

Lessons learned within 5 years of operations in the field of rural electrification in Kenya and Tanzania.

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PP Power ApS have been operation for five years now and it has been a roller coaster journey where we have succeeded in some areas and failed in others. I would here like to describe the journey briefly to conclude where we in my opinion did right and where we did wrong.

2016-2017

The company was founded ultimo 2016 by my wife Annie and me with an initial investment of 50.000 DKK on the idea to develop an affordable, portable power solution based on renewable energy for families in Africa not connected to public grid. I started working in the company on my own without salary for the first 1,5 years and was partly funded by the Danish InnoBooster Scheme with approx. 250,000 DKK which was used for developing hardware and software MVP prototypes together with sub-suppliers in Denmark. My background comes from the Danish energy industry where I have worked for more than 20 years as software and hardware engineer as well as business developer in both big companies and smaller startup companies. My wife helped me with sourcing and logistics. A friend and colleague of mine Christian Nielsen helped me with writing applications for funding and got some shares in return and are a member of the Board.

In the summer of 2017, I traveled for a month to Kenya with 10 MVP prototypes to have them tested in a small village together with a Kenyan friend of mine Jeremiah who studied software development in Denmark. He and his sister Deborah living in the village helped me build a small PV system of 200 Watt in a school of the village Muskut, where school kids could bring and charge the portable power solutions and carry them back to their homes for lighting and phone charging.



We got valuable feedback on the functionality of the system and on the willingness to pay for the system in small weekly installments which was less than they normally spend on buying kerosene for oil lamps and mobile charging.

I traveled back to Denmark to try and develop the next version where design and plastic molding was on the to-do list. This was pretty expensive around 1 mill. DKK so this was not an option for me myself to do.

To help us find partners and explore our opportunities we became members of the Danish organization Access2Innovation and the global initiative GOGLA, from where we got market insights and access to partners and programs e.g. certification schemes.

I applied for a Danida project together with Aalborg University in Denmark and two Tanzanian partners – a University and a micro-grid company. I traveled to Tanzania in February 2018 to explore this and at the same time to follow up on our Kenyan customers. We failed to get funded by Danida, but we got some interesting partners in Tanzania to move on with. In Kenya one of the main feedback from our test customers was a wish to make a solution with its own PV panel so that people did not have to walk for a charge of the battery.

2018

Instead of developing our own design of the battery solution I sought to find an off-the-shelf Chinese solution that could fit our needs. I found a candidate and on the journey to Kenya in February 2018 I tested this solution among our first customers and showcased it at a technical School in Eldoret. This was a huge success and after I got home, I negotiated with the Chinese company to let us develop an IoT PCB to be combined with their BMS PCB so that we could communicate with the battery over mobile network and LoRa as for our first version. In this way this Chinese battery could be switched on and off in line with customer payments and we could monitor and log usage on our server backend. Now, I had contact with several potential partners in Kenya and Tanzania (CX Power, SolarKiosk and Rafiki Power) and was ready to move on.



In June I traveled back to Kenya and Tanzania to follow up on partners and to have some administrative tasks done (Getting SIM cards for our battery solution, bank account and integration with mobile wallets, getting our first Chinese batteries out of customs etc.) Deborah and I was also having a look at our competitors M-Kopa and SunKing, they are both operating in the village where we test our solution. Their offers are similar to ours, but the systems are smaller.

In Tanzania I did the same things to get to know the competitors Mobisol, Zola and SunKing. I was also testing our new battery solution with local sim cards. In Tanzania I got introduced to a local hotel owner, Ian, and he introduced me to a local guy Kisuejo who could act like a local manager like Deborah in Kenya. I agreed with him to make a small report on how things could be set up in Tanzania and when I came back to Denmark, we arranged an agreement.



We still needed to have batteries in Tanzania for testing at potential customers, so I arranged with Deborah to send some from Kenya to Tanzania with bus to be picked up by a local Taxi driver Arnold who I met in Arusha. I also flew to Dar es-Salaam and after visiting SolarKiosk to plan a visit to some local sites the next time I was to come to Tanzania.



My only concern at this point now was that I did not have any more money as of the summer of 2018. I had tried several accelerator programs and attended several Investment Pitches without any luck. I also tried to get a new InnoBooster project of half a million DDK without any success.

