Canada had found an important partner for its investments in water in energy in the Minister of Water Resources and Energy at Cameroon, Mr. Gaston Eloundou Essomba. Interestingly, the erstwhile high commissioner added in her parting note that Canada considered its own bilingual nature as one of its key strengths and would continue to strengthen Cameroon National Commission's efforts towards sustaining bilingualism and multiculturalism.⁷

Way Forward

By early 2018, Caleb had completed around 40 installations in Cameroon and estimated that he had directly impacted the lives of 250 people. However, as the civil war gained strength in the country, he decided to move temporarily back to Canada. He hopes that one day he shall

⁶ Siobhan O'Grady (2019). Washington Post. Retrieved in July 2019 from https://d21rhj7n383afu.cloudfront.net/washpost-production/The_Washington_Post/20190117/5c40e368e4b048a6f153fef5/5c4240e4e4b06c96e32f7313_1509128713498-xfd55s_t_1547845874846_640_360_600.mp4

⁷ Cameroon Tribune (2019). Business new resources from Yaounde. Retrieved from <https://allafrica.com/list/aans/post/af/cat/business/pubkey/publisher:editorial:00010079.html>

be able to go back to the island of Mbissa and resume the work he had started. He aspires to develop his business throughout sub-Saharan Africa.



Figure 3. Anglophone region of Cameroon
Source. Washington Post. ⁶

BRIEF TEACHING NOTE

(Please contact the corresponding author to receive the detailed teaching note)

The case of MBISSA Energy Systems fits in nicely with the descriptions of bricolage and bottom of pyramid innovations.⁸ Although the relative innovativeness of the technology at hand seems trivial, the social impact that this incremental innovation has gathered in one of the remotest corners of earth speaks volumes about its significance.

Learning outcomes from the case

MBISSA Energy Systems can be a perfect example of a bottom of pyramid or bricolage innovation. Under constraints, Caleb and his friends have come up with a solution that is relatively unique in their context of use to provide a clean energy solution to a remote community.

Teaching outcomes

1. To teach the concepts of bottom of pyramid innovation in a graduate business, technology management or entrepreneurship class
2. To teach the concept of bricolage innovation in a graduate business, technology management or entrepreneurship class.

Background readings

1. Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative Science Quarterly*, 50(3), 329-366.
2. Prahalad, C. K. (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of Product Innovation Management*, 29(1), 6-12.
3. Siqueira, A. C. O., Mariano, S. R., & Moraes, J. (2014). Supporting innovation ecosystems with microfinance: Evidence from Brazil and implications for social entrepreneurship. *Journal of Social Entrepreneurship*, 5(3), 318-338.

⁸ Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative Science Quarterly*, 50(3), 329-366. Prahalad, C. K. (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of Product Innovation Management*, 29(1), 6-12. Siqueira, A. C. O., Mariano, S. R., & Moraes, J. (2014). Supporting innovation ecosystems with microfinance: Evidence from Brazil and implications for social entrepreneurship. *Journal of Social Entrepreneurship*, 5(3), 318-338.

Assignment questions

1. What are the factors and conditions that enabled Caleb to introduce a relatively old technology as an innovative solution in Cameroon?
2. How did Caleb use his familiar innovation ecosystems in two different countries to his benefit?
3. What are the contextual constraints that Caleb exploited to enhance the value of his business proposition?

Case analysis process

A s s i g n m e n t Questions	Case Discussion	Class Process	Duration (2 hours)
What are the factors and conditions that enabled Caleb to introduce a relatively old technology as an innovative solution in Cameroon?	The remoteness of the context and the other PESTEL features that contribute to the lack of market forces in the area can be discussed. Caleb's decision to employ cheap local materials, local village employees and an inexpensive technology can be explained. At this point, discussion should also focus on comparison between wind and solar solutions and the lack of competition from Lighting Africa in Cameroon.	Instructor introduces the case and invites the class to suggest if, why and how they think Caleb's innovation can be considered as a bottom of the pyramid innovation.	30 minutes
How did Caleb use his familiar innovation ecosystems in two different countries to his benefit?	Having explained the concept of innovation ecosystems, the instructor goes on to differentiate between strong and weak network ties, network churn and the significance of these concepts especially in the context of social enterprises in emerging markets.	Students are requested to come prepared with the background reading on innovation ecosystems and asked to draw similarities between the innovation ecosystems in Brazil, Canada and Cameroon as described in the reading and the case respectively	30 minutes
10 minute break			

What are the contextual constraints that Caleb exploited to enhance the value of his business proposition?	The bricolage framework is used to explain Caleb's business value in Cameroon.	The class is asked to come prepared with the background readings and invited to present their analysis of MBISSA Energy Systems using the Bricolage framework.	30 minutes
Debriefing	All the key concepts on bricolage and bottom of pyramid are highlighted in the debrief on the case.	Instructor debriefs various factors that impede and impel bottom of pyramid innovation and bricolage. The class ends on an examination of the various PESTEL factors that usually affect business sustainability, as in this case in emerging markets.	20 minutes