An old friend (Preben Birr Pedersen) and colleague of mine was willing to invest 750,000 DKK in the company and this also made InnoBooster willing to provide us with a new project of approx. 250,000 DKK. Now we had 1 mill. DKK to continue the development and we could start having a minimum salary. Preben could also take care of attracting new investors to the company.

In August I traveled back to Tanzania to test the first few batteries from China without the new IoT system at sites operated by Rafiki Power and Solar Kiosk and to plan the setup of a local company in Tanzania. I agree with the hotel owner, Ian, that he will be the local director with a share of 51% according to Tanzanian law. We had a local lawyer helping us out.



I also visited the Danish Embassy in Dar es-Salaam to discuss how they could help us out in Tanzania, but it seemed that the best way they could help us was by providing insights in the market and the culture which I thought that we could do ourselves. During my last visit, I had sent some batteries to Tanzania for test with SolarKiosk, but they have not gotten out of customs yet. After some local pressure we succeeded and were able to get two batteries out to be tested at some local sites, and I traveled back to Denmark with a feeling that we could make a solid business in Africa.

During the summer and fall of 2018 we had 100 batteries shipped in from China to Denmark which was disassembled and combined with our new IoT PCB in my garage before being shipped to Kenya and Tanzania for a last test before we would decide on this approach as our final solution.



We hired my son Mads to make the software integration with the local mobile wallet suppliers so that we could see payments in our back-end. This had to be tested locally and during my next trip in September and October this was one of the tasks to be closed. On the same trip all 80 of the new batteries was shipped out to Kenya and Tanzania to make the final test of both technology and business model.

Back in Kenya and Tanzania again there is a lot of trouble to get the integration up and running, but in the end we succeeded. Now we just needed the batteries out of customs, but here we also faced a lot of delays and claims of new and unforeseen expenses!

Back in Denmark again and not all has been done - I needed to go to Africa again later this year. In the meantime, we applied for a large project funded by the Nordic Development Fund for a 3 mill. DKK project to help us setup sales channels partnerships in Tanzania.

I got back to Tanzania again in November 2018 to train our local manager Kisuejo and to deliver the first test batteries to sites run by both SolarKiosk and Rafiki Power. I also met with a local social enterprise company KAKUTE run by Mr. Livinus Manyanga, whom I met when I was in Tanzania in August. Kakute could be a local partner in our NCF project.

After being in Tanzania I went to Kenya to deliver the new batteries to the customers in the local village who had helped us with testing before. Seven out of ten customer were willing to buy our new product, so this was good.

In December 2018 we got short-listed for our NCF project which was great. But we also faced some challenges because our local guy in Tanzania, Kisuejo, had cheated on us and had stolen some batteries and all our flashlights and run away! Mr. Ian, the hotel owner who recommended Kisuejo, was very sad about this and wanted to find a replacement.

We also faced some challenges with the data logging and remote control of the new batteries that we needed to fix. We thought it was about the local sim cards running out of credit and that it was not possible to top up automatically.

All issues were dealt with and before Christmas 2018 my wife Annie and I traveled to China to finalize our setup and test of the combining of our IoT solution with the Chinese company and their battery and BMS PCB.

2019

My family and I all traveled to Kenya and Tanzania in February of 2019 to solve the final issues and to finalize the setup of the local legal companies and get the local organization in place. We also needed to follow up on customers to get their feedback updated!

The customers complained about us shutting down the batteries when they did not pay, and we needed to make a solution where they got notified by SMS before this happened. Also, the re-activation after payment seemed to be of trouble some of the customers, because re-activation needed the battery to be connected to a power source – either a PV panel or mains.



At the same time, we still had issues with creating local organizations and to get legal registration – things are moving very slowly in especially Tanzania. In Kenya we were almost finished.

Both our local partners Rafiki Power and SolarKiosk were facing problems and Rafiki Power was sold to American Powergen and SolarKiosk went bankrupt.

We were also now beginning to see that our competitors except from M-kopa was beginning to specialize in the complete value chain. M-Kopa kept influence on the hole chain, but others began to focus on different parts, technology, software, distribution and credit. We still thought that keeping control of the hole value chain like the market leader M-Kopa, would bring us knowledge and experience and keep our running cost down (licenses, margin etc.)

Back in Denmark again we finalized our hardware and software with the feedback we have got from customers. I found a new Danish company Onomondo with a roaming sim card solution. This is more expensive but will run in all countries and under several network providers such as Safaricom, Airtel, Vodacom and Tigo.

As of spring 2019 we were ready for the production of our first Chinese batch of 1000 units! But we needed the funds to do so!

In May I returned to Tanzania to finalize the company registration and setting up of bank account and to plan for our upcoming NCF project if we got approved! We also need to follow up on our new local agent Linus who also seemed to be a little dishonest to the company.



I also had the time to follow up in Kenya with Deborah and our new local agent Brian. Here everything seemed to work okay only the sales were going a bit slow.

During spring and summer, we finalized our NCF project and got approved for funding incl. 30% of our battery production cost. This also made it possible for us to attract another seed investor – a former colleague of Preben, Kenneth Pedersen - with another 300,000 DKK with options of more shares.

Now we were also able to hire Rikke as our first full-time employee. She comes with an IT and marketing background. She was responsible for SoMe, reporting, analysis etc. This was a great help. And now I was also able to get a decent salary.

In August 2019 we had the kick-off of our NCF project in Tanzania and I began negotiating with local shipping companies on importing the 1000 new units from China, when production was ready. A local shipper could also facilitate warehousing and office space for around 300 USD/month.



Kakute and the other partner PG Consulting have already a lot of potential organizations that was interested in our product and solution. Also, our local agent Linus has got some contacts in local tour companies and tour organizations.

Now they needed to follow up on this to close the deals and contracts. Kakute tested some of the batteries and had questions on wiring panels and other stuff that we should investigate into further before the final solution was manufactured.

But this was difficult because I have already ordered the different items from China: Solar Panels, Radios, Bulbs and wires and of course the 300 Wh LiOn portable Battery. We had designed the box for the complete unit incl. accessories as well as a shipping box for the transport of 3 units together on pallets. So, everything was now ready!

We also began designing employee and agent commission contracts and was looking for an operation manager for the Tanzania company. Here Kakute helped a lot and recommended a guy Joseph that had previously worked at a similar position at the competitor company, Mobisol. It seemed like a good choice, but he was from South Africa and this caused some issues with the immigration authorities.

In Kenya we had now setup a local store for our batteries in a junction where many people pass by. We tested new software and the new roaming sim card from Onomondo and everything now seemed to work fine except the issues with re-activation that will be solved with the new shipment from China.

We did a lot of marketing and demonstrations and began to show sales to people that did not yet know us or the company. But it seems like a long and bumpy way to reach end-users. They compare prices a lot and do not seem to care about the value they get. So marketing was very important as well as testing different price- and credit models. Something we also note is that mouth-to-mouth is very important. This also needed to be built into our marketing and sales strategy where we can pay commission to families who recommend us to a new customer. We began to see that if we could demonstrate that the battery can provide income to customers by offering phone charging, showing movies, or hair cutting this seems very interesting.



Back in Denmark we starting to negotiate with the Danish “Vækstfonden” for a loan of 600,000 DKK to help us pay for the shipment from China.

I went back to Kenya and Tanzania in October 2019 to do more demonstrations and marketing and to finalize the local company setup in Tanzania.

At the demonstrations we now showcased hair cutting, TV and speaker systems. This is something that potential customers like – but I wondered if they can pay for these extra appliances?



We got a lot of positive feedback from our customers saying that their kids now performed a lot better in school, because they now had lights for homework during evening time. We also began to see challenges with batteries out of network reach, even though the coverage in especially Kenya is very good. Some customers had difficulties paying regularly and had issues with the batteries shutting off and the re-activation and network coverage was still a problem. Some customers also complained that the battery ran out of power and/or that the panel was too small. Our solution came with a 20 Watt but could be up to 60 Watt. This was something we had to look into for customers with a higher consumption.

In Tanzania we still faced a lot of challenges with bank accounts and mobile wallets and integration. This was now implemented in Kenya, but in Tanzania everything moves so slowly, and it seems that nothing happens between my visits. When I'm around we get some progress, but still...

We decided to hire Joseph as our new operations manager and let him make the plans for hiring employees and agents as well as making budgets for the running of the local Tanzania company.

We also visited some of the mini-grid sites where we had provided batteries for customers to test our solution by charging at the mini-grid and carry power home. The result was that customers want their own solution incl panel, so they do not have to walk for power. We discussed this with Powergen but they were not willing to test other business models where we share cost and revenue from individual power solutions. This could potentially ruin our efforts of partnering up with micro grid companies...one of the goals of our NCF project.



Sales were also an issue in Tanzania where all the good ideas laid out in August did not seem to unfold. We were still behind our budgets and no one came up with good explanations for the missing sales.

In December I traveled to China to inspect our cargo before shipment to Mombasa in Kenya. Everything seemed very good and I looked forward coming back to Africa in January 2020 with all the staff from Denmark to plan for the marketing and sales in 2020!



2020

Back in Kenya and Africa again in January now with Rikke and Kenneth who was our new investor and partner. Kenneth is in charge of bringing our administration and accounting in place so all three countries are on the same platform. He also has ideas to the marketing.

Kakute and PG keep having a lot of new good ideas for business models and partnerships. E.g. Women's saving groups (SACCOS) and different farmers and teachers groups, with whom we were introduced at our Milestone 2 kick-off meeting in our NCF project.

We still faced a lot of difficulties regarding integration of payment systems into our server back-end in Tanzania, but our bank account was now working!

In Kenya, we visited families again and made demonstrations and also contacted the NGO "World Vision", which operates in the same area where our families live. Deborah followed up on whether it was possible to make a collaboration with them.



Kakute is trying to help us with the design and printing of folders, price lists etc. in local Swahili language.

On our way back to Tanzania we stopped in Nairobi to pick up Kenneth and to visit a local recycling center called WEEE Centre, whom we wanted to partner up with. This was perfect because they had a lot of experience in electronic waste and we got to meet the director to set up the plan for making a MoU with them.

All our 1000 batteries arrived from China and was stored in our local warehouse and office space. We planned to have 100 batteries transferred from Tanzania to Kenya, but this was pretty expensive because we had to pay custom and VAT again into Kenya. However, this was done over the next couple of months.



We were now ready to accelerate sales in both Kenya and Tanzania.

In March the world was closing down due to the new Corona virus and everything was put on hold in both Denmark and Africa. This made us try to setup sales locally in Denmark together with a Danish reward-based crowd-funding platform. We did succeed in this, but we did not have the funds and stock to continue to try and get this market running even though we got some input from different accelerator programs in Denmark.



We had worked with our NCF partners online and set up training with potential agents etc. We did not manage to get sales started and had trouble with getting all permits to operate in Tanzania especially with our roaming sim card from Onomondo. This took two months until we finally got the permit without any explanation on why they delayed this.

We were doing okay on setting up plans and materials, but when it came to implementation things did go wrong and nothing really happened in Tanzania during spring and summer of 2020. We also made a huge marketing plan that we had to postpone to August due to COVID-19. Clients were not willing or could not buy our solution, even that everyone told us that it was a very good system.



From GOGLA and other sources we now began to see the effect of companies specializing in different parts of the value chain. Companies are now specializing in making distribution and payment software for both front-ends, back-ends and embedded into the hardware. This means that it is now much easier

for competitors to entering the market because they do not have to invent everything themselves. Even Chinese companies are now beginning to manufacturing solutions that have embedded different vendors open software solutions like OpenPAYG. As a consequence we began to see big players like Solaris Offgrid, American Green Planet and French Engie to enter the market buying competitors and start-ups and thus focusing on different business models instead of technology and organizations.

In June 2020 we had a fire at our warehouse in Tanzania because of faulty electricity installations and we lost half of our stock – and our local insurance was not yet in place – very bad! It took nearly two months to get the fire report and the police report.



From then on everything began to go wrong.

So, the collaboration between the local partners began to drift apart and we also saw fraud from Joseph's side putting money from sales in his own pocket. This was because the integration with mobile wallets was still not working. Also, Ian hired two super-agents who were pretty good at selling and this also made some obstacles in the team.

All of this caused Ian to be very tight on allowing the team spending cost on marketing, allowances and demonstrations. And this made sales slow down again.

All this ended with the firing of the whole local team, except from the country manager and co-owner Ian whom I trust very well, and this made the follow up on our greatly planned marketing campaign in August 2020 a failure where we did not succeed in closing any of almost 2000 leads we got from this expensive marketing campaign. During this we also saw some fraud from the super-agents that Ian hired, and we were now without any local sales force or organization.

Because the sales did not emerge in Tanzania, we did not have any success in attracting new investors to the company and toward the end of the year 2020 we were beginning to face liquidity challenges.

2021

We hired a new operation manager, Emily, who was recommended to us by the local Arusha Technical College, whom Ian knew very well and trusted. This started to get things under control, but many customers had not paid their installments, and many had also complained about too small panels due to their higher – and unexpected – consumption. All in all, this made us change our strategy at the end of the year towards getting cash sales up and deliver credit sales to micro finance companies. This is a different customer segment and therefore we had to make a new sales plan. We did so where we budgeted on selling 30 units every month. This was done in agreement with our NCF partners and the local PPP TZ company.

To make sales emerge and to get more customer feed-back we decided to hire a marketing agent in PPP TZ to help with cash sales in Arusha urban areas as well as delivering credit sales towards clients that have previously shown interest in our product in suburban areas and distribute the batteries among both

villages and urban areas on a low cost deposit scheme to see the effect of having a lot of batteries distributed.

We have expanded into Dar Es Salaam setting up a partnerships the company “Namibian and Tanzanian Group Ltd”, who have an office and a shop/showroom locally.

We have also through a Danish/Kenyan NGO started sales at the Victoria Lake on both sides of the border.

In total this have given us approx 130 new clients using our solution. This is still not near the goal that we set up for the company and not all have paid for the battery.

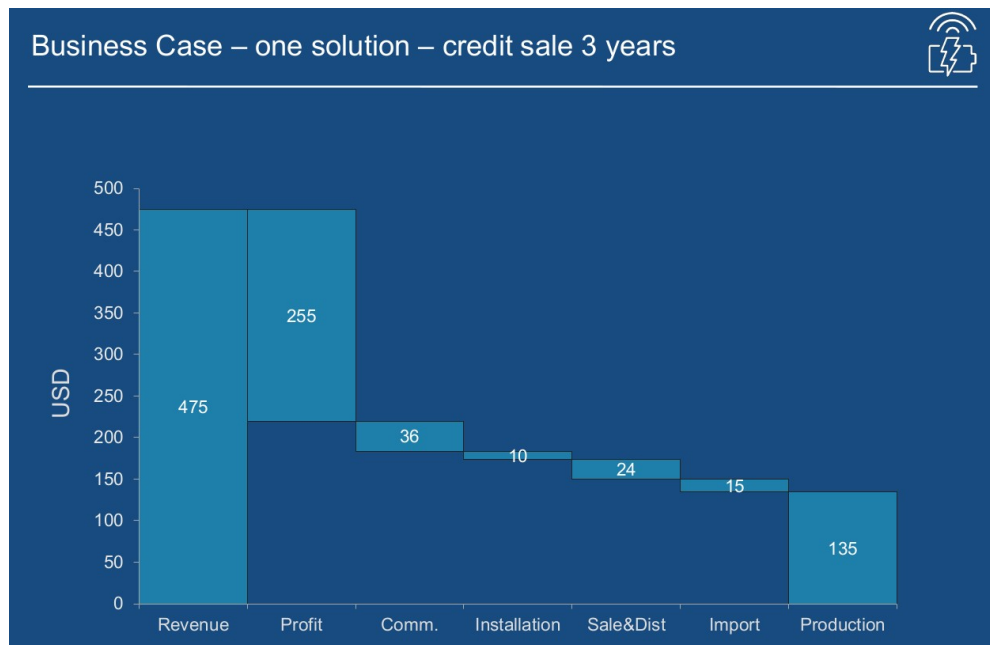
During 2021, we did not reach this target but even though we see that sales are now finally going up, we are now facing liquidity challenges that needs to be taken care of. First step was to minimize cost in Denmark by terminate the CEO for the company. We also terminated Rikke our full time employee. Now the Board is working for the company for free and as consultants were fees are expected to stay in the company.

We have by the end of 2021 not yet succeeded in creating a sustainable business and we now need further investments or partnerships with other similar companies if we are to be able to continue operations.

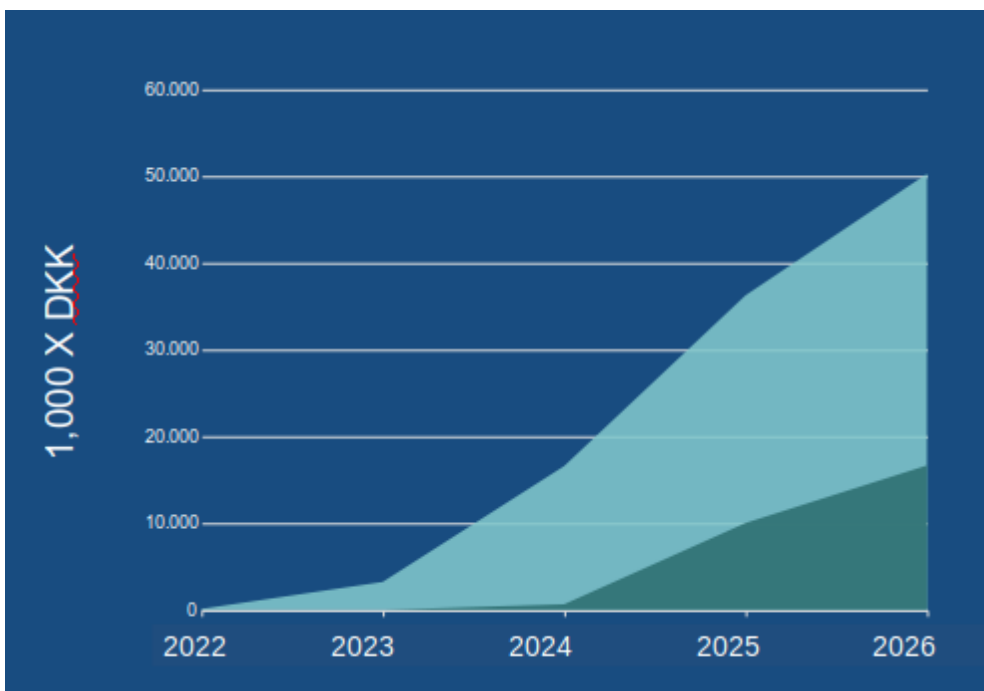
With the right competencies and organization setup in Africa, we are still convinced that Peoples Portable Power can become a good business with a big impact on the living conditions of families in Africa who do not have access to electricity and are therefore limited in terms of access to education, health and income from own small businesses. We will have to work hard on getting awareness towards PPP and this will mostly be done through engagement with NGO’s where we in the beginning finance the equipment either by ourselves, our investors or by donors.

Our original budgets on income and expenses, with the right staffing and organization are still valid. We will of-cause need new investments, but we can now with our build up knowledge and partners in Tanzania and Kenya over time make a sustainable business with great impact.

Our cost structure looks like this:



The total fore-cast on profit thus looks like a sale of 20,000 plants within 3 years. In comparison, the market in Kenya and Tanzania alone is over 5 million units. By 2023, the goal is to reach 3,000 units sold. In 2024 10,000 units and in 2025 20,000 units. This will make us a profit of approx. 3.5 mill USD in 2025.



We expect break-even at an annual sale of approx. 3000 batteries, but delayed one or two years due to our business model, which is partly based on leasing and installments.

Minimum running costs for staff, office, warehouse, etc .:

Denmark: 2 employees, office, insurance etc. approx. USD 300,000 / year for handling approx. 3000 units annually.

Africa each country: Country Manager, Operations Manager, Technician, Accountant, office space, warehouse, insurance, etc. approx. 60,000 USD for handling up to 1500 units / year. Sales agents are commission-paid and are included in the variable costs.

Total costs for handling up to 3000 units / year approx. USD 420,000

Margin is between 113 - 255 USD depending on type of sale (cash, installment or leasing)

Break even will be between 1700 - 3700 depending on the type of sale

Higher sales can be achieved at lower marginal costs

To cover fixed operating costs, marketing, building country organizations, production of goods over the next two years incl. repayment of existing debt, we need an investment in the order of 350,000 USD.



Conclusions

- MVP tested and validated locally with trusted partners is very important and was done successfully in Kenya
- We were too quick to launch our first product in the market – the 1000 units. We needed more time to test and should have continued with smaller batches even though this was at higher unit cost
- Local presence from the Danish team is very important and was a success until Corona hit us
- We should have attracted stronger competences and capital within local sales and international marketing earlier
- We should have offered a bigger share to larger institutional investors earlier
- Our Danish organization has been too weak and small, but we did not have the funds to do otherwise
- We should not have entered into Tanzania as a second market before everything was fully tested in our first market in Kenya
- Partnering up with strong value chain companies (distribution and credit) has been too weak
- We have not been able to setup an complete sales organization in Tanzania
- We should have got local help on setting administrative things up in Tanzania and not started until this was finalized.